2640B
Display Terminal

HEWLETT hp PACKARD

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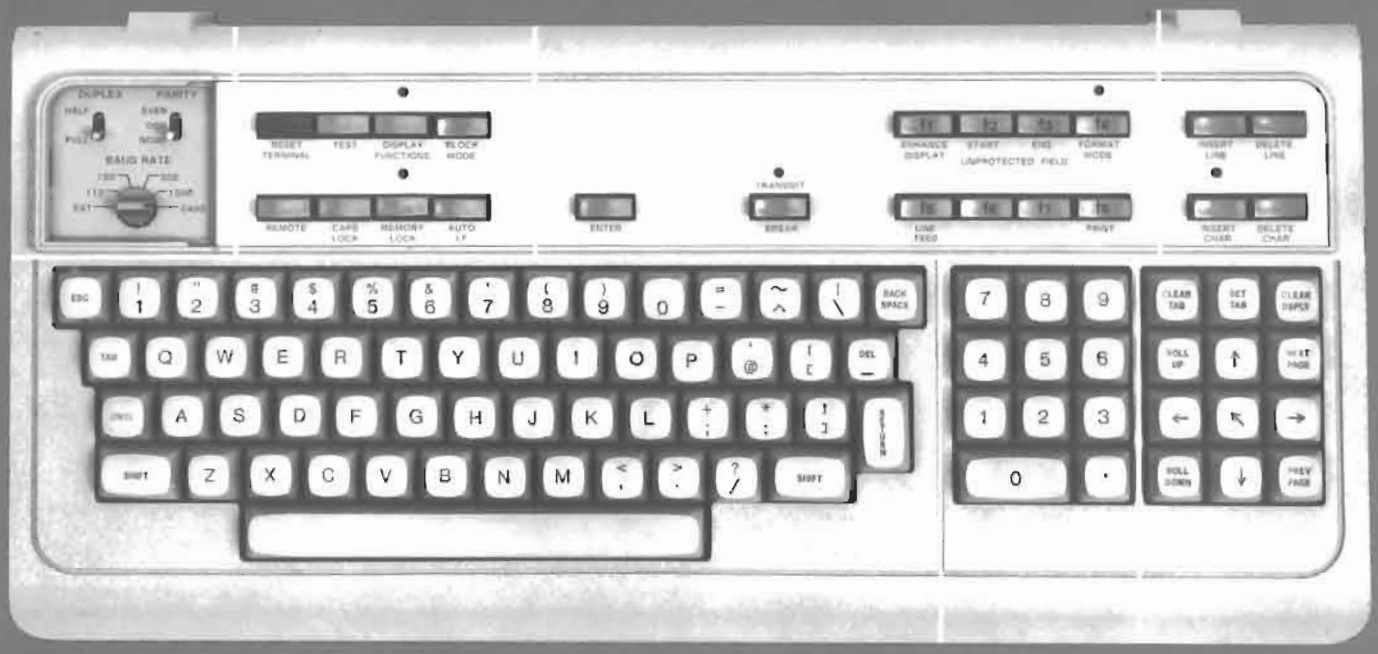
COMMUNICATIONS GROUP

TERMINAL CONTROL GROUP

SPECIAL FUNCTIONS GROUP

EDIT GROUP



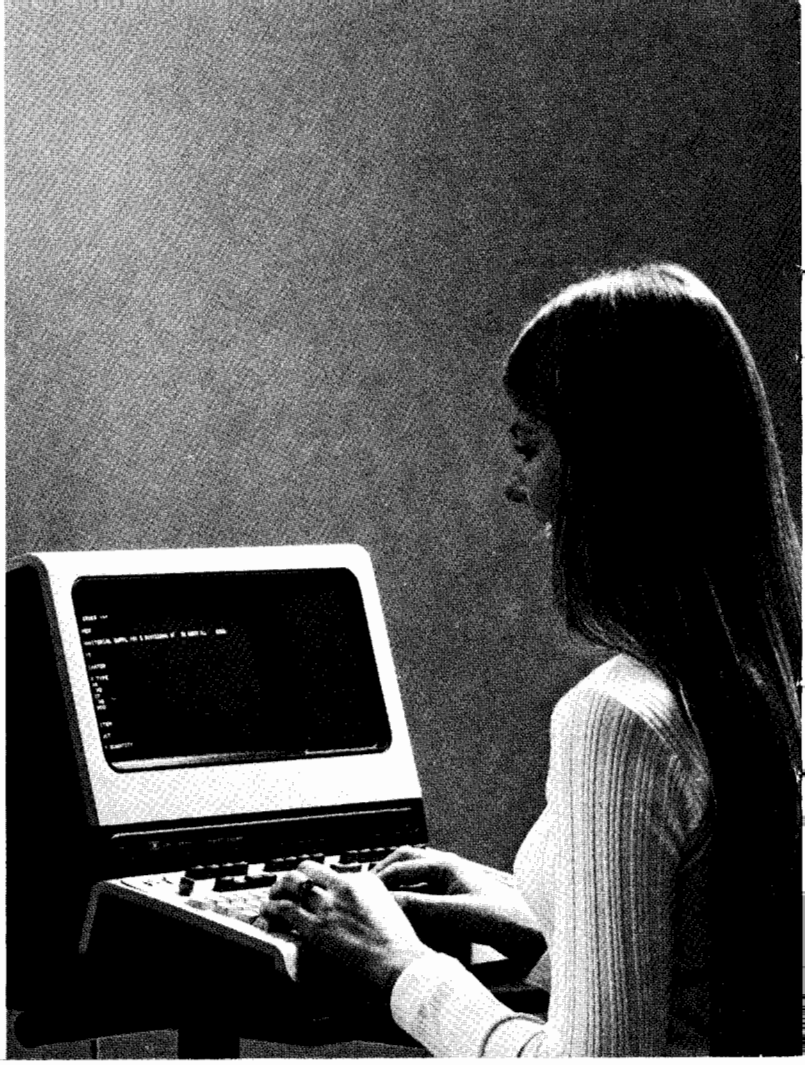
CHARACTER SET GROUP

NUMERIC GROUP

DISPLAY GROUP

HP 2640B Display Station Keyboard

Congratulations!



You have chosen Hewlett-Packard's new 2640B Display Station, a technological advance in reliable terminals. The terminal's flexibility, extensive features, and ease of operation can save you valuable time and computer resources in a wide range of applications.

This user's manual has been prepared to acquaint you with your terminal and to serve as an aid to achieving its optimum use. This manual tells you how to install and use the terminal. It should answer any questions you have about the actual use of the terminal. This manual also provides condensed reference information allowing you to use the terminal online (connected to a computer).

Detailed programming and accessory installation information is contained in the *HP 2640 Reference Manual 02640-90110*. The *HP 2640 Service Manual 02640-90115* (ordered separately) provides information regarding troubleshooting, repair, and theory of operation.

How to Use this Manual

This manual is written as an introduction to the terminal. It describes most of the terminal's features so that you can become familiar with its capabilities without worrying about all of the functional details. Once you have become familiar with the terminal or desire detailed information on specific features you can refer to the *Reference Manual*. If you are already familiar with HP 2640 series terminals, you need not read the entire manual. You can use the index at the back of the manual to locate answers to specific questions.

This manual is made up of the following sections and appendix.

Section I – Introducing the HP 2640B. This section provides a general description of the terminal and briefly describes its capabilities.

Section II – Getting To Know Your Terminal. This section explains how to identify terminal options and accessories. In addition it gives instructions for preparing your terminal for use.

Section III – The Keyboard. This section gives the location and describes the function of each of the major key groups.

Section IV – Using Your Terminal By Itself. This section gives step-by-step examples of using the terminal in typical operations. These operations can be performed without the need of peripheral devices (printer) or a computer system.

Section V – Using Your Terminal With Other Devices. This section provides step-by-step examples of how to use the terminal with optional printers.

Section VI – Using Your Terminal With A Computer. This section explains how to setup and use the terminal with a computer system.

Section VII – Maintaining Your Terminal. This section gives instructions for cleaning the terminal.

Section VIII – In Case of Difficulty. This section explains what to do if the terminal does not work properly. Included is a simple test that can be made to verify proper terminal operation.

Appendix – The appendix contains condensed programming information for all of the terminal's features.

Index – An index is provided for quick access to all information contained in the manual.

Terms Used in this Manual

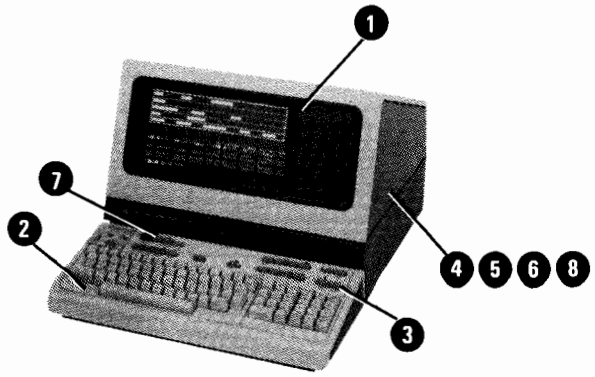
A brief glossary of terms that you should know is given in the following table. Being familiar with these terms will help you to better understand the material presented in this manual.

TERM	DESCRIPTION	TERM	DESCRIPTION
CURSOR	The blinking underline on the display that tells you where the next character, or space, will occur; acts as a pointer.	LINE	A row of characters. It may be thought of as a line of text in a book.
DATA TRANSFER OPERATION	The process of transferring data from one device to another.	LOCAL MODE	Operating the terminal without the aid of a computer system (that is, "off-line").
DEVICE	The optional printer.	PAGE	24 lines. (The amount of data that can be displayed on the screen at one time.)
FORM FEED	Moves the printer paper to the top of the next page.	REMOTE MODE	Operating the terminal with the aid of a computer system (that is, "on-line").

Introducing the HP 2640B

The HP 2640B has many special features that make it both powerful and easy to use. Among these features are:

- High-Resolution Display
- Full Editing Capability
- Plug-In Character Sets
- Microprocessor Control
- Self-Test Key
- Pop-In Modularity



1 High-Resolution Display

The terminal has a 12.7cm by 25.4cm (5 in. by 10 in.) rectangular display providing a 1,920 character capacity in 24 lines of up to 80 characters. The characters are formed by a 7 x 9 dot matrix. The display is engineered to make the characters easy to read. This makes long sessions at the terminal more comfortable.

2 Versatile Keyboard

The terminal has a detachable keyboard. It includes a 11-key numeric key group, display control key group, and 22 additional editing, and special function keys.

3 Full Editing Capability

Editing and computer time requirements can be significantly reduced by such features as:

- Character insert and delete, line insert and delete, display clear.
- Roll up, roll down, next page, previous page.
- Cursor sensing, addressability, tabulation, and positioning.

❹ Plug-in Character Sets

The terminal has the capacity to use up to four sets of 128-characters each. Adjacent characters on the display may be from any character set. A Math Character Set, Large Character Set, and Line Drawing Set are available with the optional Underline, Blinking and Half-Bright feature.

❺ Choice of Communications Capability

You can operate character-by-character as a completely interactive terminal or on a block of data at a time. Information can be composed and edited locally, allowing you to verify and correct data before transmission to the computer.

The terminal operates at up to 2400 baud and offers asynchronous data communications using an RS232C interface. Optional capabilities include current loop, split input/output speed, and custom baud rates.

Connection to a computer can be direct or through a modem. In addition the terminal can be connected directly to a variety of printers to provide hard copy.

❻ Microprocessor Control

All operations are controlled by the terminal's own microprocessor. The microprocessor manages memory allocation and data communications, monitors keyboard operations, and controls the display.

❼ Self-Test

The terminal has been engineered for high reliability, ease of testing, and when needed, rapid repair. By using the TEST key you get a Go/No-Go indication of the terminal's operating condition.

❽ Pop-in Modularity

The modular computer-like construction of the terminal makes it easy to service. The electronics are contained on printed circuit cards that can be exchanged within the terminal. Up to 14 cards can be installed. This allows a flexible choice of options.

Getting to Know Your Terminal

How to Identify Options and Accessories

Your terminal is delivered with the options and accessories that you requested already installed and tested. The options and accessories installed are specified on the Identification Labels found under the rear access cover. When you receive the terminal make sure that all of the items that were ordered are present. A list of options and accessories is given in the *Reference Manual*.

When communicating with Hewlett-Packard regarding your terminal, use the Model, Serial, and Option numbers to insure quick identification by HP. Hewlett-Packard Sales and Service Offices are listed in Section VIII.

NOTE

If your terminal is already installed, you can proceed to "Turning the Terminal On and Off".

Preparing the Terminal for Use

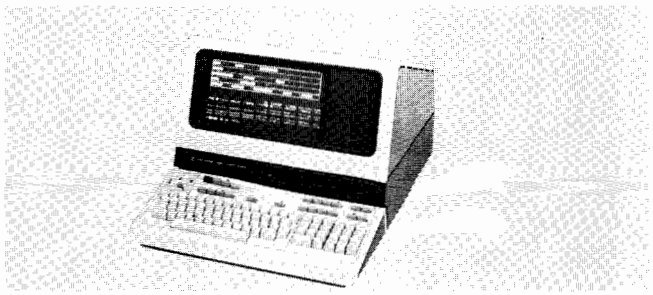
The terminal is designed to operate in a wide range of environments. It is self-contained with easy access to all operator controls so that normal installation does not require opening the unit.

NOTE

If you must open the unit for option or accessory installation, please refer to the *HP 2640 Reference Manual 02640-90110*.

Simply complete the following steps for proper installation:

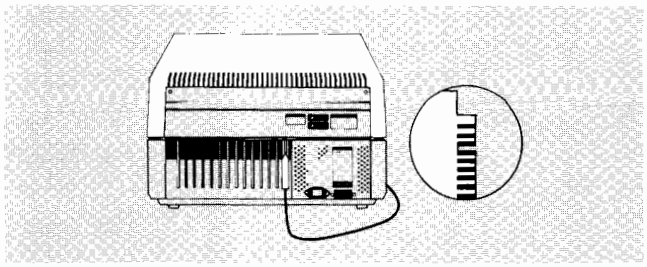
STEP 1. Place the terminal on any convenient surface, except plush or spongy surfaces that might restrict air flow through the bottom vents; do not use typewriter pads, for example.



STEP 2. Raise the unit's hinged rear access cover (two rotating latches hold it in place) and connect the keyboard cable hood connector to the printed circuit card connector that has been notched to match the cable connector.

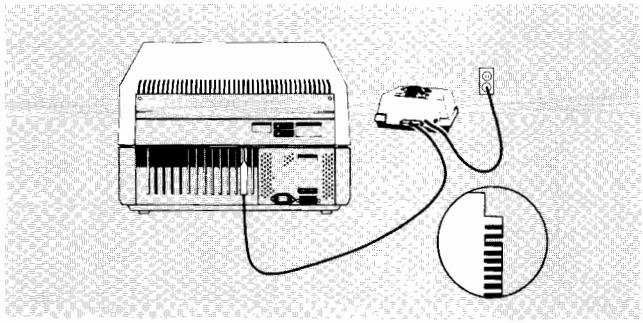
NOTE

Card connectors have been notch-keyed to prevent erroneous connection. Minimal pressure is needed to make the connection.

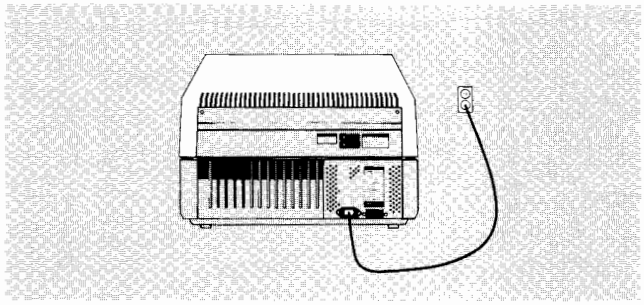


STEP 3. This step is only required when the terminal is to be used with a computer.

Connect the proper interface cable hood connector to the communication interface. The card connector that has been notched to match the hood connector. Connect the other end of the interface cable to your modem or computer.



STEP 4. Put the power switch in the OFF position. Connect the power cord to the terminal power connector.



STEP 5. MAKE SURE THAT YOUR VOLTAGE MATCHES THE TERMINAL'S REQUIREMENTS (either 115V or 230V, see the rear panel label). Plug the 3-prong power connector into your power outlet.

NOTE

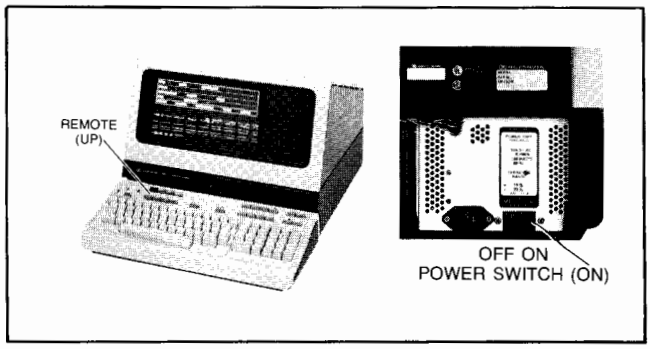
For safety reasons a 3-prong grounded power outlet must always be used.

Turning the Terminal On and Off

ON

STEP 1. When the terminal has been properly installed, set the REMOTE key to the up position (i.e. set for off-line operation).

STEP 2. Set the Power Switch, located at the back of the terminal, to ON. After 15 seconds the terminal will be ready. The display and memory will be clear and the cursor will be blinking.



STEP 3. (Optional) You should also press the TEST key. If the terminal beeps and displays a test pattern similar to that shown on page 8-2, the terminal is working properly and is ready to use.

If the cursor does not appear or the TEST function does not work properly, set the Power Switch to OFF and do not attempt to use the terminal until the malfunction has been corrected by a qualified service representative.

OFF

The terminal is turned OFF by setting the Power Switch at the back of the terminal to OFF.

Exercise 1

Display data on the screen and edit it. Sit down in front of the keyboard and type your name. Notice that the cursor moves across the screen as you type. This tells you where the next character will appear when you press the next key.

```
Alexander Hamilton_
```

NOTE

A list of display screen messages along with their meaning and recovery procedure is given on page 8-3. You may see one or more of these messages displayed while operating the terminal.

Changing a Character. To change a character displayed on the screen, position the cursor under the character to be changed (using ←, →, ↑, ↓ keys), then press the desired character key.

Further Editing. Editing text is further simplified by using the INSERT LINE, DELETE LINE, INSERT CHAR, DELETE CHAR keys. Explanations of these keys are given on page 3-5.

What to Do in Case of Difficulty

If the key or function you try does not work or an error message appears on the screen, refer to Section VIII, "In Case of Difficulty". This section provides instructions for recovering from errors, testing the terminal, and getting help if the terminal requires service.

The Keyboard

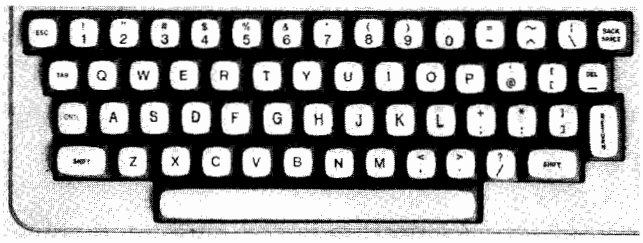
Before learning to transfer data, you should become familiar with the keyboard. Figure 1, inside the manual front cover, shows the keyboard layout. The keyboard consists of the following functional groups:

- **Character Set Group.** This group of keys is similar to a standard typewriter keyboard. It is used for entering data into the terminal.
- **Numeric Group.** An additional ten-key adding machine pad is provided to make numeric data entry easier. These keys have the same effect as the numeric keys in the character set group.
- **Display Group.** The display group keys control the cursor position and the portion of display memory shown on the screen.
- **Edit Group.** Text can be easily changed using the insert and delete functions of the edit group.
- **Terminal Control Group.** This group is used to initialize the terminal, set an operating mode, or test the terminal.
- **Special Function Group.** This group of keys controls the various input/output devices, data transfer operations, and other special functions that can be performed with the terminal.
- **Communications Group.** This set of switches is used to select communication parameters when the terminal is used with a computer.

The remainder of this section briefly describes each of the keyboard groups. Detailed descriptions of each of the keys are given later in the manual. You can use the index at the back of the manual to locate information on specific keys.

Character Set Group

The alphabetic, numeric, and symbol keys are all located in the character set group. This is the largest group of keys on the keyboard. The basic character set is made up of 128 characters. This includes upper and lower case alphabetic characters, punctuation, and some commercial symbols. In addition, several non-displaying characters are also available. The non-displaying characters are used primarily for special applications. Refer to the Reference Manual for additional information on non-displaying characters. The keyboard can generate the entire ASCII code set (see table A-1)



The standard character set symbols are indicated on the keys. The SHIFT key selects upper case or shifted characters. The BACK SPACE, RETURN, and TAB keys are used in the same manner as on a typewriter. The ESC and CNTL keys are used to provide additional character codes and to generate special control codes for various terminal operations. The use of the ESC and CNTL keys are explained later in the manual.

Exercise 2

Try typing a few lines of text to get used to the keyboard. Remember this part of the terminal works very much like a typewriter. Note that by using the backspace key you can overwrite and change characters.

Numeric Group

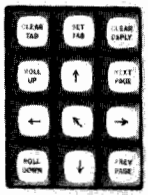
The numeric keys at the right of the keyboard act in the same way as the keys in the alphanumeric group. These keys are arranged to make it easy to enter numeric data.

Exercise 3

Try entering some numbers using the numeric key pad.

Display Group

The screen can show 24 lines of up to 80 characters each. This is called a "page". The terminal can hold multiple pages depending on the number of characters used in each line and the amount of memory installed in your terminal. The 12 keys at the right of the keyboard are used to control the data shown on the screen. This group includes the SET TAB and CLEAR TAB keys which have the same function as on a typewriter.

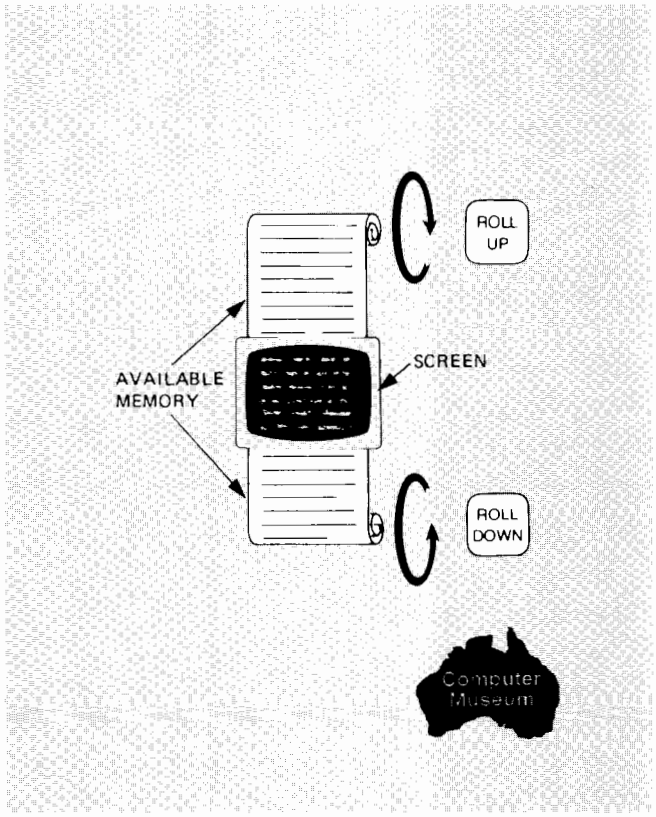


The display group keys allow you to control the position of the cursor on the screen. They also allow you to "page" or scroll through the terminal's memory to display characters that have rolled off the screen.

The terminal can store more characters than can be displayed on the screen. Depending on what memory options are installed in your terminal, you can store over 7 thousand characters. This is enough to completely fill three screens. The screen is used to look at one block or "page" of these characters at a time. Each page is made up of 24 lines of data.

When the screen has been filled (24 lines of data have been entered), the top line rolls off the screen. As you type each line the display will roll up to make room for the new line. This continues until the memory is filled. At this point if you enter another line, one or more lines in memory will be lost to make room for the new line. Memory lock operation (described later) will prevent lines of information from being lost.

The [ROLL UP] and [ROLL DOWN] keys allow you to move the screen (like a window) through memory, one line at a time.



The [NEXT PAGE] and [PREV PAGE] keys allow you to move the display 24 lines (a whole screen) forward or backward in memory. When you press these keys the information presently displayed is replaced with the next (or previous) 24 lines of memory.

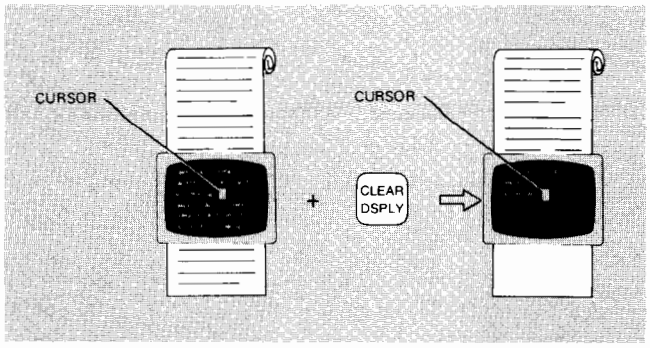
Moving the Cursor

You can move the cursor to any location on the screen with the [←], [→], [↑], and [↓] keys. Each key stroke causes the cursor to step one position in the direction of the arrow on the key.

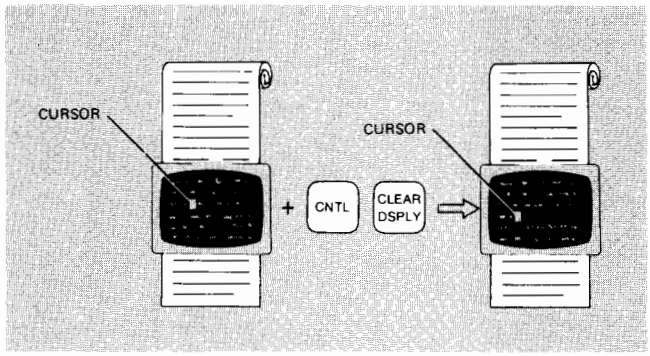
The [↖] key "homes" the cursor to the left margin of the first line of memory and displays the first page of memory. Holding the [CNTL] key down while pressing the [↖] key will cause the cursor to be moved just beyond the end of memory data. This allows you to quickly move to the end of your data so that you can append additional lines.

Clearing the Display

The [CLEAR DSPLY] key clears all of memory from the present position of the cursor to the end of memory. To clear all of memory, simply use the [↖] key to return the cursor to the beginning of memory before using the [CLEAR DSPLY] key.



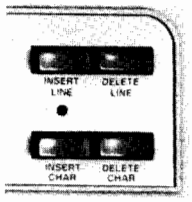
You can clear the portion of a line to the right of the cursor by holding the [CNTL] key down and pressing [CLEAR DSPLY].



The operation of the [CLEAR DSPLY] key varies slightly when the terminal is in format mode (refer to the Reference Manual).

Edit Group

The edit group (upper right portion of the keyboard) contains four keys that allow you to edit text or data on the screen. Note that some of the edit functions are disabled when the terminal is used in format mode. (Format mode is described later in the manual.)



INSERT LINE

The INSERT LINE key causes the line containing the cursor and the remaining lines below to be rolled down leaving a blank line. The cursor is moved to the left margin of the blank line. This key is disabled when the terminal is in format mode.

DELETE LINE

The DELETE LINE key causes the line containing the cursor to be deleted. The line is deleted and the remaining lines below the cursor are rolled up to take its place. The cursor is moved to the left margin. This key is disabled when the terminal is in format mode.

INSERT CHARACTER

The INSERT CHAR key allows you to insert characters into a line without overwriting existing characters. When you press the INSERT CHAR key the indicator above the key lights. This indicates that you are in the insert character mode. When you want to return to the normal (overwrite) mode of character entry, press the key again. The light will go out, indicating that you have returned to normal operation.

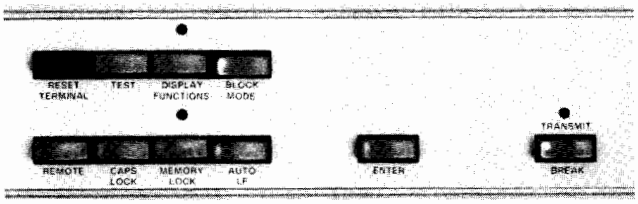
When you are in insert character mode, any characters that you type are inserted into the current line wherever the cursor is positioned. The remaining characters in the line are shifted to the right one column for each character entered. Characters shifted past the last column are lost.

DELETE CHARACTER

The DELETE CHAR key deletes the character at the cursor position. The remaining characters in the line to the right of the cursor (up to the right margin) are shifted left one column for each character deleted.

Terminal Control Group

The control group keys are located in the upper left of the keyboard. These keys are used to select modes of operation, test the terminal, and to control such functions as capital character lock and automatic line feed.



RESET TERMINAL

Pressing the RESET TERMINAL key causes the terminal to be set to the initial power-on state: display and memory clear, cursor home. This key should not be used unless necessary (refer to Section VIII, In Case of Difficulty).

TEST

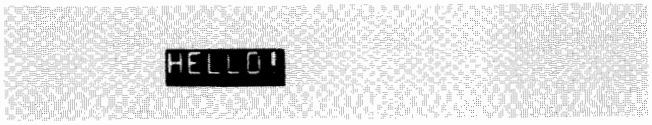
The TEST key performs a diagnostic test of the terminal. If a failure is detected, an error message may be displayed. If no error is found, a standard test pattern is displayed. Section VIII contains additional information on this key.

DISPLAY FUNCTIONS

When the DISPLAY FUNCTION key is depressed (indicator on), terminal control functions typed at the keyboard or received from the computer are not executed. You can list programs or data which have escape or control codes in them without the terminal responding to the codes. With the full 128-character set (option 001) installed, escape sequences and control codes are also displayed. The Self Test pattern (page 8-3) shown these characters.

Example:

Executing the escape sequences to move the cursor to the Home position, clear the display, turn on Memory Lock and type "Hello!" in Inverse Video would appear on the display as:



With DISPLAY FUNCTIONS On, the same sequence would be displayed as:

BLOCK MODE

The BLOCK MODE key can be used to switch the terminal to Block Mode. When the terminal is in Block Mode, typed data is displayed but not sent to the computer until requested by the computer or until after the ENTER key has been pressed and the computer has responded. Otherwise, the terminal is in Character Mode and data is transmitted as typed.

REMOTE

The terminal can be set for Remote (on-line) operation by putting the REMOTE key in the down position. This puts the terminal in communication with a computer and changes the way some of the terminal's modes operate.

AUTO LF

The AUTO LF key causes a Line Feed each time the RETURN key is pressed.

BREAK

The BREAK key can be used to interrupt the operation of the terminal's data communication function. Refer to the *Reference Manual* for additional information.

TRANSMIT Indicator

The TRANSMIT indicator will be on when a data link exists between the terminal and the computer. Refer to the *Reference Manual* for additional information.

ENTER

When the terminal is set for Remote (on-line), the ENTER key allows you to send blocks of data to a computer. The ENTER key functions differently depending on the character, block, format mode, and REMOTE key settings.

CAPS LOCK

The CAPS LOCK key locks all alphabetical keys to upper-case characters. The @ , [,] , \ , and ^ keys are locked in lower-case. The remaining numeric/symbol keys operate normally. (The CAPS LOCK key restricts the keyboard to the first 96 characters of the ASCII character set.)

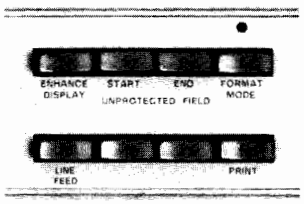
MEMORY LOCK

The MEMORY LOCK key has two functions, overflow protect and display lock. Overflow protect prevents data from being lost when the terminal's memory is full. Display lock freezes data at the top of the screen. Entered data then rolls around the frozen data and into the terminal's memory. This allows you to retain headings or instructions as you enter data. Refer to Section IV for a discussion of how to use MEMORY LOCK.

Special Functions Group

[f1] thru [f8] Special Function Keys.

These eight keys perform multiple functions depending on whether the [CNTL] key is also pressed.



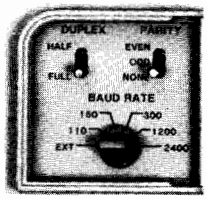
These keys are assigned values of ESC p through ESC w.

[CNTL] Key Operations

The [CNTL] key is used with the special function keys to send the assigned values to a computer. They can then be used to select preprogrammed functions. Can also be used to generate ASCII control codes.

Communications Group

The communications group (upper left portion of keyboard) contains three switches for controlling the operation of the terminal when it is used with a computer. The setting of these switches depends on the particular data communications option used.



DUPLEX

The DUPLEX switch selects whether or not the terminal should display characters as they are typed. In some cases the computer will "echo" the characters back to the terminal to indicate that it has received them correctly. When set to HALF, typed characters are displayed by the terminal and sent to the computer. Setting the switch to FULL prevents the characters from being displayed unless they are returned from the computer. This function is ignored when the terminal is in Block Mode.

PARITY

This switch selects whether even, odd, or no parity is supplied with each character sent to the computer. This parity information is used to determine if each character has been correctly received. If the terminal detects an error a "_" or "■" may be displayed on the screen in place of the character.

BAUD RATE

The BAUD RATE switch selects the rate at which the terminal will send and receive data. The available rates are 110, 150, 300, 1200, or 2400 baud. This corresponds to 10, 15, 30, 120, or 240 characters per second. When set to the EXT position the terminal speed can be set by the computer or some other external source.

Using Your Terminal by Itself

The terminal can store over 7,000 characters and can be used without a printer and without being connected to a computer.

We will use the terminal by itself to learn how to enter and correct data, use alternate character sets, and work with special forms. Once you have been introduced to the basic terminal, later sections will describe how to use the terminal with a printer, or a computer.

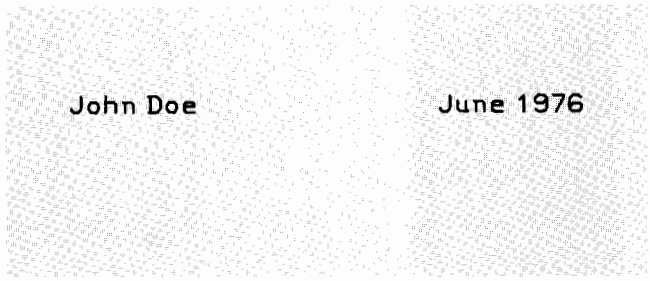
NOTE

The terminal uses a variety of messages to inform you of terminal status. A list of messages and the corresponding action that should be taken is given in Section VIII.

Entering Data

One of the most important uses of the terminal is data entry. Data is entered using the keyboard. The data can then be sent to a computer, or listed on a printer.

Example: Enter the following name and date —



Correcting Data

If you make an error or wish to change an entry you have made, you can use any of the cursor or edit keys discussed earlier. For example, to add the middle initial T. to the entry in the previous example, move the cursor under the "D". Press the INSERT CHAR key and type "T." and a space. Press the INSERT CHAR key again to return to normal overwrite mode. (The indicator above the key should go out.)

Techniques of Data Entry

In order to simplify data entry you can use tabs and data forms.

Tabs

Setting Tabs. To set a tab, move the cursor to the desired column and press [SET TAB]. Once a tab is set, the [TAB] key (located on the left of the keyboard) can be used to move the cursor to the next tab setting

Using Tabs. Once tab positions have been set you can tab using the [TAB] key in the same manner that you would on a typewriter.

Clearing Tabs. You can clear individual tabs by moving the cursor to the tab position and pressing the [CLEAR TAB] key.

Moving Text Blocks

You can move blocks of text or data using [MEMORY LOCK].

Example: In the following text, move the paragraphs into the proper order.

Initial order:

```
(Top of screen)  3. This is paragraph 3.
                    It should be last in
                    the group.
                 2. This is paragraph 2.
                    It should be second.
                 1. This is paragraph 1.
                    It should be first.
                    (blank line)
```

Step 1. Press [↖], [CLEAR DSPLY] and type in the paragraphs as shown. Be sure to type [RETURN] following the last line.
Step 2. Position the cursor in the first line of paragraph 2.
Step 3. Turn on [MEMORY LOCK].
Step 4. Use the [ROLL UP] key until the remaining paragraphs have rolled up under the cursor position and off the screen.
Step 5. Turn off [MEMORY LOCK].
Step 6. Press [↖].

The display should appear as follows:

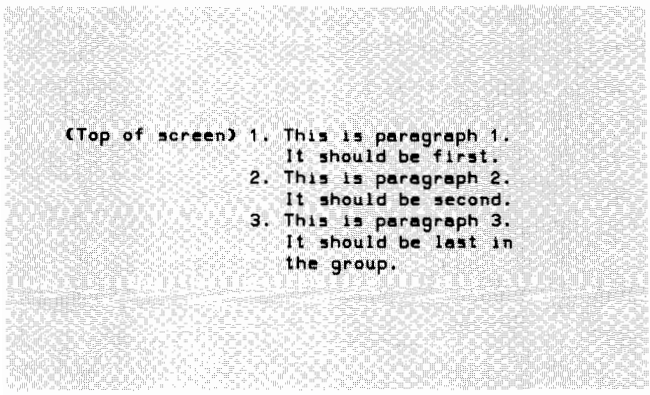
```
(Top of screen)  2. This is paragraph 2.
                    It should be second.
                 1. This is paragraph 1.
                    It should be first.
                 3. This is paragraph 3.
                    It should be last in
                    the group.
```

Step 7. Now move paragraph 1 by positioning the cursor in the first line of paragraph 1 and turning on MEMORY LOCK.

Step 8. Use the ROLL UP key until the cursor is in the first line of paragraph 3.

Step 9. Turn off MEMORY LOCK and press ↖. The paragraphs should now be in .order.

Note that if the data is not on the first page of memory, the ROLL DOWN key can be used instead of ↖ to view the newly ordered text.



Display Features

The terminal provides the following display features:

- **Display Enhancements** — Parts of the display can be half bright, underlined, blinking, or inverse video.

- **Alternate Character Sets** — The keyboard can be used to select characters from Math, Line Drawing, large character or other special character sets.

- **Protected Fields** — Data cannot be changed by the user and will not be sent to the computer.

- **Unprotected Fields** — Data can be entered and changed. Data will be sent to the computer.

Forms can be created with these features to make data entry easier and reduce the chance of errors. The forms used are similar to paper forms except that they are displayed on the terminal screen. Forms are made by defining "fields" of one or more characters. Each character can be given one or more of the display features. Once a form is created, it can be stored in the computer and displayed as needed.

The remainder of this section discusses briefly how forms are used. A complete discussion of forms and how they are used is contained in the *Reference Manual*.

Using Display Enhancements

The standard terminal can display data using inverse video (black on white). In addition, if your terminal has the 13231A Display Enhancement accessory you can also use half bright, underline, and blinking characters. Each character position on the screen can be displayed with various combinations of these features.

- **Half Bright** — characters are displayed at half intensity (grey).
- **Underline** — an underline is displayed below the normal character.
- **Inverse Video** — the screen is white and characters are black.
- **Blinking** — characters including the inverse video, underline, and half bright features blink.

The display enhancements are used by assigning one or more of them to a field. The selection sequence is [f1] ,(enhancement character).The enhancement character (@,A through O) is used to select the combination of display enhancements to be assigned to the field. The following table lists the enhancement character for each of the combinations. The field is ended by selecting another enhancement, the end of the current line, or by [f1] , [@]

	Enhancement Character														
	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Half-Bright									x	x	x	x	x	x	x	x
Underline					x	x	x	x					x	x	x	x
Inverse Video			x	x			x	x			x	x			x	x
Blinking		x		x		x		x		x		x		x		x
End Enhancement	x															

Example: Define columns 10 through 14 of line 5 to be inverse video and blinking.

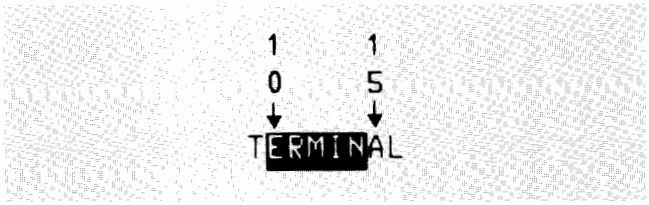
Step 1. Position the cursor at column 10 in line 5.

Step 2. Type [f1] , [SHIFT] [C] .

Step 3. Move the cursor to column 15 in line 5.

Step 4. Type [f1] , [@] (this ends the enhancements). The field should be white.

Step 5. Type the word TERMINAL beginning in column 9 of line 5. It should appear as shown below. (If your terminal does not have the 13231A accessory installed the characters will not blink.)



Using Alternate Character Sets

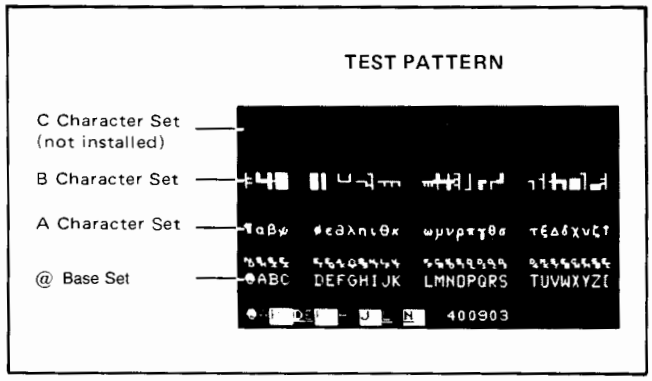
Your terminal can display up to four different character sets. Each character set can contain up to 128 characters or symbols. In addition to the Math, Line Drawing, and Large Character sets available as options, you can create character sets tailored for special applications. Contact your nearest Hewlett-Packard Sales Office for additional information on special character sets.

Switching from one character set to another can be done on a character-by-character basis. For example, a character from the Math Symbol Set can be displayed next to characters from the base set. This is done by defining one or more character positions in a line to be from alternate character sets. (Each group of characters can be thought of as a field.)

NOTE

The following discussion assumes that the Math and Line Drawing character sets are present and are installed as alternate sets A and B respectively and that the CAPS LOCK key is down.

To use optional character sets, first select the character set to be used as the alternate. (With the terminal in its initial state, character set A is defined to be the alternate.) Type ESC ,) followed by an @ , A , B , or C to select the desired alternate set. (To find out which character set corresponds to @, A, B, or C, generate the test pattern by pressing the TEST key). This displays the order of the character sets as follows:



Example: Define the Math Set as the alternate character set.

From the test pattern the Math Symbol Set is found to be the A alternate character set.

[ESC] , [)] , [A]

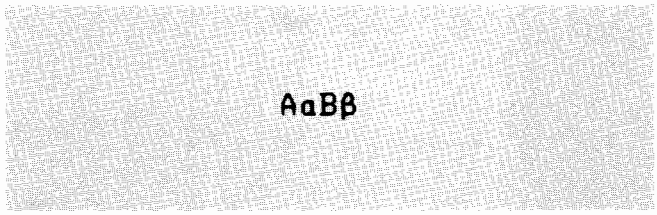
Once the alternate character set is defined, you can switch from the base to the alternate set by typing [CNTL] [N]. (Hold the [CNTL] key down while you type [N].)

The terminal automatically returns to the base or @ set at the end of a line. To return to the base set within a line, type [CNTL] [O]. (This means that you must type [CNTL] [N] again if your field of alternate characters extends onto the next line.)

To display AαBβ type the following sequence:

[A] , [CNTL] [N] , [A] , [CNTL] [O] , [B] , [CNTL] [N] , [B]

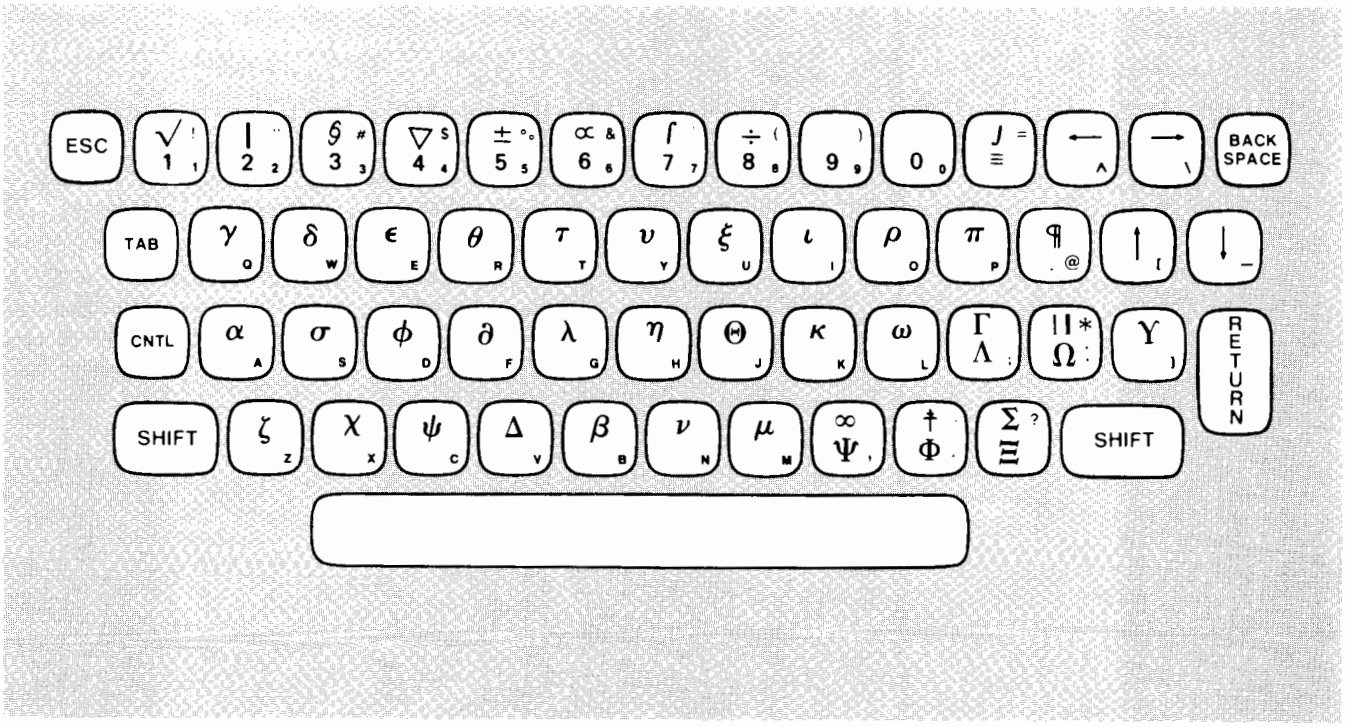
The screen should display AαBβ.



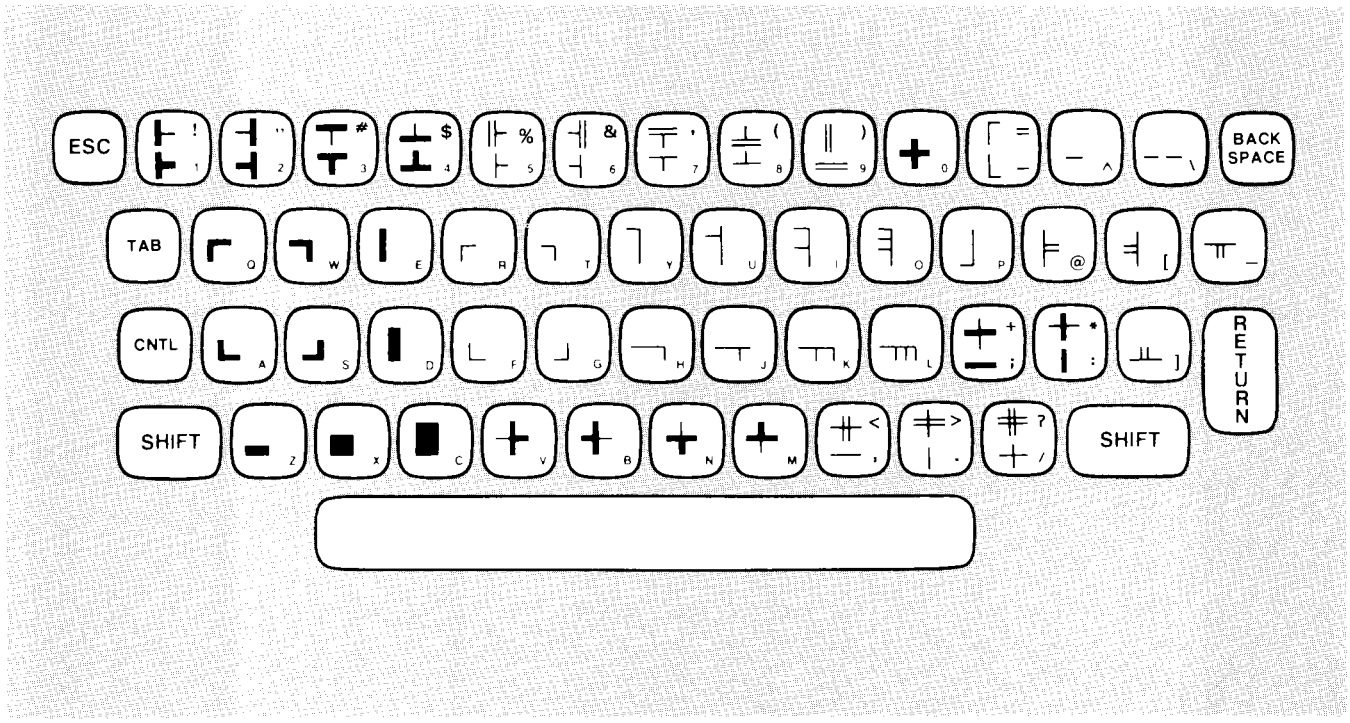
Once a field has been defined as from the alternate set, the field moves with the display when the [ROLL UP] , [ROLL DOWN] , [NEXT PAGE] , and [PREV PAGE] keys are used. To change to a different alternate character set another [ESC] , [)] command must be typed.

The Math Set is useful for applications requiring the use of equations or formulas. The elements of the optional Math Symbol Set are shown below.

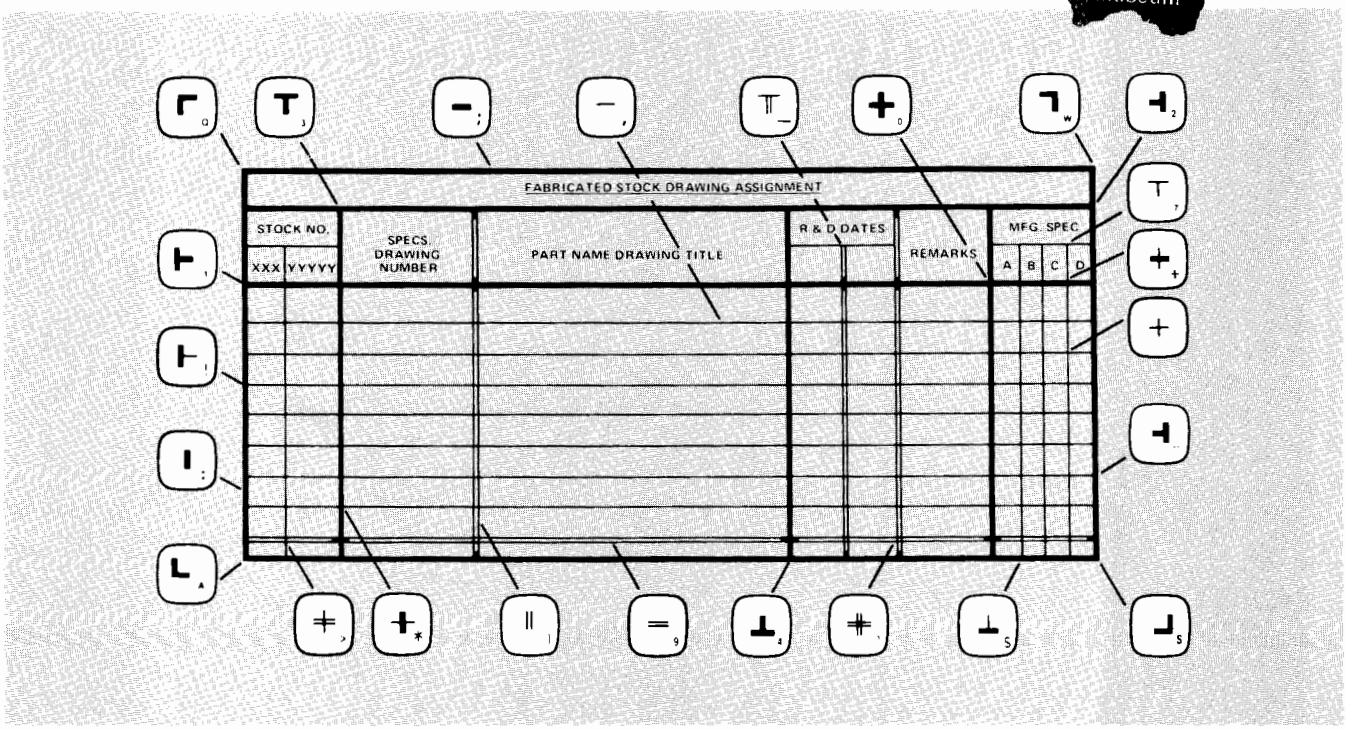
$$\iiint_{0}^{\infty} \Psi^{*} \left[\frac{-h}{2\pi i} \frac{\partial \Psi}{\partial t} \right] dv = \iiint_{0}^{\infty} \Psi^{*} E \Psi dv$$



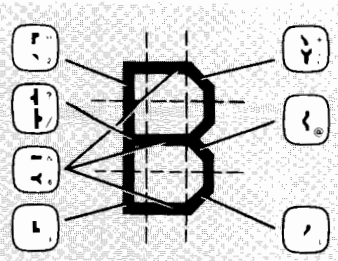
The Line Drawing Set provides a limited graphics capablity. Simple line drawings and fairly complex forms for data entry applications can be generated. The elements of the optional Line Drawing Set are shown below.

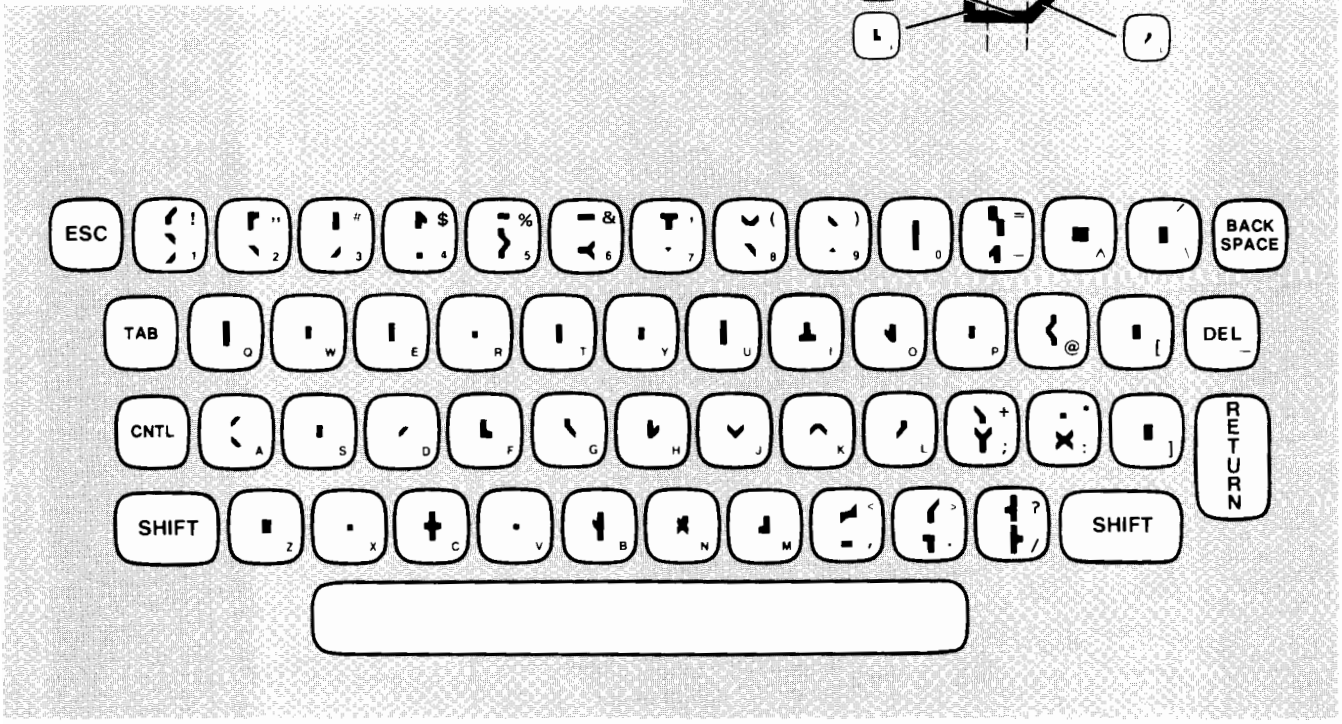


Example:


FABRICATED STOCK DRAWING ASSIGNMENT
STOCK NO.
XXX YYYYY
SPECS. DRAWING NUMBER
PART NAME DRAWING TITLE
R & D DATES
REMARKS
MFG. SPEC
A B C D

The Large Character set allows you to create alphabetic characters that are three times the size of normal characters. The elements of the Large Character set are shown below.





Forms Mode (Format Mode)

In Forms Mode the terminal prevents you from overwriting or transmitting data in protected fields. Forms mode is normally entered under control of the computer or through a command from the keyboard. The indicator above the key is on while the terminal is in Format Mode.

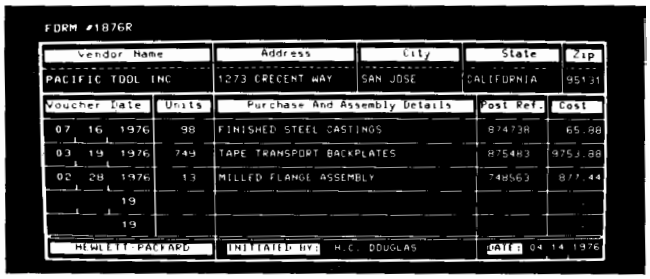
Protected Fields

Fields can be protected so that displayed data cannot be overwritten or sent to a computer. When the terminal is placed in "Forms Mode" (FORMAT Mode) all character positions on the screen are protected except those fields that have been specifically defined as "unprotected".

Unprotected Fields

Data can be written into unprotected fields in the normal manner. After reaching the end of an unprotected field, the cursor moves to the beginning of the next unprotected field and a beep is generated. The tab functions can be used to move from one unprotected field to the beginning of the next unprotected field. Fields are defined as "unprotected" by using [f2] at the start of the field. [f3] or the end of the line is used to the end the field.

In the following figure only the fields shown in black are unprotected. Even if you move the cursor to a protected field and type a character the cursor will move to the nearest unprotected field before displaying the character.



Example: Define column 1 through 9 of line 3 as "unprotected".

Step 1. Position the cursor at column 1 in line 3.
Step 2. Type [f2] .
Step 3. Move the cursor to column 10 of line 3.
Step 4. Type [f3] .

Now try turning on Forms Mode ([f1]) and typing data. (Note that the indicator above the [f4] key will be on while in Format Mode.) Note that data can only be entered into the unprotected field. (Remember to turn off Forms Mode with [f4] .)

Using Your Terminal With a Printer

Introduction

This section describes how to use your terminal with an optional printer. The terminal can be used with Hewlett-Packard 9866 and 9871 printers as well as most printers using an RS 232 type interface.

Performing Print Operations

You can output data to the printer by pressing the PRINT key. This causes the terminal to "Home Up" the cursor and then send the entire contents of display memory to the printer. Each line of output is followed by a carriage return and a line feed.

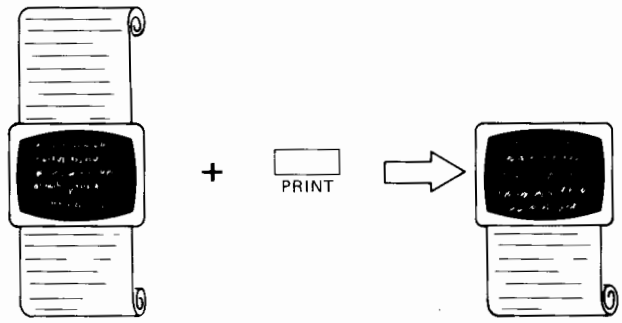
After all of the data has been sent to the printer, the terminal sends a form feed command to the printer. This causes most printers to eject a blank page.

Control Characters

All ASCII control characters (Null, Esc, Us, etc.) are sent to the printer as blanks or spaces.

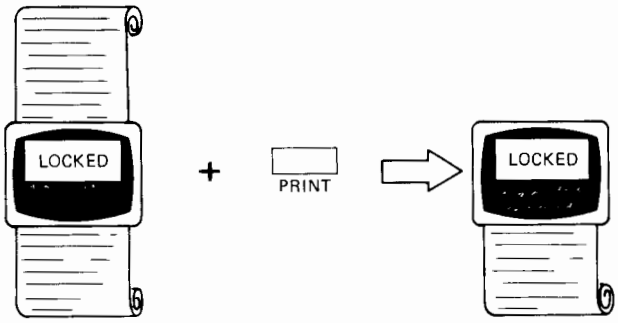
Forms Mode

If the terminal is in Forms Mode, data in protected fields is converted to blanks before being sent to the printer. This allows you to use preprinted forms on the printer and only output the data used to fill in the form.



Memory Lock

When the Memory Lock feature is used, the PRINT key causes the locked portion of the screen to be moved to the beginning of display memory when the terminal performs the "Home Up" operation. (Refer to the discussion "Moving Text Blocks" in Section IV.)



The locked portion of the display is then output first followed by the remaining data in display memory.

Using Your Terminal with a Computer

The terminal can be connected to a computer system either directly or through a modem. A variety of interface accessories are available depending on the type of connection desired. (Additional information on interfaces is contained in the *Reference Manual*.)

Preparing the Terminal for Use On-Line

Very little must be done to use the terminal on-line. The proper interface should be installed, and the modem or direct line connected (this is normally already done). Make the settings listed in the following paragraphs.

Communication Settings

There are three switches in the communication group used to match the requirements of the computer that you will use. Additional information on communication settings is given in the *Reference Manual*.

BAUD RATE. This switch sets the speed at which data will be transferred. If you do not know the correct speed, use 300 (2400 is commonly used when the terminal is directly connected to a computer.) If data from the computer appears garbled it may mean that you should select a different baud rate.

PARITY. This switch selects the type of data checking to be used. If the "_" or "■" character appears on the screen, you may have selected the wrong parity.

DUPLEX. This switch is normally set to FULL. If no characters are displayed, switch to HALF.

Selecting Operating Modes

REMOTE. The 

key must be down. This allows the terminal to send and receive data through its communication interface.

AUTO LF. Normally the 

key should be up.

CAPS LOCK. Leave the CAPS LOCK key down unless the system you are using accepts lower case characters.

BLOCK MODE. The BLOCK MODE key is used to select character-by-character or block transmission of data. When the key is up the terminal transmits characters to the computer as they are typed. This mode of operation is used for conversational exchanges with the computer system.

Example:

Computer `Please Type Your Company Name`

You type `HEWLETT-PACKARD`

Computer `What File Number Would You Like From The HEWLETT-PACKARD Library?`

You type `12345`

and so on . . .

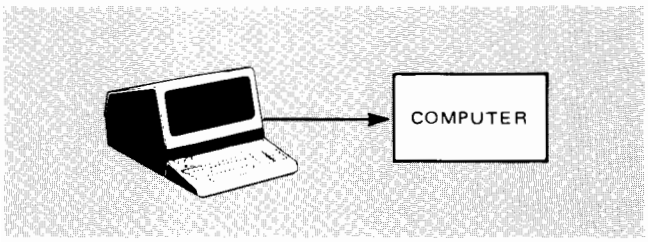
When the BLOCK MODE key is down, characters are not sent as they are typed. Instead you can input information to the terminal and then edit it before sending it to the computer. The data is sent with the ENTER key. A portion of a line, a whole line, or even an entire screen of data can be sent at once. The size of the block of data sent depends on the setting of switches inside the terminal. (Refer to the *Reference Manual* for detailed information on the operation of Block Mode.)

Additional Settings

These are several more switch settings that can be made. These settings control such terminal features as the number of characters to be sent in block mode, and character overstrike (Space Overwrite Latch). Setting of these switches is normally required only when the terminal is first installed. These switches are located inside the terminal. Instructions for setting these switches is contained in the *Reference Manual*.

If a modem is used it may be necessary to turn on the modem, make modem speed and parity settings, or dial a number. Baud rate, duplex, and parity settings should be the same values used for the terminal.

Sending Data to the Computer

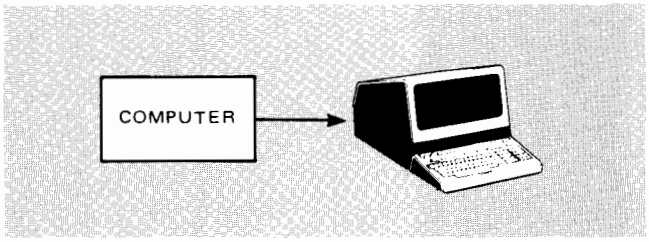


Data can be sent to the computer from the terminal keyboard.

From the Keyboard

When not in Block Mode, data entered from the keyboard is sent immediately to the computer automatically. If you are in Block Mode (BLOCK MODE key down) then the data is stored in the terminal until you press the ENTER key. Block mode and the ENTER key are often used with data entry forms (Refer to Section IV).

Receiving Data From the Computer



To the Display

No special action is required to receive data from the computer. Data is normally displayed on the screen as it is received.

Maintaining Your Terminal

This section contains simple procedures for cleaning the terminal screen and keyboard.

Cleaning the Screen and Keyboard

The screen and keyboard can be cleaned to remove dust or grease. First, lightly dust using a damp, lint-free cloth. The cloth should be just damp enough to pick up dust, not wet. Paper towels are fine. Avoid wiping dust or lint into the keyboard area.

Most conventional spray cleaners can be used to remove smudges and fingerprints. DO NOT use petroleum based cleaners such as lighter fluid! These could harm the plastic surfaces. Avoid spraying between the keys.

In Case Of Difficulty

This section contains error recovery instructions, testing and troubleshooting information, and a list of error messages. Once you have determined that the terminal is not functioning properly, follow the procedures for requesting service are given at the end of the section under "How to Get Help".

Using RESET TERMINAL

It may be necessary to use the RESET TERMINAL key to clear error conditions. Since the RESET TERMINAL key has a major effect on terminal operation, it should not be used unless necessary.

A Reset is performed by pressing the RESET TERMINAL key. This has the same effect as turning power on. It completely reinitializes the entire terminal and should not be used unless necessary.

The screen and memory are cleared, format mode, display functions, and all programmable functions including the function keys (f1 - f8) are turned off or set to their default values.

Operator Troubleshooting (SELF-TEST)

The TEST key tells you if the terminal is performing properly. The tests are made from the keyboard and do not require tools or even a computer. You should make the tests whenever you feel that the terminal is not working properly. If the terminal fails any of the tests, refer to "How to Get Help" at the end of this section.

A terminal test checks out the terminal and is made by pressing the TEST key. This is a GO/NOGO check to see if the terminal is functioning properly. This test can also be used to find out which options are installed and how the terminal jumpers are set. Pressing the TEST key causes the following:

- The keyboard lights are turned on. This indicates that the terminal's power supply, microprocessor, and indicators are functioning properly. The lights remain on until the test is completed.

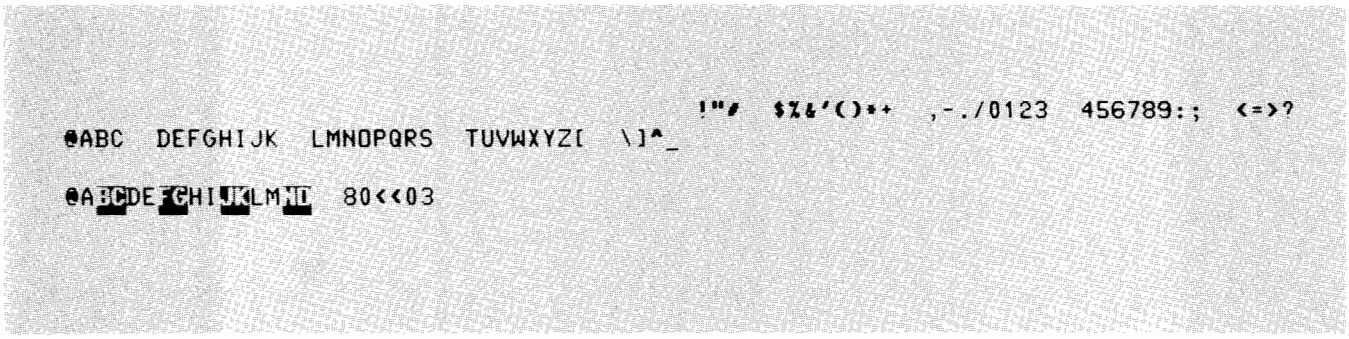
- A test of the terminal's microcode is made, the display is turned off, and the terminal's display memory is tested.

- The bell is beeped, the display is turned back on, and all character sets contained in the terminal are displayed.
- A line of characters, @ABCDEFGHIJKLMNO, is displayed. If the Display Enhancement option is installed, then Underline, Half-Bright, and Blinking will be displayed with Inverse Video in all possible combinations in this line of characters.
- Six digits of status information are displayed and the keyboard indicators are returned to the state they had before the test began. (Refer to the *Reference Manual* for an explanation of terminal status.)

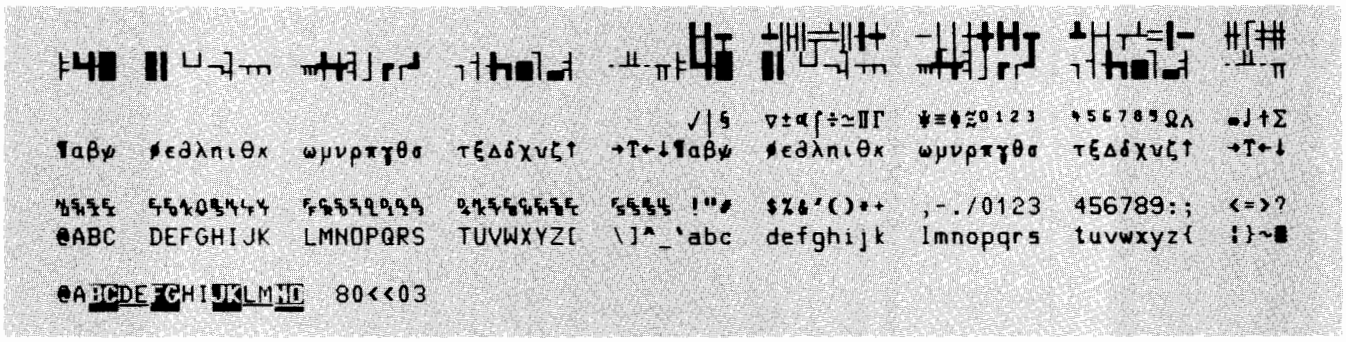
Test Pattern for the standard terminal.

Generally, if the terminal beeps and the display shows a pattern similar to the ones below, then the terminal is functioning properly. The test pattern displayed will depend on which features are present in your terminal.

RESET TERMINAL must be pressed to resume operation if an error occurs during the test. When RESET TERMINAL is used to recover from a test error, the terminal will always perform a full reset. However, terminal operation will not be reliable if the Self Test failed.



Test Pattern for terminals containing Display Enhancements, 128 character base set, Display Enhancements, Math Symbol Set, and Line Drawing Set.



How to Get Help

If you have performed the self test and received an error message or if the test did not complete properly, the terminal is probably malfunctioning. At this point you can contact your nearest Hewlett-Packard service office. A list of service offices is given at the back of this manual.

If you wish, you can perform additional tests which may correct the malfunction. Procedures for these tests are given in the *Reference Manual*. These tests consist of a check of the terminal's assemblies and cables for loose connections and a test of the data communication function. The communication test helps isolate malfunctions when the terminal is used with a computer.

Messages

A variety of display messages inform you of terminal operating status, improper commands, or malfunctions. Messages appear in the upper left corner of the screen.

The following table gives an alphabetic list of terminal messages, their meaning, and any action that may be required.

Table Of Display Messages

MESSAGE	MEANING	ACTION
LOADER	The terminal is loading a diagnostic program.	No action is required.
PRINT FAIL	The printer did not respond properly. Either the printer is turned off, is not connected properly, or is out of paper.	Press RETURN. Check to make sure that the printer is properly connected to the terminal, is turned on, and has paper.
RAM TEST FAIL	A RAM error has been detected during self test.	Refer to the *Reference Manual*.
ROM TEST FAIL	A ROM memory error has been detected during a self test.	Refer to the *Reference Manual*.

Hewlett-Packard Sales and Service Offices

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ALABAMA
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Pensacola 32575
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Table 4: Programmer's Reference Table

KEY OR SWITCH	CODE	FUNCTION
CHARACTER SET GROUP		
Alphabetical, numerical & symbol keys	— — —	Similar to typewriter keyboard
ESC (escape) key	ESC ([C)	Leads off an ASCII escape sequence
TAB key	HT (IC)	Forwards cursor to next tab position
CNTL (control) key	— — —	Used to generate ASCII control codes
BACK SPACE key	BS (HC)	Cursor left one space
RETURN key	CR (MC)	Returns cursor to start of line
NUMERIC AND DISPLAY CONTROL GROUP		
↑ key	ESC A	Cursor Up
↓ key	ESC B	Cursor Down
→ key	ESC C	Cursor Right
← key	ESC D	Cursor Left
↖ key	ESC H	Cursor Home
↖ c	ESC F	Cursor Home Down
CLEAR DSPLYC	ESC K	Clear to the end of the line
CLEAR DSPLY key	ESC J	Clears memory from cursor position
ROLL UP key	ESC S	Scroll the display up one line
ROLL DOWN key	ESC T	Scroll the display down one line
NEXT PAGE key	ESC U	Displays the next 24 lines of memory
PREV PAGE key	ESC V	Displays the previous 24 lines of memory
SET TAB key	ESC 1	Sets the tab at the current cursor column
CLEAR TAB key	ESC 2	Clears the tab at the current cursor column
CONTROL GROUP		
RESET TERMINAL key	ESC E	sets the terminal to power-on state
TEST key	ESC z	Terminal Self-Test
DISPLAY FUNCTIONS key & indicator	ESC Y (on) ESC Z (off)	Control functions disabled and displayed
BLOCK MODE latching key	— — —	Block Mode: data displayed but not transmitted until requested; otherwise, terminal is in Character Mode and data transmitted as typed.
REMOTE latching key	— — —	Remote (on-line) operations; otherwise, off-line operation
CAPS LOCK latching key	— — —	Upper-case alphabetical lock
MEMORY LOCK & indicator	ESC l (on) ESC m (off)	Memory overflow protect; display lock
AUTO LF latching key	— — —	Line Feed with each terminal carriage return
ENTER key	— — —	Enables block transfers
BREAK key	— — —	Transmits BREAK signal to interrupt computer
TRANSMIT indicator	— — —	Data link exists

KEY OR SWITCH	CODE	FUNCTION
SPECIAL FUNCTIONS GROUP		
ENHANCE DISPLAY key (f_1)	ESC & d	Turns on Display Enhancement
START UNPROTECTED FIELD key (f_2)	ESC [	Starts an Unprotected Field
END UNPROTECTED FIELD key (f_3)	ESC]	Ends an Unprotected Field
FORMAT MODE key (f_4)	ESC W (on) ESC X (off)	Only unprotected fields can be modified
LINE FEED key (f_5)	LF	Line Feed
PRINT key (f_6)	ESC 0	Print Display Contents
EDIT GROUP		
INSERT LINE key	ESC L	Blank line is inserted
DELETE LINE key	ESC M	Line containing cursor is deleted
INSERT CHAR key & indicator	ESC Q (on) ESC R (Off)	Succeeding inputs inserted at cursor
DELETE CHAR key	ESC P	Character at cursor deleted

KEYSTROKE SEQUENCE	ESCAPE SEQUENCE	ADDITIONAL FUNCTIONS	
KEY	REMOTE	ENQ (E^C)	Enquiry from the computer
		ACK (F^C)	Acknowledge — response to ENQ
		BEL (G^C)	Bell
CNTL + f_1	ESC p to computer	ESC)	Define Alternate Character Set: @, A, B, C
		SO (N^C)	Turn on Alternate Character Set
CNTL + f_2	ESC q to computer	SI (O^C)	Turn off Alternate Character Set
		DC1 (Q^C)	Block Transfer Trigger
CNTL + f_3	ESC r to computer	DC2 (R^C)	Block Transfer Enable from Terminal
		ESC d	Block Transfer Enable from Computer
CNTL + f_4	ESC s to computer	RS ($\uparrow^C$)	Record Separator
		US ($\_^C$)	Unit Separator
		ESC & a	Cursor Addressing
CNTL + f_5	ESC t to computer	ESC a	Cursor Sensing (Absolute)
		ESC `	Cursor Sensing (Screen Relative)
CNTL + f_6	ESC u to computer	ESC b	Keyboard Enable
		ESC c	Keyboard Disable
CNTL + f_7	ESC v to computer	ESC I	TAB
		ESC G	Cursor Return
CNTL + f_8	ESC w to computer	ESC F	Cursor Home Down
		ESC K	Clear Line from the Cursor
ENTER	Enables block transfers.	ESC & b	HP diagnostics ONLY
		ESC Λ	Terminal Status
		ESC f	Modem Hang-up
		ESC H	Home cursor
		LF (J^C)	Move Cursor Down One Line

Table A-1. Programmer's Reference Table (Continued)

BIT 7 6 5 4 3 2 1	CONTROL (CNTL) CHARACTERS		DISPLAYABLE CHARACTERS						ESCAPE KEY PRESSED FIRST					
	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0000	N_U NUL	D_L DLE	SP	0	@	P	`	p	SP	0 PRINT	@	P DELETE CHAR	` CURSOR RELATIVE SENSE	p f_1
0001	S_H SOH	D_1 DC1	!	1	A	Q	a	q	! SET TAB	1	A ↑ CURSOR UP	Q INSERT CHAR ON	a CURSOR ABSOLUTE SENSE	q f_2
0010	S_X STX	D_2 DC2	"	2	B	R	b	r	" CLEAR TAB	2	B ↓ CURSOR DOWN	R INSERT CHAR OFF	b KEYBOARD ENABLE	r f_3
0011	E_X ETX	D_3 DC3	#	3	C	S	c	s	#	3	C → CURSOR RIGHT	S ROLL UP	c KEYBOARD DISABLE	s f_4
0100	E_T EOT	D_4 DC4	$	4	D	T	d	t	$	4	D ← CURSOR LEFT	T ROLL DOWN	d ENTER	t f_5
0101	E_Q ENQ	N_K NAK	%	5	E	U	e	u	%	5	E RESET TERMINAL	U NEXT PAGE	e	u f_6
0110	A_K ACK	S_Y SYN	&	6	F	V	f	v	& PARA METER SEQUENCE	6	F CURSOR HOME DOWN	V PREV PAGE	f MODEM DIS CONNECT	v f_7
0111	BEL	E_B ETB	'	7	G	W	g	w	'	7	G CURSOR RETURN	W FORMAT MODE ON	g	w f_8
1000	B_S BS	C_N CAN	(	8	H	X	h	x	(	8 ↖ CURSOR HOME UP	H	X FORMAT MODE OFF	h	x
1001	H_T HT	E_M EM	)	9	I	Y	i	y	) DEFINE CHAR SET	9	I HORI ZONTAL TAB	Y DISPLAY FUNCTIONS ON	i	y
1010	L_F LF	S_B SUB	*	:	J	Z	j	z	*	:	J CLEAR DSPLY	Z DISPLAY FUNCTIONS OFF	j	z TEST
1011	V_T VT	E_C ESC	+	;	K	[	k	{	+	;	K ERASE TO END OF LINE	[START UNPROTECT FIELD	k	{
1100	F_F FF	F_S FS	,	<	L	\	l	¦	,	<	L INSERT LINE	\	l MEMORY LOCK ON	¦
1101	C_R CR	G_S GS	–	=	M	]	m	}	–	=	M DELETE LINE	] END UNPROTECT FIELD	m MEMORY LOCK OFF	}
1110	S_O SO	R_S RS	.	>	N	^	n	~	.	>	N	^ STATUS	n	~
1111	S_I SI	U_S US	/	?	O	_	o	DEL	/	?	O	_	o	DEL

Example: J is bits 1001010; Control J is LF line feed; Escape (ESC) followed by J is CLEAR DISPLAY

LEGEND

AK — ACKNOWLEDGE	EM — END OF MEDIUM	NK — NEGATIVE ACKNOWLEDGE
🔔 — BELL	EQ — ENQUIRY	RS — RECORD SEPARATOR
BS — BACKSPACE	ET — END OF TRANSMISSION	SI — SHIFT IN
CN — CANCEL LINE	EC — ESCAPE	SO — SHIFT OUT
CR — CARRIAGE RETURN	EB — END OF TRANSMISSION BLOCK	SP — SPACE
D1 — DEVICE CONTROL 1	EX — END OF TEXT	SH — START OF HEADING
D2 — DEVICE CONTROL 2	FF — FORM FEED	SX — START OF TEXT
D3 — DEVICE CONTROL 3	FS — FILE SEPARATOR	SB — SUBSTITUTE
D4 — DEVICE CONTROL 4	GS — GROUP SEPARATOR	SY — SYNCHRONOUS IDLE
DEL — DELETE	HT — HORIZONTAL TABULATION	US — UNIT SEPARATOR
DL — DATA LINK ESCAPE	LF — LINE FEED	VT — VERTICAL TABULATION

NOTES: 1. LOWER CASE LETTER, LOWER CASE SYMBOL, AND CONTROL CHARACTER CODES ARE GENERATED BY STANDARD TERMINAL, BUT ASSOCIATED CHARACTERS ARE NOT DISPLAYED ON THE SCREEN.

2. SINGLE CHARACTER ESCAPE SEQUENCES AND CONTROL CODES NOT LISTED WITH A FUNCTION ARE NEITHER ACTED UPON NOR DISPLAYED.

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