

TEXAS INSTRUMENTS **PRINTER/PLOTTER** **USERS MANUAL**



TEXAS INSTRUMENTS

INCORPORATED

Dallas, Texas

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TEXAS INSTRUMENTS **PRINTER/PLOTTER** **USER'S MANUAL**

IMPORTANT

Record the serial number from the label on the unit and the purchase date in the space below. The serial number is identified by the words "SER. NO." printed on the label. Always reference this information in any correspondence.

Model No.

Serial No.

Purchase Date

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INTRODUCTION

INTRODUCTION

The Texas Instruments HX-1000 Printer/Plotter is a portable, efficient, and economical printing device for computers that use the TI *HEX-BUS*[™] Intelligent Peripheral Interface. The printer/plotter enables you to print text and plot graphic output in four colors with simple commands from the computer console.

As part of the expanding line of TI products that use the *HEX-BUS* interface (a standardized interconnection system with a uniform set of cabling patterns, control signals, and message structures), the printer/plotter connects directly to any computer compatible with this interface system.

This manual first shows you how to set up, connect, and test the printer/plotter and presents the BASIC instructions that are used to operate the unit. The commands available in graphic mode are described next, followed by sample programs that illustrate the printing and plotting capabilities of the device. A number of helpful appendices and a section of service information complete the manual.

Explanations and examples of programming employ the version of BASIC developed for the TI Compact Computer Model CC-40. Users of other TI computers may observe differences in format between some of the BASIC statements shown here and equivalent statements as used with their own machines. Apart from that distinction, however, the material in this manual applies to operation of the printer/plotter with any computer compatible with the *HEX-BUS* interface.

CONTROL SWITCHES

CONTROL SWITCHES

Power Switch

This switch, on the front of the case, controls battery power to the printer/plotter. It may also be used to reset the device if necessary when an error occurs.

Paper Advance Switch

The paper advance switch, located on the top right of the printer/plotter housing, allows the user to feed the paper through by holding the switch down. To stop the paper, release the switch. The paper advance switch cannot be operated while the printer/plotter is active.

Device Number Switch

The setting of this switch determines the address (normally 10) of the printer/plotter. The device number switch is accessible through the paper storage cover (see *Loading and Removing the Paper*).

SET-UP INSTRUCTIONS

SET-UP INSTRUCTIONS

Setting up the printer/plotter for the first time is a straightforward process. First the paper and pens are installed. Then the printer/plotter is attached to the *HEX-BUS* interface. Finally the operation of the device is checked. This section describes the steps involved in each of these procedures. Please read the material completely before you begin to set up the printer/plotter.

CAUTION

The electronic components of the printer/plotter can be damaged by discharges of static electricity. To remove static, touch a metal object such as a doorknob or desk lamp before handling the peripheral. Avoid touching the connector contacts.

After you have unpacked the printer/plotter you are ready to load a roll of paper, install the pens, and attach the peripheral to the *HEX-BUS* interface. Save the packing material for storing or transporting the device.

Note: The printer/plotter contains sophisticated, precisely fitted mechanical and electronic components. It will give long and trouble-free service when operated according to the guidelines in this manual, but it is not indestructible. To maintain the precision and high reliability built into your printer/plotter, protect it from mechanical shocks and temperature extremes. Handle it carefully and follow the care-and-cleaning suggestions given in the **PRINTER/PLOTTER MAINTENANCE** section of the manual.

SET-UP INSTRUCTIONS

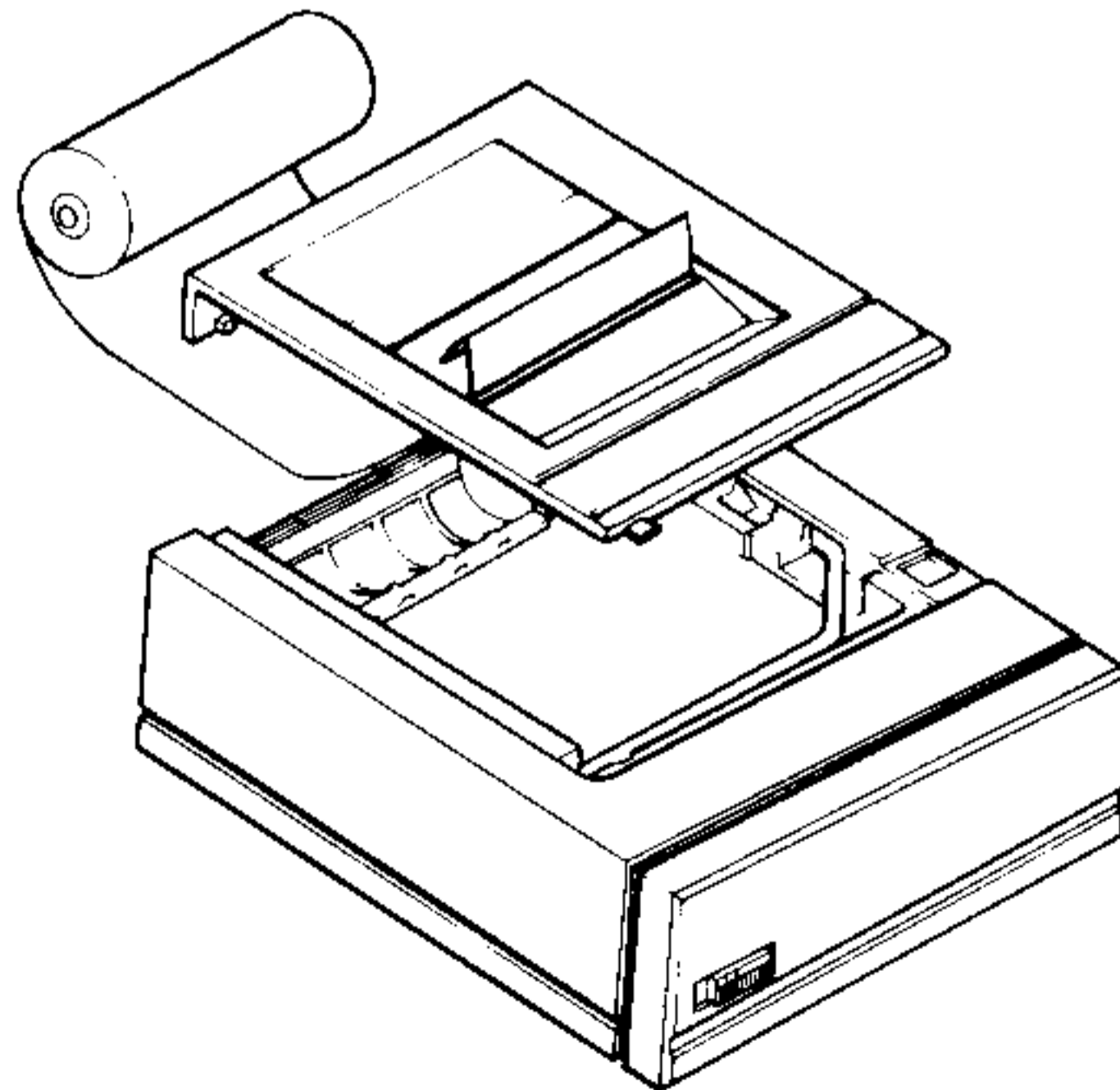
Loading and Removing the Paper

The printer/plotter has provision for both internal and external paper storage. Rolls of paper up to 30mm in diameter fit neatly within the unit for maximum portability. A retractable spindle can be folded out to accommodate larger rolls of paper. In either case, the paper is fed into the peripheral as follows.

1. Holding the printer/plotter firmly, slide the paper storage cover backward (see illustration) and lift it clear of the unit. If the printer/plotter is turned off, turn it on and wait for the self-test activity to end. (For later reference, take note of the setting of the device address switch located in the right front corner of the paper storage compartment. The switch may be set either to position 10 or to 11.)
2. If you intend to mount the paper roll externally on the retractable spindle, fold the spindle partly out and slip the roll over it so that the paper unrolls from the bottom. Then lower the spindle the rest of the way toward the rear.

If you intend to install the paper internally, leave the spindle in its retracted position.

3. Fold over about two inches of paper and make a sharp crease as shown. Then insert the creased end of the paper into the slot at the back of the paper feed mechanism. Press the paper advance switch until the paper feeds through to printing position.



SET-UP INSTRUCTIONS

When correctly installed, the paper passes between the rubber roller and the two small brass rollers located at either side of the feed mechanism.

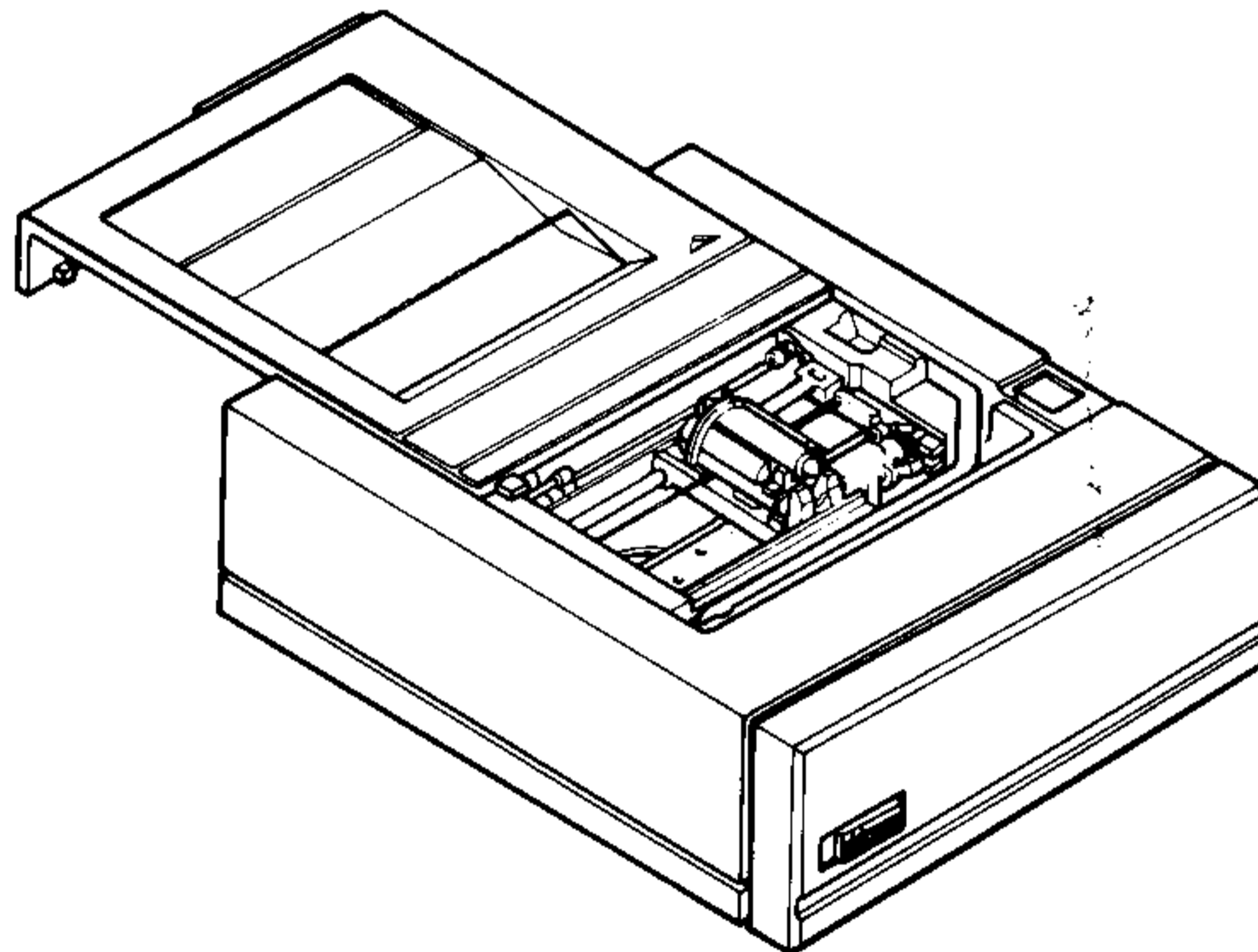
4. If the paper is to be stored internally, place the paper roll in the compartment provided. If the roll is mounted externally, verify that the spindle rests firmly in the notch at the right rear of the printer/plotter housing.
5. The procedure for installing pens is described in the next section. If pens are already in place, lay the paper storage cover back on the unit, making sure that the end of the paper tape passes through the serrated slot at the rear of the print viewing window. Then slide the cover forward until it snaps back into place.

If it becomes necessary to remove the paper from the unit before the roll is used up, simply lift off the paper storage cover, cut the paper behind the point where it enters the roller mechanism, and press the paper advance switch to bring the remaining paper through the mechanism.

SET-UP INSTRUCTIONS

Installing the Pens

1. Be sure that the printer/plotter is turned off and disconnected from the *HEX-BUS* interface.
2. Remove the paper storage cover as described under *Loading and Removing the Paper*. Locate the small barrel-shaped pen carriage, which normally resides at the left side of the print mechanism when the unit is turned off.
3. If existing pens are to be replaced, remove them as described in the next section. Then proceed as follows for each pen to be inserted.
4. Move the pen carriage approximately to the midpoint of its travel. Rotate the carriage counterclockwise until an empty pen chamber is in topmost position. Each pen chamber is color-coded.



SET-UP INSTRUCTIONS

5. Select a pen of the same color as the empty chamber. Uncap the pen and insert the tip into the aperture at the end of the chamber next to the roller. Then press the end of the pen down into the chamber until it clicks into position.
6. Continue with steps 4 and 5 to insert the remaining pens. When all pens are in place, move the pen carriage fully left.
7. Lay the paper storage cover back on the unit and make sure that the end of the paper tape passes through the serrated slot at the rear of the print viewing window. Then slide the cover forward until it snaps into place.

After each session the pens should be removed, capped, and stored. A receptacle is provided for this purpose next to the paper storage area at the right rear corner of the printer/plotter. The procedure for removing pens is described in the following section.

SET-UP INSTRUCTIONS

Removing the Pens

1. Be sure that the printer/plotter is turned off and disconnected from the *HEX-BUS* interface.
2. Remove the paper storage cover as described under *Loading and Removing the Paper*. Locate the two plastic and metal projections at the right side of the printer mechanism. Note that one of the projections is a small metal rod (release rod) controlled by a spring-loaded plastic pivot.
3. Slide the pen carriage fully to the right. The release rod should now be directly under one end of the topmost pen.
4. Rotate the pivot upward by pressing down to lift one end of the pen from the carriage. The pen can then be grasped by its free end and pulled from the carriage. Note that each pen is color-coded to a particular slot in the carriage.
5. Move the pen carriage slightly to the left to disengage it from the release rod. The carriage can then be rotated counterclockwise to raise the next pen into top position. Turn the carriage until it clicks.
6. Slide the carriage back to the right and pry out the second pen as described in steps 3 and 4.
7. Repeat steps 5 and 6 to extract the remaining two pens.

After the paper and pens are installed, the printer/plotter is ready to be connected to the *HEX-BUS* interface and tested. This procedure is discussed on the next few pages.

SET-UP INSTRUCTIONS

TI products designed for use with the *HEX-BUS* interface have identical eight-pin recessed connectors for the cable through which they communicate. The computer has one such connector, while each peripheral has two connectors so that a series of devices may be attached to the computer. The first peripheral is plugged directly into the computer, the second peripheral is cabled to the first, and so on. The trailing peripheral has one connector free.

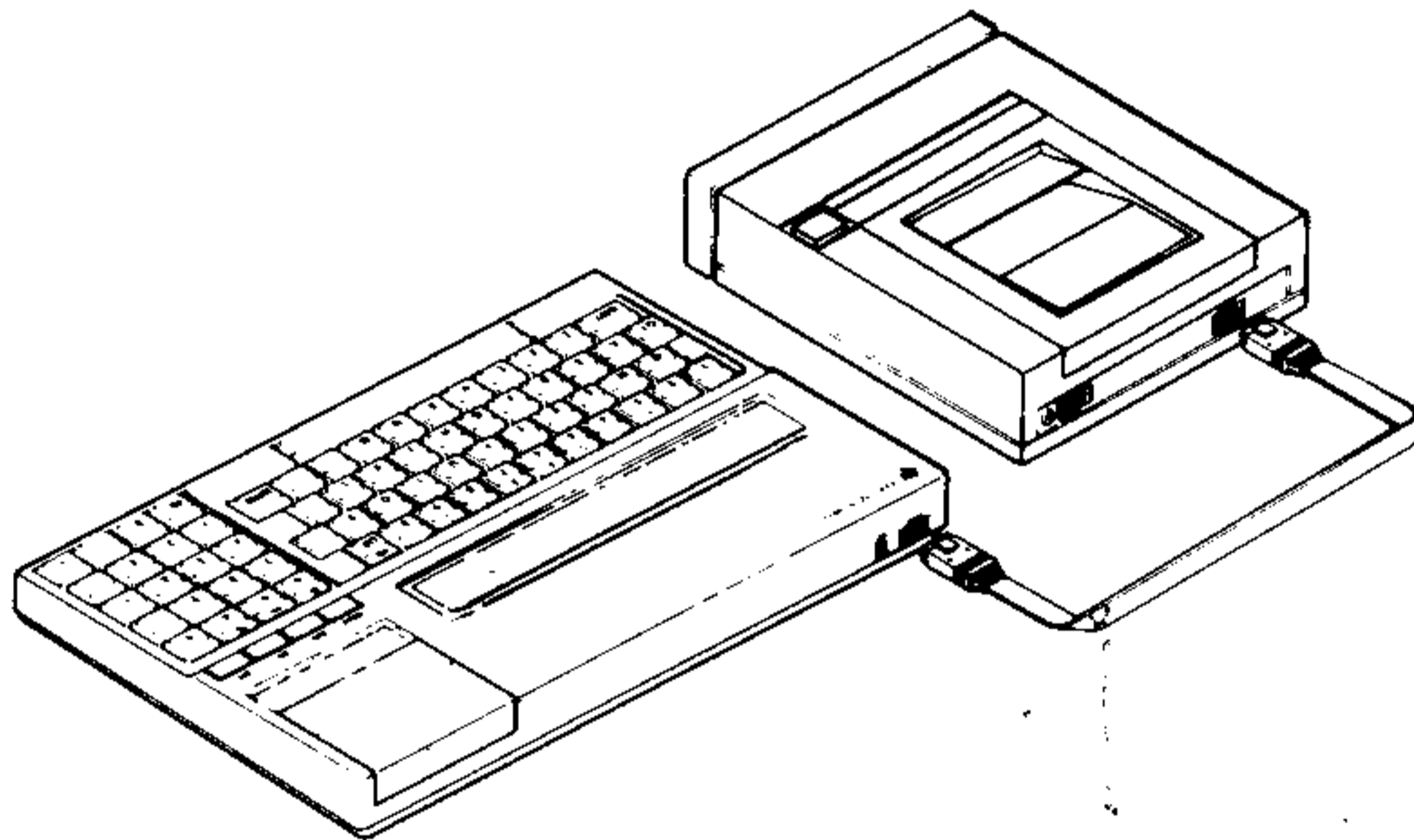
You may link peripherals to the computer in any order. Just plug one end of a *HEX-BUS* interface cable into the available connector and plug the other end into one of the connectors on the peripheral you intend to attach, as described in the next section. The plugs are keyed so that you can insert them only one way.

Peripherals are normally arranged in a stack next to the computer, using the short sections of cable furnished with the devices. Longer cables are available separately if you prefer to position the equipment differently.

SET-UP INSTRUCTIONS

Connecting the Printer/Plotter

1. Turn off the computer.
2. If other peripherals are already attached to the *HEX-BUS*[™] interface, wait for their activity to cease. Then turn them off.
3. Locate the device having the one available *HEX-BUS* connector (either the last peripheral on the bus, or the computer if no peripherals are attached yet). Holding that device firmly, plug one end of the *HEX-BUS* cable into the connector.
4. Place the printer/plotter in position and attach the other end of the cable to either connector on the unit.



5. You may use the AC adapter model AC9203 to power the printer/plotter. **DO NOT CONNECT ANY OTHER ADAPTER TO THIS PERIPHERAL.** If you intend to use the AC adapter, attach the power cord to the small jack on the back of the printer/plotter and plug the unit into a standard 115-volt outlet.

CAUTION

To prevent damage, disconnect all devices before moving any part of the *HEX-BUS* interface system. The cables and connectors which link the computer and peripherals are subject to accidental strain if not detached. For shipment over long distances repack the system securely, preferably in its original packing materials.

SET-UP INSTRUCTIONS

Testing the Printer/Plotter

The power-up test for the printer/plotter occurs in two parts. The first part consists of a preprogrammed self-test function that is executed immediately after the unit is turned on, independently of the computer attached. The self-test allows you to check printing quality and test the operation of the pens and printing mechanism.

1. Turn on the printer/plotter and any other peripherals attached to the *HEX-BUS*. Then turn on the computer.

Note: All peripherals must be turned on for proper operation.

2. The printer/plotter should respond by generating four colored squares, each square drawn with a different pen.
3. Check the figure to make sure that all four pens have drawn clear lines. If any have not, repeat the test by switching the printer/plotter off and on once more. If results do not improve, replace the defective pens as described in the pen installation and removal directions. If the self-test reveals any problems in the operation of the printing mechanism, consult the *In Case of Difficulty* section of the manual for further assistance.

The printer/plotter is powered by five rechargeable AA-type nickel-cadmium batteries. The length of battery service life and the interval between charges depend on how frequently and how long the printer/plotter is used.

The unit is shipped with batteries installed and fully charged. When it is time to recharge the batteries, an attempt to access the printer/plotter causes error code 25 (see appendix A) to appear in the computer display. The AC adapter furnished with the unit must then be connected for several hours to recharge the batteries. The adapter may be used continually, but for maximum service life it is a good practice to allow the batteries to go through the normal discharge/recharge cycle.

If the batteries appear unable to hold a charge, contact Texas Instruments as indicated under *If You Have Questions or Need Assistance*.

SET-UP INSTRUCTIONS

The second part of the power-up test is originated by the user at the computer console. Note that the following test routine is used with the CC-40. Computers other than the CC-40 may require different test procedures from that listed below.

2. If the address switch is set to position 10, type **CALL IO(10,1)** and press **[ENTER]**. If the switch is set to 11, enter **CALL IO(11,1)**.

The **CALL IO** statement causes the I/O (Input/Output) indicator in the computer display to flicker momentarily. Depending on the setting of the address switch, either the message **I/O error 4 "10"** or **I/O error 4 "11"** should then appear in the display as the **ERROR** indicator comes on. This result shows that the printer/plotter is responding properly to the computer.

Note: The **CALL IO** entry is an attempt to end access to the printer/plotter. The device has just been turned on at this point, however, and is not yet enabled for access. In returning error code 4 (device not open), the printer/plotter is operating as it should.

If a code other than "4" is displayed, the device may not be connected properly. Check the cabling between the computer and the printer/plotter and refer to appendix A.

If the I/O indicator stays on while the rest of the display remains blank, verify that all peripherals are powered up. The computer cannot respond to input from the keyboard while in this state. Turn the printer/plotter off momentarily to clear the condition. Then check the cable connections and try the operational check once more. If results are the same, a hardware problem may exist in the **HEX-BUS** interface cable or the printer/plotter. See the *In Case of Difficulty* section of the manual for further assistance.

3. Press **[CLR]** to clear the error message and restore the cursor. The printer/plotter is now ready for use.

OPERATING THE SYSTEM

OPERATING THE SYSTEM

After the printer/plotter is connected to the **HEX-BUS** interface and tested, you can control its operation from the computer console in one of several ways.

- You can operate the printer/plotter with **BASIC** statements and commands in programs of your own, as described in this manual.
- You can use separately available *Solid State Software*[™] cartridges that allow you to access peripherals by responding to prompts in prewritten programs for engineering, science, business, and financial applications.
- If you are using a CC-40 computer equipped with an Editor/Assembler cartridge, you can control the printer/plotter in assembly language.

Appendix B lists and describes the assembly-language command codes applicable to the printer/plotter. For further information on the use of *Solid State Software* or Editor/Assembler cartridges with this peripheral, refer to the manuals for those cartridges.

As an introduction to the use of the printer/plotter in **BASIC**, you may wish to key in the following short program.

```
100 LINPUT "ENTER MESSAGE: ";M$
110 OPEN #1,"10",OUTPUT
120 PRINT #1,"MSG WAS: ";M$
130 CLOSE #1
```

After you type in the program and press **[RUN]**, the prompt **ENTER MESSAGE:** should appear in the computer display. Type a message and press **[ENTER]**. The printer/plotter should respond by printing your entry together with the phrase **MSG WAS:**.

OPERATING THE SYSTEM

Using BASIC Statements and Commands

Statements are BASIC instructions within a program that are executed when the program is run. Commands are BASIC instructions outside a program that are executed immediately. Every instruction belongs to one of these two categories, though some BASIC statements can also be executed immediately.

The BASIC statements and commands that may be used with the printer/plotter are summarized below. All of them are implemented in the CC-40 computer. The CALL IO statement may not be available in other TI computers.

- LIST—Prints or displays a copy of a program.
- OPEN—Configures the printer/plotter to receive data and instructions from the computer.
- PRINT—Transmits data and instructions to the printer/plotter.
- CLOSE—Ends computer access to the printer/plotter.
- CALL IO—Calls a subprogram which can be used to communicate with peripherals. Allows greater control over internal aspects of operation than is otherwise possible in BASIC.

The OPEN statement must precede PRINT and CLOSE. It may precede CALL IO as well (see appendix B for the operations available through CALL IO). LIST, however, is used independently of OPEN.

On the next few pages, the BASIC statements and commands available for use with the printer/plotter are described. The sample formats included with each description are those used with the CC-40 computer. Other TI computers compatible with the HEX-BUS™ interface may use slightly different BASIC formats.

OPERATING THE SYSTEM

The OPEN Statement

The OPEN statement prepares a BASIC program for communication with peripheral devices. When used with the printer/plotter, the OPEN statement associates the device with a file number and sets parameters for the communication. The OPEN statement for the printer/plotter 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 between 1 and 255.

Device-number is the numeric designation of the peripheral to be operated. Each HEX-BUS peripheral has a number of its own. The device number of the printer/plotter is normally either 10 or 11.

Note: The printer/plotter is shipped from the plant with a device number of 10 (the number used in the examples in this manual). The address can be readily switched to 11, but this is necessary only if you connect a second printer/plotter to the HEX-BUS interface. In such an application, each unit must have a device number of its own so that the computer can address them individually.

Software-options are a pair of options that you may vary to match the characteristics of the printer/plotter to the requirements of specific applications. If you choose not to vary them, these options automatically assume certain settings called *default values*.

- Carriage return—The *carriage return* option allows the user to regulate the action of the printing mechanism at the end of each PRINT statement. When C = N is specified, no carriage return or linefeed characters are generated by the printer/plotter after a record is output. C = L allows the peripheral to issue a carriage return and linefeed after executing a PRINT statement. C = L is the default value and need not be specified.

Note: The printer/plotter automatically generates a carriage return and linefeed to segment strings of characters that exceed the width of the paper. If the *carriage return* option is set to C = N, however, the pen carriage does not return to the left margin after the final character is printed.

OPERATING THE SYSTEM

- **Size/scale**—This option permits the user to select either of the two print sizes (normal and compressed) available in text mode. Each print size has a corresponding graphic scale, described further in the *Graphic Mode Commands* section of the manual. A setting of $S=0$ produces compressed print in text mode (36 characters per line) and scales graphic characters to the dimensions of scale $S0$. With a setting of $S=1$, text is printed in normal size (18 characters per line) and graphic output is scaled to $S1$. $S=1$ is the default value.

If both software options are included in an OPEN statement, the *carriage return* setting must precede the *size/scale* setting.

File-attributes are optional keywords that define certain features of the data file itself. For attributes not specified, default values are assumed. These features are described below.

- **File organization**—SEQUENTIAL is the only file organization that may be used with the printer/plotter. This is the default value and need not be specified in the OPEN statement. RELATIVE (random access) files cannot be used.
- **File type**—Most equipment in the *HEX-BUS* interface system can process data either in ASCII (American Standard Code for Information Interchange) characters as DISPLAY files or in INTERNAL format. In printer/plotter applications, however, the DISPLAY file type is required. This is the default value and need not be entered.
- **Open mode**—OUTPUT must be specified with the printer/plotter. Attempting to open this peripheral in INPUT, UPDATE, or APPEND mode creates an error condition.
- **Record type**—*Records* are the blocks of data that make up file contents. The *HEX-BUS* interface system uses VARIABLE records whose length you can define, with a default value of 80 characters for the printer/plotter if no length is specified. You can set maximum record length to either more or fewer than 80 characters by following VARIABLE with a number (as in the second example below). This feature is useful when, for instance, you wish to break up printed items into groups shorter than a single line of output at the printer/plotter.

OPERATING THE SYSTEM

Examples:

```
100 OPEN #1,"10",OUTPUT
```

Readies the printer/plotter for use, leaving print size at the default value of 18 characters per line and allowing the unit to independently generate a carriage return and linefeed after execution of each PRINT statement in text mode.

```
110 OPEN #1,"10.S=0",OUTPUT,VARIABLE 10
```

Enables the printer/plotter for access. *Size/scale* setting $S=0$ compresses text to 36 characters per line. The VARIABLE 10 entry specifies a maximum record size of 10 characters—longer records are segmented to this length.

The term *file* generally refers to a collection of data stored in a mass storage device such as the TI *Wafertape*TM peripheral. Although the printer/plotter is a display-type device not strictly oriented towards use with files, the word is employed in this manual for the sake of overall consistency and simplicity.

The CLOSE Statement

A device enabled for use with an OPEN statement must also be closed when its use is ended. The CLOSE statement for the printer/plotter has the following general form.

```
CLOSE #file-number
```

File-number is the number specified in the associated OPEN statement.

OPERATING THE SYSTEM

The PRINT Statement

To send data or graphic commands from the computer to the printer/plotter, use the PRINT statement in the format shown below. The peripheral must first be opened in OUTPUT mode.

```
PRINT #file-number,print-list
```

File-number refers to the number established in the associated OPEN statement. When used without a file number, the PRINT statement places data in the computer display.

The contents of *print-list* may consist of either text or graphic items as well as the software control codes applicable to the printer/plotter. The use of PRINT in graphic mode is presented in a separate section of the manual.

When information is transmitted to the printer/plotter in text mode, the peripheral generates a carriage return and linefeed after execution of each PRINT statement unless *carriage return* software option N is set. For a description of the carriage return and linefeed functions, refer to *The OPEN Statement*.

Examples:

```
120 PRINT #9,A$;B$;C$
```

Puts the values of the variables A\$, B\$, and C\$ into the next locations of the file opened as #9.

```
130 PRINT #9,"HX-1000 Printer/Plotter"
```

Places HX-1000 Printer/Plotter in the next position of the file opened as #9.

Additional examples of the use of the PRINT statement with the printer/plotter are found in the *Graphic Mode Commands* and *SAMPLE APPLICATIONS* sections of this manual.

OPERATING THE SYSTEM

The LIST Command

An entire program or specified lines of a program can be printed out through use of the LIST command in the following format.

```
LIST "device-number [.software-options]"[.line-list]
```

Device-number corresponds to the address of the printer/plotter. The *software-options* available in the OPEN statement are also applicable to LIST.

When the LIST command is entered, an OPEN statement is automatically transmitted to the printer/plotter first, followed by a character string of zero length which causes the printer/plotter to execute a linefeed (if *carriage return* software option C=L is in effect). The program is then listed and a CLOSE statement is automatically sent to the printer/plotter.

Examples:

```
LIST "10",30-100
```

Causes device 10 (the printer/plotter) to list lines 30 through 100 of a program stored in the computer.

```
LIST "10"
```

Lists an entire program to the printer/plotter.

When the LIST command is issued without a device number, the program is listed in the computer display.

The CALL IO Statement

CALL IO is a BASIC statement used in the CC-40 computer to support special features and capabilities unique to many HEX-BUS™ peripherals.

With the printer/plotter, the most frequent use of CALL IO—other than in the power-up check—is to close the device in the event of I/O error 5 (device already open). This is an error condition that the standard CLOSE statement may not successfully clear. You can use CALL IO (10,1) to close the printer/plotter.

For a complete description of the CALL IO statement, consult the BASIC reference guide for the CC-40 computer.

OPERATING THE SYSTEM

Software Control Codes

The *HEX-BUS* printer/plotter has two modes of operation. One is the text mode, in which standard ASCII (American Standard Code for Information Interchange) characters and symbols are printed. The other is the graphic mode, in which images and patterns corresponding to information in program statements are drawn.

In either text or graphic mode, the printer/plotter can interpret and execute instructions that regulate print action, pen color, and character size. These functions, as well as the text and graphic modes of operation themselves, are selected through transmission of *software control codes* to the printer/plotter.

Each control code is sent to the printer/plotter as the binary representation of an ASCII code. In programming, control codes are transmitted through use of the character string function (CHR\$(n), where "n" is the decimal equivalent of an ASCII control code. To cause the pen carriage to backspace, for instance, control code 8 may be sent to the peripheral in a form such as the following.

```
140 PRINT #1, CHR$(8)
```

OPERATING THE SYSTEM

The software control codes applicable to the *HEX-BUS* printer/plotter are listed and described below.

- CHR\$(1)—*Pen 1*. Selects the black pen.
- CHR\$(2)—*Pen 2*. Selects the blue pen.
- CHR\$(3)—*Pen 3*. Selects the green pen.
- CHR\$(4)—*Pen 4*. Selects the red pen.
- CHR\$(8)—*Backspace*. Moves the pen carriage backward one character space.
- CHR\$(10)—*Linefeed*. Advances the paper one line.
- CHR\$(11)—*Line up*. Moves the paper back one line.
- CHR\$(13)—*Carriage return*. Sends the pen carriage back to the left edge of the paper.
- CHR\$(17)—*Text mode*. Readies the device to print standard ASCII characters. CHR\$(17) is the only control code recognizable by the printer/plotter in graphic mode.
- CHR\$(18)—*Compressed print*. Sets maximum line length to 36 characters.
- CHR\$(19)—*Graphic mode*. Takes the printer/plotter out of text mode and prepares it to plot graphic data.
- CHR\$(20)—*Normal print*. Sets maximum line length to 18 characters.
- CHR\$(21)—*Test*. Causes the printer/plotter to execute its internally programmed self-test, drawing four differently-colored squares.

Graphic Mode Commands

In graphic mode the surface of the paper is considered as a field of X-Y coordinates, across which the pens are moved relative to some point of origin. The coordinates are stored in permanent memory in the printer/plotter's control circuitry. The available plotting area covers 216 coordinate points across the width of the paper and 999 points along its length.

The origin at power-up is located at the left edge of the paper, at the resting position of the pen carriage. The origin may be subsequently redefined as shown below at any point in the plotting area at which the pen stops.

The commands available for graphic applications are listed and described below. Each command has the form of a single-letter mnemonic (usually followed by additional data) which is transmitted in a PRINT statement for execution. To place the printer/plotter in graphic mode for the examples in this section, open the unit for output and send CHR\$(19) in a PRINT statement.

Define Origin—"O"

The define origin command designates the current pen position as the point of reference for coordinates transmitted in subsequent graphic commands. The origin may be reestablished as often as desired.

Example:

```
100 PRINT #1,"O"
```

Defines the present pen location as the origin for graphic coordinates.

Draw Line—

"L(x1,y1):c:p,(x2,y2):c:p,...(xn,yn):c:p]"

The printer/plotter executes this command by tracing a line from the first set of coordinates (x1,y1) to the second set (x2,y2), from the second set of coordinates to the third, and so on. The *draw line* command may include any number of X-Y coordinates beyond a minimum of two. These coordinates, as well as the values of "c" and "p," may be supplied in the form of string variables (see the multi-function plotting program in the SAMPLE APPLICATIONS section for an illustration).

Variable "c" determines the pen color used. Its value may be 1 for black, 2 for blue, 3 for green, or 4 for red. If no color is initially specified, the black pen is used. Once selected, the pen color remains in effect until changed in a subsequent command group or until the printer/plotter is turned off.

Either dotted lines with variable degrees of spacing or solid lines can be generated with the *draw line* command. The content of variable "p" determines the line type. With "p" set to 0, solid lines are drawn. With "p" set to a value of 1 through 9, dotted lines with pitch (spacing) corresponding to the value of "p" are produced. If no value is specified for pitch, "p" assumes a setting of 0 and solid lines are drawn. The value established remains in effect until the pitch is reset or until the peripheral is turned off.

Example:

```
100 OPEN #1,"10",OUTPUT
110 PRINT #1,CHR$(19)
120 PRINT #1,"L(6,12):2:0,(100,40):3:7,(194,12)"
130 CLOSE #1
```

Readies the printer/plotter for output, puts it in graphic mode, traces a solid blue line from coordinates (6,12) to (100,40), draws a dotted green line with pitch 7 from that point to coordinates (194,12), and closes the device. The printer/plotter remains in graphic mode until reset or turned off or until CHR\$(17) is sent.

OPERATING THE SYSTEM

Draw Relative Line—

"R(x1,y1):c[:p],(x2,y2):c[:p],...(xn,yn):c[:p]"

The *relative line* command resembles the *draw line* command in format, content, and function. The difference between the two is that the coordinates in the *relative line* command are based on the current pen position—not on the defined origin. The pen location at the time the *relative line* command is issued is temporarily taken as an origin.

Example:

The sequence

```
120 PRINT #1,"L(0,0),(0,100),(100,100)"
130 PRINT #1,"R(0,0),(0,-100),(-100,0)"
```

Draws a square. The *draw line* command in line 120 produces the left and top side relative to the present origin (assumed to be at the left side of the tape) and stops the pen at the upper right corner. The *relative line* command in line 130, using that pen location as a reference, completes the square by tracing the right side and bottom.

Move Pen—"M(x,y)"

The printer/plotter responds to this command by raising the pen and transporting it to the location indicated by coordinates (x,y). The pen remains in raised position until the next output statement is executed.

Example:

```
140 PRINT #1,"X(125,0)"
```

Moves the pen to location 125 on the X axis, relative to the current origin.

OPERATING THE SYSTEM

Relative Move Pen—"J(x,y)"

Like the *relative line* command described above, the *relative move pen* command takes the current pen location, rather than the graphic origin, as a point of reference. It shifts the pen from its present position to that indicated by coordinates (x,y).

Example:

```
150 PRINT #1,"L(0,0),(200,200)"
160 PRINT #1,"J(0,-100)"
```

First draws a diagonal line from the origin to position (200,200). Line 160 then moves the pen in the Y plane to a point opposite the midpoint of the line.

Scale Character—"Sn"

The *scale character* command sets character size in proportion to the value of "n", which may range from 0 through 9. Scale 0 corresponds to compressed print (36 characters per line) in text mode. Scale 1 corresponds to normal character size (18 characters per line) in text mode.

The value assigned to variable "n" remains in effect even during shifts between graphic and text mode, as long as the printer/plotter is turned on. The scale is initialized to a value of 1 at power-up and is reinitialized to that value if the peripheral is reset.

Example:

```
400 PRINT #1,"S7"
```

Sets graphic character size to scale 7.

The following brief program illustrates the range of graphic character sizes available.

```
100 OPEN #1,"10",OUTPUT
110 PRINT #1, CHR$(19):PRINT #1,"A1"
120 FOR X=0 TO 9
130 NS=STR$(X):PRINT #1,"S"&NS
150 PRINT #1,"T(Z)"
160 NEXT X:CLOSE #1
```

OPERATING THE SYSTEM

Home—"H"

The *home* command raises the pen, moves it in the X plane to the left margin of the paper, and resets the origin to that location. The pen remains in raised position until execution of the next command that causes it to draw.

Example:

```
180 PRINT #1,"H"
```

Positions the pen at the left margin and defines that point as the origin.

Print Text—"T(c1c2c3...cn)"

The *print text* command enables the user to include strings of text with graphic output to the printer/plotter. This feature is extremely useful in such applications as the labeling of charts and graphs.

When *print text* is executed, the items in parentheses are printed from the current pen location. If the pen reaches the margin of the paper before printing is complete, it disposes of the remaining text by "scissoring" at that point without printing any further characters.

Example:

```
190 PRINT #1,"T(Text in graphics)"
```

Prints the phrase Text in graphics starting at the current pen position.

OPERATING THE SYSTEM

Angle—"An"

In graphic mode, text may be output at any of four different printing angles. The *angle* command allows the user to select the angle at which to print text by varying the value of "n" from 0 through 3:

With variable "n" set to 0, upright characters are printed. This is the power-up default value and need not be specified. With "n" set to 1, characters are rotated 90 degrees clockwise and text is printed downward. When "n" equals 2, the angle is shifted 180 degrees clockwise and characters are printed upside down from right to left. Setting "n" to 3 rotates the print angle 270 degrees clockwise and causes text to be printed upward.

Example:

The sequence

```
160 PRINT #1,"M(100,0)"  
170 PRINT #1,"A3"  
180 PRINT #1,"T(Angle 3)"
```

prints the expression Angle 3 vertically at an angle of 270 degrees.

Once established, the angle setting remains in effect until reset or until the printer/plotter is turned off.

Color—"Cn"

The *color* command allows the user to set a pen color independently of the *draw line* and *relative line* commands. With variable "n" equal to 1, the black pen is used. Setting "n" to 2, 3, or 4 selects the blue, green, or red pen respectively.

The color chosen remains in effect until reset in subsequent graphic commands or until the printer/plotter is turned off. The color setting remains in effect during shifts between text and graphic mode. It is possible to use any of the four available colors in text as well as in graphic applications.

Example:

```
200 PRINT #1,"C2"
```

Rotates the pen carriage until the blue pen is in topmost position.

RECOVERY FROM ERRORS

RECOVERY FROM ERRORS

Most programming errors that involve the printer/plotter occur during output to the device as a result of some discrepancy in program statements. These errors are seldom serious, and they are easily remedied. They are normally indicated to the user in the form of a displayed message beginning I/O error... which includes a one- to three-digit error code and the device number of the printer/plotter. If the error occurs during execution of a program, any open files are automatically closed. The error codes that you may encounter with the printer/plotter are listed in appendix A with their meanings and recommended corrective steps.

In the event of such an error, first note the code number and look it up in appendix A. Next clear the fault indication and restore the cursor by pressing [CLR]. Then try the operation again, following the suggestions given in the appendix for that error.

Should the above measures not solve the problem, turn the peripheral off briefly and try again. If the malfunction persists, turn the computer off momentarily and try again. Successive attempts that produce the same error may indicate a hardware fault. Consult the *In Case of Difficulty* section of the manual for service information and additional troubleshooting suggestions.

SAMPLE APPLICATIONS

SAMPLE APPLICATIONS

Printer/Plotter Character Set

The program shown below prints the repertoire of characters available to the *HEX-BUS* printer/plotter. The character set is arranged in four columns. Each character is printed with its corresponding decimal code. The codes range from 32 through 127.

```
100 OPEN #1,"10",OUTPUT
110 FOR K=32 TO 47
120 PRINT #1,K;CHR$(K);"  ";
130 PRINT #1,K+16;CHR$(K+16)
140 NEXT K
150 PRINT #1,CHR$(10)
160 FOR L=64 TO 79
170 PRINT #1,L;CHR$(L);"  ";
180 PRINT #1,L+16;CHR$(L+16)
190 NEXT L
200 PRINT #1,CHR$(10)
210 FOR M=96 TO 111
220 PRINT #1,M;CHR$(M);"  ";
230 PRINT #1,M+16;CHR$(M+16)
240 NEXT M
250 CLOSE #1
260 END
```

Line 100 enables the printer/plotter for operation and prepares it to receive data from the computer. The FOR-NEXT loop in lines 110-140 directs the peripheral to print 16 lines in two columns beginning with character code 32. The first column contains characters 32-47 (line 120) and the second column contains characters 48-63 (line 130).

Line 150 transmits a linefeed to the peripheral in preparation for the second group of characters, which contains characters 64-79 (line 170) and 80-95 (line 180). Another linefeed in line 200 precedes the third group, characters 96-111 (line 220) and 112-127 (line 230).

The blanks enclosed in quotation marks at the end of lines 120, 170, and 220 provide spacing between the columns. The CLOSE statement in line 250 ends access to the printer/plotter.

SAMPLE APPLICATIONS

Multi-Function Plotting Program

The following program plots mathematical functions such as sine waves, square waves, circles, and lines. In this application the X axis is considered to run down the length of the paper, while the Y axis extends across its width. For convenience and added flexibility, the functions are placed in subroutines at the end of the program. The user can readily substitute other functions for those included in this example.

```
100 ! MULTI-FUNCTION PLOTTING PROGRAM
110 ! COMPOSE SUBROUTINES (500,600,...) SO THAT
    Y=FUNCTION OF X
120 ! AVOID USING THE FOLLOWING VARIABLES
130 ! CLR$( ) DSH$( ) FNUM LASTF MIN P$ TITLE$ XF$
    XMN( ) XMX( ) XT$ YF$ YT$
140 ! SCALE AND SHIFT Y SO THAT 0<=Y<=215
150 INPUT "ENTER # OF FUNCTIONS (1-8): ";LASTF
160 INPUT "ENTER TITLE: ";TITLE$
170 DIM XMN(8),XMX(8),CLR$(8),DSH$(8)
180 FOR FNUM=1 TO LASTF
190 INPUT "ENTER COLOR (1-4) OF PLOT "&STR$(FNUM)
    &": ";CLR$(FNUM)
200 INPUT "ENTER DASHING (0-9) OF PLOT "
    &STR$(FNUM)&": ";DSH$(FNUM)
210 INPUT "ENTER Xmin OF PLOT "&STR$(FNUM)
    &": ";XMN(FNUM)
220 INPUT "ENTER Xmax OF PLOT "&STR$(FNUM)
    &": ";XMX(FNUM)
230 NEXT FNUM
240 MIN=XMN(1)
250 FOR FNUM=1 TO LASTF
260 IF XMN(FNUM)<MIN THEN MIN=XMN(FNUM)
270 NEXT FNUM
280 OPEN #1,"10",OUTPUT
290 PRINT #1,CHR$(19):PRINT #1,"H":PRINT
    #1,"J(100,0)"
300 PRINT #1,"S1":PRINT #1,"A1":PRINT
    #1,"T("&TITLE$&" )"
310 PRINT #1,"H":PRINT #1,"J("&STR$(MIN)&","0)":PRINT
    #1,"O"
```

SAMPLE APPLICATIONS

In lines 100-310 the preliminary set-up tasks are carried out. The functions to be plotted are chosen, parameters are read in, the peripheral is configured for graphic output, a title is printed, and the graphic origin is defined. The minimum and maximum values of X (input in lines 210 and 220) should be chosen so that the resultant Y values fall within the range of zero through 215.

```
320 FOR FNUM=1 TO LASTF
330 X=XMN(FNUM)
340 XF$=STR$(INT((X+.5)*-1))
350 ON FNUM GOSUB 500,600,700,800,900,1000,1100,1200
360 YF$=STR$(INT(Y+.5)):GOSUB 400
370 NEXT FNUM
380 CLOSE #1
390 END
400 IF X>=XMX(FNUM) THEN RETURN
410 X=X+1
420 XT$=STR$(INT((X+.5)*-1))
430 ON FNUM GOSUB 500,600,700,800,900,1000,1100,1200
440 YT$=STR$(INT(Y+.5))
450 P$="L("&YF$&","&XF$&"):"&CLR$(FNUM)
    &": "&DSH$(FNUM)&","&YT$&","&XT$&)"
460 DISPLAY P$:PRINT #1,P$
470 XF$=XT$:YF$=YT$
480 GOTO 400
500 Y=600*X+108
510 RETURN
600 Y=108
610 X=X+XMX(FNUM)-XMN(FNUM)-1
620 RETURN
700 Y=108*SIN(X*4)+108
710 RETURN
720 D=1/C*SIN(C*A*PI/70)
800 Y=3*X+108
810 RETURN
900 Y=X+108
910 RETURN
1000 Y=-1*X+108
1010 RETURN
1100 Y=-2*X+108
1110 RETURN
1200 Y=-3*X+108
1210 RETURN
```

SAMPLE APPLICATIONS

From line 320 through the remainder of the program, functions are calculated and plotted on the basis of the parameters supplied by the user. The X and Y values obtained are converted to string variables. These variables are then assembled and sent to the printer/plotter in a *draw line* command (lines 450 and 460), which is briefly displayed at the computer console immediately before transmission.

The value of X is then incremented by 1, a new Y coordinate is calculated, and a new *draw line* command is created and sent to the printer/plotter. This process continues until the limits of the user-supplied parameters are reached.

PRINTER/PLOTTER MAINTENANCE

PRINTER/PLOTTER MAINTENANCE

Care and Cleaning

Maintenance of the *HEX-BUS* printer/plotter consists basically of periodic cleaning. The device should be cleaned with a soft brush to remove paper dust and particles after every three months of use. Outside plastic surfaces of the printer/plotter can be cleaned with a mild detergent and water solution. Avoid using solvents.

Pen Replacement

The four ball-point pens used in the *HEX-BUS* printer/plotter should be removed and stored after each use and must be replaced periodically when they run dry. The procedure for pen removal and replacement is described under SET-UP INSTRUCTIONS at the beginning of the manual.

The printer/plotter is certified to perform a minimum of 10,000 trouble-free color changes, and in normal use it should provide many more. The pen carriage and other electromechanical components are, however, rather intricate assemblies. Avoid subjecting the printer/plotter to rough treatment such as mechanical shocks and temperature extremes. If any maintenance other than pen replacement and regular cleaning becomes necessary, it is recommended that you contact either the store at which you purchased the device or one of the TI Service Centers as noted in the SERVICE INFORMATION section.

APPENDICES

Appendix A: ERROR CODES

Listed below are the error codes related to the operation of the printer/plotter in BASIC programs.

The error codes marked with an asterisk (*) are those that apply only if you use the CALL IO instruction. They do not occur with any other BASIC statements or commands.

CODE MEANING

- 0* NO ERRORS.
- 1 DEVICE/FILE OPTIONS ERROR. Check the options in the OPEN statement or IO call. Make sure that commas, periods and equal signs are used correctly.
- 2 ERROR IN ATTRIBUTES. Check the file attributes given in the OPEN statement or IO call.
- 4 FILE/DEVICE NOT OPEN. Open the device before using it.
- 5 FILE/DEVICE ALREADY OPEN. Close the device and try again. If the CLOSE statement in BASIC does not work, use CALL IO (see page 19) to close the device. If neither of the above steps is successful, you can close all peripherals by momentarily turning the computer off.
- 6 DEVICE ERROR. The printer/plotter generates this error message if a malfunction occurs during output operations. Try the operation again.
- 10* NOT REQUESTING SERVICE. This message may be sent by a peripheral in response to a poll by the computer to determine which device initiated a service request.
- 12* BUFFER SIZE ERROR. The data buffer length specified in the Input/Output subsystem instructions is not sufficient for the data returned by a peripheral. Make the buffer larger.
- 13 UNSUPPORTED COMMAND. The printer/plotter sends this message in response to commands that it cannot accept.
- 25 LOW BATTERIES IN PERIPHERAL. Recharge the batteries.

APPENDICES

- 80 SYNTAX ERROR IN DATA. An error is present in the spelling, punctuation, or format of a PRINT statement. Check the syntax of the statement involved.
- 81 COORDINATES OUT OF RANGE. The coordinates given within a PRINT statement in graphic mode exceed the number ± 999 . Revise the coordinates to fall within this range.
- 255 BUS TIME-OUT ERROR. The computer generates this error code if it loses contact with a peripheral. Check the cable connections.

Appendix B: USING ASSEMBLY LANGUAGE

This appendix is primarily for use in conjunction with the Editor/Assembler manual and software package created for the CC-40 computer. The descriptions given here supplement the explanations and examples found in the Editor/Assembler manual.

The CC-40 computer has an Input/Output subsystem which you can access to communicate with *HEX-BUS*TM peripherals on an assembly-language level. This communication can take place either entirely in assembly language if you have the Editor/Assembler cartridge, or from BASIC if you use the CALL IO instruction with appropriate command codes.

Command Codes

The assembly-language command codes with which you can operate the *HEX-BUS* printer/plotter are listed below, together with any applicable restrictions.

- 0 *Open*. Prepares a device for use. The printer/plotter must be opened in OUTPUT mode using SEQUENTIAL files. The APPEND mode and RELATIVE file type cannot be used.
- 1 *Close*. Completes any pending operations by a device and ends the use of the device until the next *open* instruction.
- 4 *Write*. Sends data to a peripheral device. The printer/plotter must first be opened in OUTPUT mode.
- 7 *Return Status*. Used in requesting device and file status information from peripherals. When this message is sent to the printer/plotter, the *end-of-file* flag is always returned set to zero.
- 10 *Service Request Poll*. Not used in programming, but automatically sent to peripherals by the computer when it receives a service request. Determines which device is requesting service.

- 254 *Null Operation*. Sent by the computer in response to any service requests received while a previous request is being processed. Though the computer may enable a number of peripherals for service requests, it can process only one request at a time.
- 255 *Reset Bus*. Closes all open device files and resets all peripherals attached to the computer.

For a detailed treatment of the CC-40 Input/Output subsystem and command codes, refer to the manual for the Editor/Assembler cartridge.

APPENDICES

Appendix C: DEVICE NUMBERS

Each *HEX-BUS* peripheral is assigned a number, used by the computer to address that particular device. Addresses 10 and 11 are allocated to the printer/plotter. If the OPEN statement of a program segment references the number 10, for example, all input or output associated with that segment is directed to the printer/plotter.

When you use only one printer/plotter on the *HEX-BUS* interface, it is not necessary to reassign device numbers; just use the factory-set base address of 10. If you use two of these peripherals at once, however, each must have a device number of its own so that the computer can address them individually.

Device numbers are established by a switch within the peripheral. To change the address from 10 to 11, follow the procedure described below.

1. Unplug the peripheral. Disconnect it from the computer and all other devices.
2. Open the paper storage cover and remove the paper as described under *Loading and Removing the Paper*.

Removing the paper exposes a small slot containing a slide switch labeled **DEVICE ADDRESS** at the bottom of the paper storage compartment. With a small screwdriver or the tip of a pen, move the switch from position 10 to position 11.

APPENDICES

Appendix D: ASCII CODE TABLE

lsb/msb	Hex	0	1	2	3	4	5	6	7
Hex	Bin	0000	0001	0010	0011	0100	0101	0110	0111
0	0000			sp 32	0 48	@ 64	P 80	\ 96	p 112
1	0001	PEN 1 1	TEXT 17	!	1 49	A 65	Q 81	a 97	q 113
2	0010	PEN 2 2	COMP 18	"	2 50	B 66	R 82	b 98	r 114
3	0011	PEN 3 3	GRAPH 19	#	3 51	C 67	S 83	c 99	s 115
4	0100	PEN 4 4	NORM 20	\$	4 52	D 68	T 84	d 100	t 116
5	0101		TEST 21	%	5 53	E 69	U 85	e 101	u 117
6	0110			&	6 54	F 70	V 86	f 102	v 118
7	0111			'	7 55	G 71	W 87	g 103	w 119
8	1000	BS 8		(	8 56	H 72	X 88	h 104	x 120
9	1001			)	9 57	I 73	Y 89	i 105	y 121
A	1010	LF 10		.	10 58	J 74	Z 90	j 106	z 122
B	1011	LU 11		+	11 59	K 75	[91	k 107	{ 123
C	1100			,	12 60	L 76	\ 92	l 108	| 124
D	1101	CR 13		-	13 61	M 77	] 93	m 109	} 125
E	1110			.	14 62	N 78	^ 94	n 110	~ 126
F	1111			/	15 63	O 79	_ 95	o 111	~ 127

SERVICE INFORMATION

SERVICE INFORMATION

In Case of Difficulty

If the *HEX-BUS* printer/plotter does not appear to be working properly, check the following.

1. **Power**—Be sure that the batteries are serviceable and fully charged, and that the power switch is on.
2. **Paper**—Verify that the printer/plotter has not run out of paper.
3. **Cleaning**—Use a soft brush to remove paper and dust particles if necessary.
4. **Program Errors**—If the printer/plotter does not function with a BASIC or assembly-language program, check the program. The statements used to access the peripheral may be incorrect. Be sure that the device number, software options, and general statement formats are in order.
5. **Cables and Connectors**—Be sure that all sections of *HEX-BUS* cable are plugged in securely. Check for loose or broken cables and connectors. If any connectors are separated, turn off the computer and peripherals and press the connectors together. Then turn the system back on and perform the power-up checks described in the SET-UP INSTRUCTIONS section.

SERVICE INFORMATION

If the printer/plotter still does not appear to be working properly, first turn all power off. Next, disconnect this peripheral from the computer and other devices. Then follow the steps below.

1. **See if the computer itself is working properly.** Turn on the computer. Enter the statement **OPEN #1, "10",OUTPUT**. The error message **I/O error 255 #1** should appear in the computer display, indicating that the device named cannot be opened. This is the result expected when the printer/plotter is not connected to the computer.
2. **Check that the printer/plotter is working properly.** Refer to the set-up instructions and reconnect the printer/plotter to the computer. Switch the unit on and wait for the automatic self-test to end. Then type **OPEN #1,"10",OUTPUT** and press **[ENTER]**. The **OPEN** statement should disappear from the computer display and be replaced by a blinking cursor on the left side, indicating that the device named has been opened. Type **PRINT #1,CHR\$(21)** and press **[ENTER]**. The printer/plotter should perform the self-test once more.
3. If the printer/plotter still does not work when reattached to the computer, then the peripheral or its cable may be faulty.
4. If none of the above procedures correct the difficulty, consult the section entitled *If You Have Questions or Need Assistance* or refer to the *Service Information* portion of the *User's Reference Guide*.

SERVICE INFORMATION

Service Centers

If your HX-1000 Printer/Plotter requires service and you do not wish to return the unit to a service facility for repair or replacement, you may elect to exchange the unit for a factory-reconditioned HX-1000 Printer/Plotter of the same model (or equivalent model specified by TI) by going in person to one of the service centers which have been established across the United States. A handling fee will be charged by the service center for in-warranty exchanges of the HX-1000 Printer/Plotter. Out-of-warranty exchanges will be charged at the rates in effect at the time of the exchange. Please refer to the enclosed Service Center listing or call the Consumer Relations Department for exchange fee information and the location of the nearest service center.

SERVICE INFORMATION

If You Have Questions or Need Assistance

If you have questions in connection with repair of the HX-1000 Printer/Plotter or concerning peripheral, accessory, or software purchase, please call our Customer Relations Department at (800) 858-4565 (toll free within the contiguous United States). The representatives at these numbers cannot provide technical assistance.

For technical questions such as 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

Because of the number of suggestions which come to Texas Instruments from many sources containing both new and old ideas, Texas Instruments will consider such suggestions only if they are freely given to Texas Instruments. It is the policy of Texas Instruments to refuse to receive any suggestions in confidence. Therefore, if you wish to share your suggestions with Texas Instruments or if you wish us to review any BASIC language program which you have developed, please include the following statement in your letter.

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WARRANTY

THREE-MONTH LIMITED WARRANTY

THIS TEXAS INSTRUMENTS HX-1000 PRINTER/PLOTTER WARRANTY EXTENDS TO THE ORIGINAL CONSUMER PURCHASER OF THE ACCESSORY.

WARRANTY DURATION

This HX-1000 Printer/Plotter is warranted for a period of three (3) months from the date of the original purchase by the consumer.

WARRANTY COVERAGE

This HX-1000 Printer/Plotter is warranted against defective materials or workmanship. THIS WARRANTY IS VOID IF THE ACCESSORY HAS BEEN DAMAGED BY ACCIDENT, UNREASONABLE USE, NEGLIGENCE, IMPROPER SERVICE OR OTHER CAUSES NOT ARISING OUT OF DEFECTS IN MATERIALS OR WORKMANSHIP.

WARRANTY DISCLAIMERS

ANY IMPLIED WARRANTIES ARISING OUT OF THIS SALE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE ABOVE THREE-MONTH PERIOD. TEXAS INSTRUMENTS SHALL NOT BE LIABLE FOR LOSS OF USE OF THE HX-1000 PRINTER/PLOTTER OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE CONSUMER OR ANY OTHER USER.

Some states do not allow the exclusion or limitation of implied warranties or consequential damages, so the above limitations or exclusions may not apply to you in those states.

LEGAL REMEDIES

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

WARRANTY

WARRANTY PERFORMANCE

During the above three-month warranty period, your HX-1000 Printer/Plotter will be repaired or replaced with a new or reconditioned unit of the same or equivalent model (at TI's option) when the unit is returned by prepaid shipment to a Texas Instruments Service Facility listed below. The repaired or replacement unit will be warranted for three months from date of repair or replacement. Other than the postage requirement, no charge will be made for the repair or replacement of in-warranty units.

Texas Instruments strongly recommends that you insure the unit for value, prior to shipment.

TEXAS INSTRUMENTS CONSUMER SERVICE FACILITIES

U.S. Residents

Texas Instruments Service Facility
2303 North University
Lubbock, Texas 79415

Canadian Residents

Geophysical Services Incorporated
41 Shelley Road
Richmond Hill, Ontario, Canada L4C5G4

Consumers in California and Oregon may contact the following Texas Instruments offices for additional assistance or information.

Texas Instruments Consumer Service
831 South Douglas Street
El Segundo, California 90245
(213) 973-1803

Texas Instruments Consumer Service
6700 Southwest 105th Street
Kristin Square
Suite 110
Beaverton, Oregon 97005
(503) 643-6758

Federal Communications Commission Requirements Concerning Radio-Frequency Interference

The Texas Instruments Compact Computer 40 and peripherals generate and use radio-frequency (RF) energy. If not installed and used properly (as outlined in the instructions provided by Texas Instruments), this equipment may cause interference to radio and television reception.

This equipment has been type-tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules. These rules are designed to provide reasonable protection against radio and television interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television reception (which you can determine by turning the equipment off and on), try to correct the interference by one or more of the following measures.

- Reorient the receiving antenna (that is, the antenna for the radio or television that is "receiving" the interference).
- Change the position of the computer with respect to the radio or television equipment that is receiving interference.
- Move the computer away from the equipment that is receiving interference.
- Plug the computer into a different wall outlet so that the computer and the equipment receiving interference are on different branch circuits.

If these measures do not eliminate the interference, please consult your dealer or an experienced radio/television technician for additional suggestions. Also, the Federal Communications Commission has prepared a helpful booklet, "How to Identify and Resolve Radio-TV Interference Problems." This book is available from

The US Government Printing Office
Washington, D.C. 20402

Please specify Stock Number 004-000-00345-4 when ordering copies.

WARNING: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to the computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.