Using Your HP Touchscreen Personal Computer as a Terminal

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Preface

This manual describes how to use the HP Touchscreen PC as a terminal. It describes the terminal's built-in editing, text creation, graphics, printing capabilities, and the interface between the terminal and the host computer.

This manual is meant to be used in conjunction with other manuals. While this manual describes what the terminal can do, the devices connected to your terminal play a large part in determining when and why you use many of the terminal's features. Therefore, you should also refer to the following documents:

- The manual for your host computer
- The manuals for the application programs that run on your host computer
- The *HP 150 MS™-DOS User's Guide*
- The manual for the external printer you intend to use
- The manual for the plotter you intend to use

For example, this manual tells you how to send data to the host computer, but it does not tell you how to prepare the host computer to receive data; that information is in the host computer's manual. This manual tells you how to program your own function keys, but the escape sequences that you might assign to the function keys are explained in the *HP 150 MS-DOS User's Guide.*

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1 Introducing Your HP Touchscreen Terminal

Your HP Touchscreen PC can be used two ways: either as a personal computer or as a terminal. A terminal is a device that enables you to communicate with and use the resources of a "host" computer. A host computer is any computer to which your terminal is connected. The HP Touchscreen PC terminal is an "intelligent" terminal, that is, it has built-in capabilities of its own.

This guide explains how to use your HP Touchscreen PC as a terminal. This chapter explains:

- how this guide is organized
- what other documents exist for your HP Touchscreen PC
- what your HP Touchscreen PC terminal can do
- some of the ways you can use your terminal
- how to change the HP Touchscreen PC from a personal computer to a terminal and back again

How to Use This Guide

Each chapter in this guide has three parts. First, a short introductory section tells you what the chapter is about. Second, the chapter explains how to do something. Third, there is an example that illustrates what has been explained. You can duplicate these examples on your terminal. If possible, always do the examples because they will help you understand the explanations. Most chapters contain more than one explanation and example.

This guide contains eight chapters and three appendices:

Chapter 1 "Introducing Your HP Touchscreen PC Terminal", contains introductory information about your terminal.

Chapter 2 "Entering and Editing Data", explains how to type and format, and edit text.

Chapter 3 "Protecting and Moving Text", describes how to protect yourself against the loss of text and how to move blocks of text.

Chapter 4 "Using the Advanced Display Features", describes how to use the terminal's special display features such as inverse video and underlining. It also tells how to use alternate character sets such as the line drawing set for drawing forms. Finally, it describes how to give data entry fields special characteristics so that they accept only certain kinds of data.

Chapter 5 "Using Your Terminal with a Host Computer", explains how to prepare the terminal for communication and how to send and receive data from the host computer. It also explains how to print data directly from the host computer.

Chapter 6 "Creating and Using User-Defined Functions", tells you how to create your own set of functions that you implement by touching the function labels or by pressing the function keys.

Chapter 7 "Graphics Fundamentals", gives you an overview of how to use the terminal's own graphics features from both the keyboard and some basic escape-sequence programming.

Chapter 8 "Printing Your Data", reviews all the printing information described in the previous chapters and discusses a few more printing features.

Appendix A shows the HP Touchscreen keyboards.

Appendix B contains a chart that shows each set of labels used in terminal mode.

Appendix C contains charts that show the line drawing character set, the math character set, and the extended ASCII foreign language character set.

Related Documentation

This guide tells you how to use your HP Touchscreen PC as a terminal. Other documents explain how to use the HP Touchscreen PC as a computer. These documents include:

Getting Started with Your HP Touchscreen Personal Computer

Using Your HP Touchscreen Personal Computer

HP 150 MS-DOS User's Guide

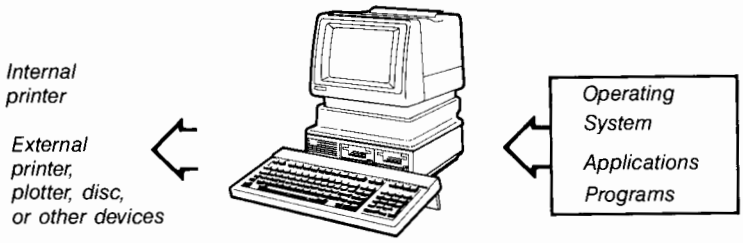
A Quick Look at What You Can Do

Your HP Touchscreen PC can be used either as a terminal or as a personal computer. These two modes of use are quite different. A personal computer is a self-contained unit that has its own resources: a central processor, an operating system, application programs, and usually disc drives for storage. A terminal, on the other hand, has only a few resources of its own; its main purpose is to provide a way for you to communicate with a "host" computer. The host computer can be located in the next office, in the next building or in another state. You cannot use the HP Touchscreen PC as a terminal and a personal computer at the same time, but you can alternate between the two if you wish.

While your HP Touchscreen PC is a terminal, you can use it in two ways: in Local Mode or in Remote Mode. While in Local Mode, you can use all the built-in features of your terminal but you cannot communicate with the host computer. While in Remote Mode, you can use most of the built-in features of your terminal and you can also communicate with the host computer.

Figure 1-1 shows the differences between the HP Touchscreen PC as a computer and as a terminal.

The HP 150 as a Personal Computer.



The HP Touchscreen as a Terminal.

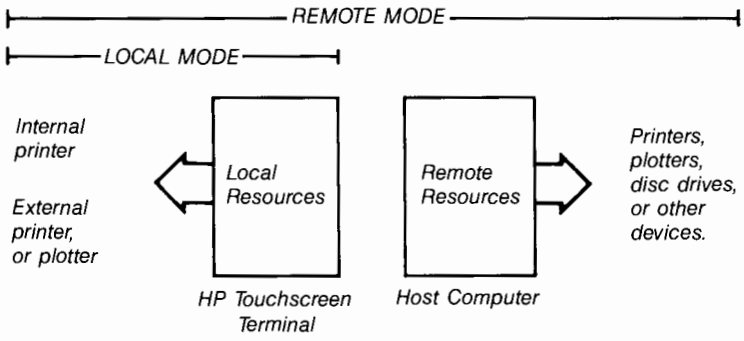


Figure 1-1. Using the HP Touchscreen PC as a Computer Versus Using it as a Terminal

Using the Keyboard and the Touchscreen Function Labels

The keyboard works almost the same way when it is being used with a terminal as when it is being used with a personal computer. **Appendix A** describes the use of all the keys on the keyboard when the HP Touchscreen PC is being used as a terminal.

While your HP Touchscreen PC is a terminal, it has function labels at the bottom of the screen. Each label has the name of a function in it. There are two kinds of labels. The lowercase labels take you to another set of labels. The uppercase labels turn a function on or off.

You turn on a function by touching its label. When a function is "on" or "active," there is an asterisk (*) in the label. You also turn off a function by touching its label. When a function is "off" or "inactive," there is no asterisk in the label.

As an alternative, you can press the function keys at the top row of your keyboard instead of touching the function labels. Figure 1-2 shows how the function keys on the keyboard correspond to the function labels on the screen.

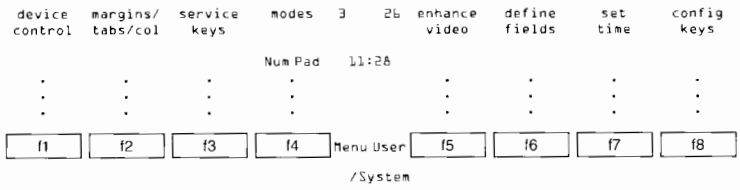


Figure 1-2. Correspondence Between the Touchscreen Function Labels and the Function Keys

In the above figure, the numbers between the fourth and fifth labels represent the line the cursor is on and the column (character position on the line) the cursor is on. For

example 3&26 means that the cursor is on the third line in the 26th column. Below the label line are the words `Num Pad`. This means that the numeric keypad is active. The numbers following Num Pad tell the time of day (providing you have set it correctly).

The function labels shown above are called the User/System labels. They are displayed when you press the User System key and are the "top level" function labels. Once you have the User/System labels on the screen, you can access any set of function labels you want. They are all lowercase labels, which means that when you touch one of them, you are taken to the next set of labels, or returned to the previous set of labels if the current set is the lowest level.

All the sets of labels named in the User/System set are described in this manual except service keys and config keys. The service keys labels are described in the *HP 150 Service Manual* and the config keys labels are explained in *Getting Started with Your HP Touchscreen Personal Computer* and *Using Your HP Touchscreen Personal Computer.*

Using Your HP Touchscreen PC as a Terminal

Changing your HP Touchscreen PC from a computer to a terminal is simply a matter of touching a few labels at the bottom of your screen.

However, if your HP Touchscreen PC has not been used as a terminal before, some configuration chores must be done before you can use it as a terminal. All of the configuration and installation tasks are described in the manual, *Using Your HP Touchscreen Personal Computer.* Make certain that these tasks that relate specifically to terminal operation have already been done:

1. Specify whether the HP Touchscreen PC should power on as a computer or as a terminal. (Global Configuration Menu.)
2. Specify which port is to be used for communication with the host computer. (Global Configuration Menu.)
3. Specify how data is to be sent to and from the host computer. (Port Configuration Menu.)
4. Specify how data is to be sent to the local printer and through which port. (Port Configuration Menu.)
5. Specify the terminal operation default values. (Terminal Configuration Menu.)
6. Physically connect the terminal to the host computer. The connection can be made through a cable that goes directly between the HP Touchscreen PC and the host computer, or through a modem that sends the signals through telephone lines. Physical installation information is available in **Chapter 10** of *Using Your HP Touchscreen Personal Computer.*

Powering Up as a Computer

If your HP Touchscreen PC is configured to power up as a computer with P.A.M. on the screen, the Modes labels first appear on the screen followed by the P.A.M. labels. The Modes labels are not active during this power-up stage, so you have to wait until the P.A.M labels come onto the screen:

```
Start          Set Date   Reread          File    Terminal    Help
Applic         and Time   Discs           Manager
```

Touch the Terminal label. This immediately places your HP Touchscreen PC in terminal mode and the Modes labels should appear on the screen:

```
LINE     MODIFY    BLOCK     REMOTE          SMOOTH    MEMORY    DISPLAY    AUTO
MODIFY     ALL     MODE      MODE*           SCROLL    LOCK      FUNCTNS    LF
```

Powering Up as a Terminal

If your HP Touchscreen PC is configured so that it powers up as a terminal, the active terminal labels should appear immediately on the screen:

```
LINE     MODIFY    BLOCK     REMOTE          SMOOTH    MEMORY    DISPLAY    AUTO
MODIFY     ALL     MODE      MODE*           SCROLL    LOCK      FUNCTNS    LF
```

Powering Up as a Computer with No Operating System Available

If your HP Touchscreen PC is configured to power up as a computer, but there is no operating system in disc drive A:, this message appears at the bottom of the screen:

```
Load Op Sys failed, Op Sys device not found Press
RETURN to Clear
```

When you press the Return key, the Modes labels should appear on the screen:

```
LINE     MODIFY    BLOCK     REMOTE          SMOOTH    MEMORY    DISPLAY    AUTO
MODIFY     ALL     MODE      MODE*           SCROLL    LOCK      FUNCTNS    LF
```

Using Your HP Touchscreen PC as a Terminal After Using It as a Computer

If you have been using your HP Touchscreen PC as a computer, you must make certain that you have closed all your files before changing to the terminal mode of operation. Then return to the P.A.M. Main Menu and touch the Terminal label to display the Modes labels.

Choosing Local or Remote Mode

When you first enter the Terminal Mode, your terminal is automatically in Remote Mode. This is indicated by an asterisk in the REMOTE MODE label. No asterisk in the REMOTE MODE label means that the terminal is not in Remote Mode. Therefore, it is in Local Mode. To change from Remote Mode to Local Mode, or from Local Mode to Remote Mode, touch the REMOTE MODE label. Remember:

REMOTE MODE*	means that the terminal is set up to communicate with the host computer.
REMOTE MODE	means that the terminal cannot communicate with the host computer.

Using Your HP Touchscreen as a Personal Computer Again

After using your HP Touchscreen PC as a terminal, you can return to using it as a personal computer by pressing the [Shift] and [Stop] keys at the same time. This causes the P.A.M. main menu to be displayed (if P.A.M. is in your system's main memory).

Change the HP Touchscreen PC into a Terminal

Let us suppose that your HP Touchscreen PC is configured to power up as a computer, that you want to use it as a terminal in Local Mode for a while, and then use it as a computer again. If your terminal is not configured to power up as a computer, you will have to change the procedure in Step 1 to match one of the descriptions above.

1. Place the HP Touchscreen PC in its Terminal Mode by doing the following:

   a. Insert the System Work Disc into disc drive A.

   b. Turn on the HP Touchscreen PC and its disc drives.

   c. Wait for the P.A.M. Main Menu labels to appear:

```
Start          Set Date   Reread          File    Terminal    Help
Applic         and Time   Discs           Manager
```

   d. Touch the `Terminal` label.

   e. The Modes set of labels appears:

```
LINE     MODIFY    BLOCK     REMOTE          SMOOTH    MEMORY    DISPLAY    AUTO
MODIFY    ALL      MODE      MODE*           SCROLL    LOCK      FUNCTNS    LF
```

2. Put the terminal into Local Mode.

   Touch the `REMOTE MODE` label so that the asterisk disappears.

3. Return the terminal to a computer again.

   Press [Shift] and [Stop] at the same time.

More About Local and Remote Modes

When you are in communication with the host computer (Remote Mode), it is difficult or impossible to perform certain tasks such as editing text. When you need to perform a task that does not require communication with the host computer, you can place the terminal in Local Mode. While in Local Mode your terminal uses only its own built-in resources and perhaps a printer. When your terminal is in Local Mode, you can:

- use the terminal as an "electronic typewriter"
- draw forms, graphs, and charts
- edit data you may have received from the host computer
- create user-defined functions that you implement by touching the function labels at the bottom of your screen
- print what is on the screen

To use your terminal in Remote Mode, it must be physically connected to, and in communication with a host computer. While your terminal is in Remote Mode you can:

- send data to and receive data from the host computer
- gain access to graphics application programs such as HPDRAW
- gain access to graphics application programs such as HPDRAW
- gain access to large data bases
- communicate with other users connected to the same host computer or network

Most of the information in this guide concerns tasks that can be done in Local Mode.

Setting the Time on Your Terminal

Although you can set the time through the P.A.M. Main Menu when you are using the HP Touchscreen PC as a computer, it is often convenient to set it while you are using the HP Touchscreen PC as a terminal.

After you have changed your HP Touchscreen PC into a terminal, press the [User System] key, then touch the set time label. This new set of labels appears on the screen:

```
HOURS     HOURS     MINUTES   MINUTES
FORWARD   BACK      FORWARD     BACK
```

Touch the desired labels repeatedly until the correct hour and minute are displayed below the label line. When you have set the correct time, press the [User System] key once to return to the previous set of labels.

Set the Time

You have just powered up your HP Touchscreen PC as a terminal and want to set the correct time. The time displayed on the terminal is `11:58`. You want to change it to the correct time, for example, `15:40`.

1. Display the set time labels:
   a. Press [User System] key to display the User/System labels.
   b. Touch the `set time` label to display the set time set of labels.
2. Move the hours forward by touching the `HOURS FORWARD` label repeatedly until the correct hour appears on the screen.
3. Move the minutes back by touching the `MINUTES BACK` label repeatedly until the correct minute appears on the screen.
4. Press [User System] once to return to the previous set of function labels.

The time shown at the bottom of the screen is now set to the correct time.

2 Entering and Editing Data

You can enter and edit the data you see on your screen while your terminal is in Local Mode (not in communication with the host computer). Local Mode uses only the built-in resources of your HP Touchscreen PC. No disc drive or special program is needed. While in Local Mode, your terminal operates much like an electric typewriter.

This chapter explains how to use Local Mode to:

- create text
- format text
- edit text
- print text

Using Local Mode

To work in Local Mode, there must be no asterisk in the REMOTE MODE label. No asterisk means that Remote Mode is turned off and the terminal is operating in Local Mode.

Automatic linefeed must be turned on. When automatic linefeed is turned on, there is an asterisk in the AUTO LF label. If you press the Return key while automatic linefeed is turned off, the cursor returns to the beginning of the line it is on. If you press the Return key while automatic linefeed is turned on, the cursor moves to the beginning of the next line.

Prepare to Use the Terminal in Local Mode

First, gain access to the Terminal Mode as described in **Chapter 1**. Then prepare to use the terminal in Local Mode.

This set of labels is displayed:

```
LINE     MODIFY   BLOCK    REMOTE                SMOOTH   MEMORY   DISPLAY   AUTO
MODIFY   ALL      MODE     MODE*                 SCROLL   LOCK     FUNCTNS   LF
```

1. Put the terminal in Local Mode:

   Touch the REMOTE MODE label to remove the asterisk (if there is an asterisk) in the label.

2. Turn on Automatic Linefeed:

   Touch the AUTO LF label to place an asterisk in the label (if there is none there).

Your terminal now is in Local Mode and ready to use.

Understanding Display Memory

When you type text, your terminal displays it on the screen. At the same time, it stores the text in the terminal's display memory. The display memory is 48 lines (or two pages) long; the screen's display area is 24 lines (or one page) long. You can think of the screen as a "window" through which you can see 24 of the lines in display memory. Figure 2-1 shows how the screen acts as a window for the text in display memory.

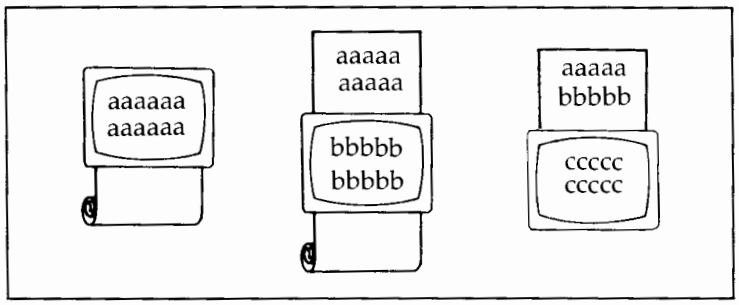


Figure 2-1. The Screen as a Window on the Display Memory

If you type more than 24 lines, the top lines on your screen rolls off the screen. It is saved in display memory. When you have typed 48 lines of data (this includes blank lines), display memory is full. When you type the 49th line, the first line is forced out of display memory and it is lost. When you type the 50th line, you lose the second line, and so on. You can prevent the accidental loss of text by using the Memory Lock function described in **Chapter 3**.

After you have entered your text you can display various parts of it, edit it, print it, or switch to Remote Mode and send it to the host computer.

Entering and Editing Text

Entering and editing text on the terminal is easy. Here is where your terminal outshines an electric typewriter. You can type text much as you would on an electric typewriter, then edit what you see on the screen before you print the perfectly edited copy or send it to the host computer.

When you begin to type text, the terminal's margins are preset for you at columns 1 and 80. The cursor tells you where the next character you type will be on the screen. If you make a typographical error, use the [Backspace] key to back up to the the error and type over it. Other keys, which are described in this chapter, change the margins, set tabs, and insert and delete characters and lines.

Automatic Wraparound

When the line of characters you are typing is eight characters from the end of the line, the terminal bell rings. If you do not use the [Return] key to start a new line, the terminal breaks the line at the right margin and continues on the next line. This is called automatic wraparound.

Your terminal may have been configured so that it does not have automatic wraparound. In this case, when you get to the end of the line, the cursor remains at the right margin until you press the Return key to move to the beginning of the next line.

Displaying Text

If you have typed more than 24 lines of text, part of the text is above the screen window in the display memory. The Prev and Next keys allow you to see all the text. Press:

- Prev — to see the first page in display memory.
- Next — to see the second page in display memory (or last line(s) if the memory is not full).

Figure 2-2 illustrates how these commands work.

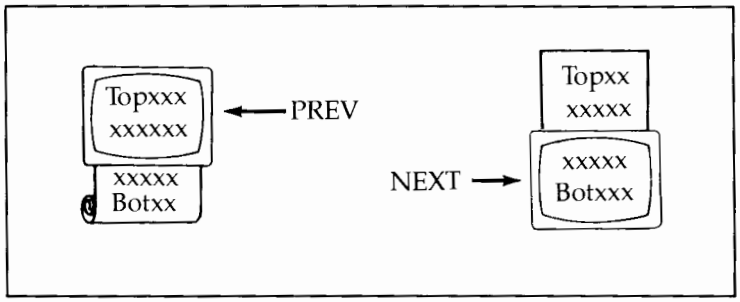


Figure 2-2. The Prev and Next key actions

Inserting Characters and Lines

Use the Insert char key to insert a character in a line. To insert a character in a line, press the Insert char key. The message Ins Char appears on the status line below the labels. Next, use the arrow keys to move the cursor to the position after where the character is to be inserted. Finally, type the character. All the characters to the right of the inserted character move to the right as you insert characters.

To correct the word `tme` to `time` in the example below, position the cursor under the `m` in `tme`. Then press the Insert char key. Then type the letter i.

```
Now is the tme for all good men to come to the ..
```

Insert char —- Type: i

To turn off the Insert char feature, press the Insert char key again. (Some people prefer to leave the character insertion feature on all the time so that they never accidentally type over text they have already entered.)

To insert an entire line, move the cursor to the line below where you want a new blank line to appear. Press the Insert line key. A new blank line appears above the cursor position. You can now type on the new blank line.

Deleting Characters and Lines

To delete a character, move the cursor to the character to be deleted. Then press the Delete char key to delete the character. When you delete a character from a line, all the characters to the right of the deletion move to the left to fill in the space. If you hold the Delete char key down, your terminal continues to delete characters and spaces until you release the key.

To delete a line, move the cursor to any place on the line to be deleted. Press the Delete line key. The line disappears from the screen and the line below moves up to replace it.

Use the [Clear line] key to delete all the characters to the right of the cursor position on a line.

To delete all the lines from the cursor position to the end of display memory, move the cursor to a selected position on the first line and press the [Clear display] key. All the lines from the cursor position to the last line in display memory are deleted.

To delete all the lines from display memory, use the diagonal "home" arrow to move the cursor to the beginning of display memory. Then press [Clear display].

Edit a Business Address

If you have any text in display memory, clear it by using the home (diagonal arrow) key to move the cursor to the top of the display memory. Then press the [Clear display] key. This example assumes that the User/System labels are on the screen. (Remember, you can get the User/System labels by pressing the [User System] key.)

Let's practice editing an address.

1. Type this address and salutation:

   Ms Mary Morrison
   555 Anderson Avenue
   Alpine, 95111

   Dear Ms. Morrison:

2. The state has been left out of Mary's address. Insert the state's name:
   a. Move the cursor to the "9" in the last line of Ms Morrison's address.
   b. Press the [Insert char] key.
   c. Type: California followed by two spaces.
   d. Press the [Insert char] key to turn the insert feature off.
3. It's always a good idea to include the name of the company in a business letter address:
   a. Move the cursor to anywhere on the line that says "555 Anderson Avenue"

b. Press the Insert line key.

c. Type on the new line: Acme Insurance Agency

4. The word Ms. in the salutation should not be followed by a period. Let's remove the period:

   a. Move the cursor to the period after Mx.

   b. Press Delete char to remove the period.

You now have a perfect business address and salutation. Leave it on the screen because you will need it for the examples later in this chapter.

Setting Margins and Tabs

When you first turn on your HP Touchscreen PC terminal, the margins are set to 1 and 80. No tabs are set. You can change these margin settings and set tabs to give your text the look you want. You use the margins/tabs/col set of labels to set margins and tabs to new positions.

To gain access to the margins/tabs/col labels, touch the margins/tabs/col label in the User/System set of labels. (Display the User/System labels by pressing the User System key.) You then see this set of labels:

```
START    SET     CLEAR    CLR ALL          LEFT     RIGHT    CLR ALL   TAB =
COLUMN   TAB     TAB      TABS             MARGIN   MARGIN   MARGINS   SPACES
```

Changing Margins

To change margins, move the cursor to the desired margin position, and then touch either the LEFT MARGIN or RIGHT MARGIN label.

Touch the CLR ALL MARGINS label to return the margins to their original 1-80 setting.

Setting, Clearing, and Using Tabs

To set tabs, display the margins/tabs/col labels. Move the cursor to the desired position, and then touch the SET TAB label. You can place as many tabs on a line as you want.

To clear a single tab, use the [Tab] key to move the cursor to the tab position to be cleared. Then touch the CLEAR TAB label. To clear all the tabs, touch the CLR ALL TABS label.

Press the [Tab] key to move forward from tab to tab. To move back to the previous tab, press [Shift] and the [Tab] key at the same time.

Type a Letter on your "Electronic Typewriter"

Suppose you want to write a letter to the Apex Company answering an ad in the paper. You will need to set up tabs for indenting, and for placing the date and your return address. You will also want to adjust the margins so that the letter is more compact. The letter will look like this when you are finished:

```
                                    March 1, 1984
                                    John Jones
                                    123 Chestnut Street
                                    Sunnyvale, CA 95000

Ms Mary Morrison
Acme Insurance Agency
555 Anderson Avenue
Alpine, California 95111

Dear Ms Morrison:

  I saw your ad in the paper on March 15. It looks
like exactly the kind of work I am interested in
doing. I am available for an interview any after-
noon after 2:00.

  Enclosed is my resume, two letters of recommen-
dation from former employers, and a sample of my
work.

                                    Sincerely,


                                    John Jones
```

1. Gain access to the margins/tab/col labels:
   a. Press the [User System] key.
   b. Touch the margins/tabs/col label:
2. Now change the right margin setting:
   a. Use the cursor control keys to move the cursor to column 10.
   b. Press the LEFT MARGIN label.
3. Next, change the right margin setting:
   a. Use the cursor control keys to move the cursor to column 65.
   b. Touch the RIGHT MARGIN label to set the right margin.
4. Set the tabs:
   a. Use the cursor control keys to move the cursor to column 15 so that you can indent the beginning of each paragraph.
   b. Touch the SET TAB label to set the tab.
   c. Move the cursor to column 43 so that you can place the return address in the correct position.
   d. Touch the SET TAB label to set the tab.
5. Make room for the date and your return address:
   a. Press the [▽] key to move the cursor to the top of display memory.
   b. Press the [Insert line] key eight times to create eight blank lines.
6. Add the date and the return address:
   a. Press the [Tab] key twice to move to the proper position for the date.
   b. Type the date.
   c. Type the rest of the return address as shown above.

7. Move the recipient's address over to the tenth column:
   a. Turn Insert char on.
   b. Use the arrow keys to move the cursor to the `M` in `Ms.`
   c. Press the space bar nine times.
   d. Move the rest of the address and the salutation over to the tenth column.
8. Type the body of the letter:
   a. Use the cursor control keys to move the cursor to where the body of the letter should begin.
   b. Type the rest of the letter as you would on an electric typewriter.

Printing the Contents of the Display Memory

You can print the contents of your display memory very easily. If you have an internal printer and you have not changed the printer destination, you can just press Shift with the Print Enter key at the lower left of your keyboard. The contents of the memory go directly to the printer exactly as it looks on the screen.

If your HP Touchscreen PC is not configured to drive the internal printer, an error message appears on the screen:

```
Illegal or No Destination Device.
Press RETURN to Clear
```

If this happens, see **Chapter 8** to find out how to specify the internal printer, or how to specify another printer if you don't have an internal printer.

Print Your Letter

Let's print the letter you have on your screen. This example assumes that you have specified the correct printer.

Press the Shift key and the Print Enter key at the same time.

Your letter should be printing on your printer.

3 Protecting and Moving Text

A special terminal feature called Memory Lock keeps you from losing text from display memory. This feature can also be used (1) to rearrange blocks of text that you have entered, and (2) to keep a group of lines on the screen while you type more lines. You use Memory Lock in Local Mode.

This chapter explains how to:

- keep you from losing text from display memory
- move blocks of text
- keep a group of lines on the screen while you add new lines

Protecting Your Text

Remember that display memory holds 48 lines of text. When you type more than 48 lines, you lose one line of text from display memory for every line of text you add after the 48th line.

To avoid accidental loss of text, use Memory Lock. Use the [▷] key to move the cursor to the top of the display memory. Press the [User System] key, then touch the modes label, then MEMORY LOCK to display the asterisk in the MEMORY LOCK label.

When Memory Lock is turned on and you have filled display memory with text, the keyboard locks, the terminal bell sounds. This message is displayed on the screen:

```
MEMORY FULL
Press RETURN To Clear
```

Press the [Return] key to unlock the keyboard. Turn off Memory Lock by touching the label again.

Protect Your Text from Accidental Loss

You still have your letter on the screen. (If it is no longer there, type a few lines before you start.)

1. Protect the letter from loss:

   Move the cursor to the top of display memory by pressing the [▷] key.

   Press the [User System] key, then touch modes to display the modes label.

   Touch the MEMORY LOCK label to display the asterisk.

2. Now, enter some lines of text to find out what happens when the memory fills up:

   Move the cursor to below the last line of the letter.

   Type one character per line until the terminal bell sounds, you will see this message in the lower left corner of the screen:

   ```
   MEMORY FULL
   Press RETURN To Clear
   ```

   The terminal does not accept input from the keyboard if you continue to type.

   Press the [Return] key to clear the message.

The display memory is completely full. At this point all you can do is type over lines that are already in display memory, or delete lines to make room for new lines.

Locking Lines Onto the Screen

Sometimes you may want to lock part of the text onto the screen where you can see it. It could be a heading or it might be a short table to which you want to refer while you are typing. When you have locked lines onto the screen, and when all your text on the screen exceeds 24 lines, the lines directly below the locked text go into display memory.

Figure 3-1 shows how the text moves into display memory when Memory Lock is on. In this figure the x's are the locked lines. the a's go into display memory when the screen is full.

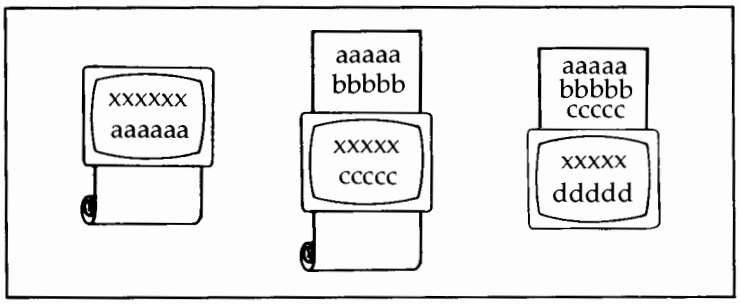


Figure 3-1. Movement of Lines When Text is Locked Onto the Screen

Before you start to lock lines of text onto the screen, make sure that Memory Lock is off. To lock text onto the screen, move the first line you want to keep on the screen to the top of the screen. You can move text to the top of the screen three ways:

- If the text to be locked begins on line 1 or line 25, use the [Prev] or [Next] keys to move the text to the top of the screen.

- Press [Shift] and the Up or Down cursor control key at the same time to roll text to be locked to the first line on the screen.
- Continue to add text until the text to be locked is at the top of the screen.

After you have the first line to be saved at the top of the screen, move the cursor to the last line you want to keep on the screen. Then touch MEMORY LOCK to lock everything from the top line to the cursor position on the screen.

When your text is printed or sent to the host computer, it appears exactly in the order you typed it even though its order on the screen may look different.

Lock Lines Onto the Screen

Now, let's lock the letter you typed in the last chapter onto the screen. Move the cursor to the first character you entered after the end of the letter and press [Clear display]. Now all that is left is the letter.

1. First, make certain Memory Lock is turned off:

   Touch the MEMORY LOCK label to remove the asterisk if necessary.

2. Lock the text onto the screen:

   Move the first line of the text to the top of the screen if it is not there already.

   Move the cursor to the bottom of the letter.

   Touch MEMORY LOCK to display the asterisk.

3. Type more lines:

   Type the alphabet below the locked text, one character per line.

   Watch the beginning of the alphabet disappear behind the locked text as you continue to type.

4. Use the [Prev] and [Next] keys to display the alphabet lines.
5. Print the contents of display memory:

   Press [Shift] and the [Print Enter] key.

The text and the alphabet are printed exactly as you entered them, not as they appear on the screen.

Moving a Block of Lines

You can use Memory Lock to move a block of lines to the beginning of your text.

First, move the cursor to the first line you want to move and touch the MEMORY LOCK label to display the asterisk. Next, press the [Shift] key and the up-arrow key [▲] repeatedly until all the lines you want to move have disappeared from the screen. Then touch the MEMORY LOCK label to turn off Memory Lock (the asterisk disappears). Finally, press the [▷] key. The block of lines that disappeared from the screen reappears at the beginning of your text.

Move a Block of Lines

Using the block moving capability, you can move a block of lines anywhere you want in display memory. Suppose you want to move block b in the example below to the bottom of the text so that the order changes from a, b, c to a, c, b. See Figure 3-2.

```
Before      After
aaaaa       aaaaa
aaaaa       aaaaa
aaaaa       aaaaa
bbbbb       ccccc
bbbbb       ccccc
bbbbb       ccccc
ccccc       bbbbb
ccccc       bbbbb
ccccc       bbbbb
```

Figure 3-2. Blocks of Text Before and After Being Moved.

Start with Memory Lock off.

1. First, clear the display memory:

   Use the [▽] key to move to the beginning of display memory.

   Press the [Clear display] key.

2. Enter the text:

```
aaaaa
aaaaa
aaaaa
bbbbb
bbbbb
bbbbb
ccccc
ccccc
ccccc
```

   End the last line by pressing [Return].

3. Move block c to the top of the group:

   Move the cursor under the first "c" in the first set of c's.

   Turn on Memory Lock by touching the MEMORY LOCK label:

   Press [Shift] and the cursor-up key three times to move the three lines.

   Touch MEMORY LOCK to turn it off.

   Press the [▽] key to move the block to the top of the text.

   Now the text looks like this:

```
ccccc
ccccc
ccccc
aaaaa
aaaaa
aaaaa
bbbbb
bbbbb
bbbbb
```

4. Move block a to the top of the text:

   Move the cursor to the first set of a's.

   Turn on Memory Lock by touching the MEMORY LOCK label:
   Press [Shift] and the cursor-up key three times to move the three lines of a's and one blank line.

   Touch MEMORY LOCK to turn it off.

   Press the [▷] key to move the block to the top of the text.

   The final text looks like this:

```
aaaaa
aaaaa
aaaaa
ccccc
ccccc
ccccc
bbbbb
bbbbb
bbbbb
```

4 Using the Advanced Display Features

Your terminal has special features that allow you to to draw forms, highlight text, and define data entry fields and their characteristics. You can use these features while the terminal is in Local Mode.

This chapter explains how to:

- gain access to the two alternate character sets
- use the line drawing character set to draw forms and the math character set to produce math symbols
- highlight areas of text or data entry fields with inverse video, blinking, underlining, or half bright display
- define fields so that they accept specified types of data
- protect non-data entry fields from accepting characters
- access the extended character set

The Alternate Character Sets

Your terminal provides you with two additional character sets. The character set indicated by the keyboard labels is called the "base" set. It is the standard USASCII character set. The two other sets you can use are the line drawing set for drawing forms and graphs, and the math set for typing mathematical symbols. Refer to **Appendix C** for the keyboard assignments for the base, math, and line drawing character sets.

To change from one character set to another, press the User System key, then touch enhance video, then etc. This displays the following function key labels:

Touch the desired label to choose a character set. You can change to a different character set anywhere on a line, but every time you move to another line, the terminal automatically reverts to the base set.

The main use for the Math set is to type mathematical formulas. For example, in a paper that uses mathematical examples, you might change to the Math character set several times. A major use of the Line set is to create forms.

Create a Form with the Line Character Set

Let's create a simple form that looks like this:

Birthday List

Name *Date*

You will enter your name and birthdate on the form later. If you were to use the form with the host computer, you could use it over and over to send or receive birthday information about all your friends or co-workers.

If your screen is not blank, use the home key to move to the top of display memory. Then press the [Clear display] key.

1. First, gain access to the line drawing set of characters:
   a. Press the [User System] key.
   b. Touch enhance video , then etc. labels.
   c. Move the cursor to the top of the screen.
   d. Touch CHANGE TO LINE .
2. Create the first line of the form:
   a. Move the cursor to column 10 and press the [Q] key to place a corner character on the screen.
   b. Press the semi-colon key [;] until the line reaches column 59.
   c. Press the [W] key to finish the line with a right corner character.
   d. Press [Return].
3. Create the second line of the form:
   a. Move to column 10 and touch CHANGE TO LINE again.
   b. This time press [Shift] and the semi-colon to draw a connecting line.
   c. Because you are going to enter alphanumeric information in this part, touch CHANGE TO BASE .
   d. Move the cursor to column 30.

      Type: Birthday List.
   e. Now move the cursor to the end of the form and touch CHANGE TO LINE .
   f. Press [Shift] and the semi-colon key to finish the line.
   g. Press [Return].

4. Create the third line of the form:
   a. Move the cursor to the beginning of the third line and touch CHANGE TO LINE .
   b. Press the 1 key to start the line.
   c. Press the semi-colon key until you reach line 50.
   d. Press the 3 key.
   e. Press semi-colon until you reach line 59.
   f. Finish by pressing the 2 key.
   g. Press Return.
5. Finish the form by yourself. Remember to create space below the labels to enter information. Also, remember to change immediately to the base character set anywhere you will enter data later.

Let your form remain on the screen. You will use it again in this chapter.

Remember This Rule

When creating a form, always change to the base character set whenever you are not actually drawing a line segment.

The Display Enhancements

You can enhance the information displayed on your terminal screen by highlighting it, causing it to blink, displaying it at half intensity, or underlining it; you can suppress the display of selected information.

To gain access to the display enhancements, press the User System key, then touch the enhance video label. The enhance video labels are displayed:

```
define     SET     SECURITY  INVERSE          BLINK   UNDRLINE   HALF      etc.
fields  ENHNCMNT    VIDEO     VIDEO           VIDEO     VIDEO    BRIGHT
```

Each of the capitalized labels provides you with a display enhancement function. All eight functions are described below.

define fields This function displays the define fields labels.

SET ENHNCMNT This function turns on the display enhancement functions whose labels contain asterisks. To use this function, first select one or more enhancements by touching the labels to display the asterisks. After moving the cursor to where the enhancement is to begin, touch SET ENHNCMNT . Move the cursor to where the enhancement is to end. Touch SET ENHNCMNT again to turn the enhancement off.

SECURITY VIDEO This function suppresses the display of information in a selected field. The terminal accepts characters but nothing shows on the screen. This feature is commonly used for passwords.

INVERSE VIDEO	This function reverses the display of characters on the screen so that dark characters are shown on a light background.
BLINK VIDEO	This function causes characters to blink.
UNDRLINE VIDEO	This function underlines the characters in a selected field. It can also be used to create lines on which data can be entered.
HALF BRIGHT	This function displays data at a lower intensity than the surrounding characters.
etc.	This function displays the character set labels.

Create a Password Field

Before you start, make some room for the password line but don't delete your form. Use the cursor control keys to move the cursor to the top of the screen. Then use the Insert line key to move the form down to the middle of the screen by pressing the Insert line key a few times.

1. Create the password label:
   a. Type: Enter password:
   b. Press the space bar once to make a separation between the label and the password field.
2. Create the password field:
   a. To place an underline on the screen to show where the password should be typed, touch UNDRLINE VIDEO to display the asterisk.
   b. To hide the password when it is typed, touch SECURITY VIDEO to display the asterisk.
   c. Touch SET ENHNCMNT .
   d. Use the space bar to move the cursor eight columns to the right and touch SET ENHNCMNT .

Because you might have to enter a password to get information from a host computer this example demonstrates how to add a password field to a screen.

You now have an underlined character field in which a password can be typed but not displayed.

The next example gives you a chance to practice some more enhancements to your form.

Enhance the Form

Now that you have created a password field, you can enhance the display areas on the form.

1. Display the words "Birthday List" at half intensity:
   a. Move the cursor to the `B` in `Birthday`.
   b. Touch HALF BRIGHT , then SET ENHNCMNT .
   c. Use the cursor control keys to move the cursor past the `t` in `List` and press SET ENHNCMNT again.
2. Create bright fields in which to enter data:
   a. Move the cursor to the line below the `N` in `Name`.
   b. Touch INVERSE VIDEO , then SET ENHNCMNT .
   c. Move the cursor to the character position before the next form line.

If you used the space bar to move over to the next line when you created the form, the whole area becomes bright. If you used the cursor control keys to move over to the next line, press the space bar to create the bright field.

---

   d. Touch SET ENHNCMNT .
3. Create another bright field for the `Date` as described above.

Defining Fields

You can specify the characteristics of the fields you have created. You can also determine the kind of data that will be accepted into each field, how data is to be transmitted, and when the field characteristics are to be active.

To gain access to the define fields labels, press the [User System] key, then touch the `define fields` label. This set of labels is displayed:

```
enhance    START     START     STOP                ALL       ONLY      ONLY      FORMAT
 video   UNPROTCT  XMIT FLD   FIELD              CHARS     ALPHA    NUMERIC     MODE
```

Each of the seven capitalized labels provides you with a field definition function. All eight of the labels are described below:

`enhance video` — This function displays the enhance video labels.

`START UNPROTCT` — This function definesthe beginning of an unprotected field. When Format mode is turned on you cannot enter data anywhere on the screen except where you have specified an unprotected field. (Fields designated by XMIT FLD are also unprotected fields.) When data is sent to the host computer, this field is emptied so that you can enter more data.

`START XMIT FLD` — This function defines the beginning of an unprotected field. This field has the same characteristics of the unprotected field described above, except when you transmit data, a copy of the data remains in the field. This is useful for fields in which data does not change very often. An example would be a field that contains today's date.

STOP FIELD

This function defines where a field is to end. It is not always necessary to use this function to define the end of a field, however. One of three conditions can end a field:

- You can specify the end of the field by touching the STOP FIELD label.
- Another field begins. In other words, you have defined the beginning of a field by touching one of the START labels. You have then moved the cursor to a new position on the line and touched one of the START labels again. The old field ends where you pressed the START label a second time.
- The line ends.

Computer Museum

ALL CHARS

This function creates a field where any character can be accepted in the field.

ONLY ALPHA

This function allows only capital and lowercase letters to be accepted in the field.

ONLY NUMERIC

This function allows only numbers, spaces, the plus sign (+), the minus sign (-), and the decimal point (.) or comma (,) to be accepted in the field.

FORMAT MODE

This function turns on all the definitions you have entered for each field described above. Data is accepted from the keyboard or from the host computer only if it meets the criteria you have specified.

Define Field Characteristics

Let's say that you are going to use your Birthday list to enter birthday data. You will want to make certain that data is entered only in the proper areas and that it is the right kind of data.

1. Display the define field labels:
   a. Press the [User System] key, then touch enhance video and define fields .
2. Set up the password field so that it only accepts alphabetic characters:
   a. Move the cursor to the first character of the password field.
   b. Touch START UNPROTCT and ONLY ALPHA .
   c. Move the cursor to the last character of the password field and touch STOP FIELD .
3. Set up the Name field so that it accepts only alphabetic characters. Use the procedure described above.
4. Set up the Date field so that it accepts only numeric characters. Use the procedure described above except touch ONLY NUMERIC instead of ONLY ALPHA .

Entering Data in Format Mode

Your screen now contains a short but sophisticated data entry form. When you turn on Format Mode, the form will accept only the specified kinds of data in the unprotected fields.

While Format Mode is active, you can only enter data in unprotected fields. The cursor always moves to the next unprotected field when:

- You press the [Tab] key.
- You enter a character in the last character position in a field.
- You try to enter data in a protected area.

To enter data in a transmit-only field (XMIT FLD), you must move to the field by using the arrow keys. The three methods described above always skip transmit-only fields.

If you try to enter data that is illegal for a field, a message is displayed near the bottom of the screen. For example, if you attempt to enter numeric data in an alphabetic field, you will receive this message:

```
Illegal for edit type: ALPHABETIC
Press RETURN To Clear
```

The message tells you that you have entered the wrong data type and that the correct data type is alphabetic. Press the [Return] key so that you can try again.

Enter Data on Your Form Using Format Mode

Let's say that your name is John Jones and your birthday is October 10, 1945. You want to enter it on your birthday list.

1. Turn on Format Mode by touching the FORMAT MODE label.
2. Move the cursor to the first field and enter your name:
   a. Press the [Tab] key to move to the first field.
   b. Type your name. John Jones
3. Move the cursor to the second field and enter your birthday:
   a. Press the [Tab] key to move to the second field.
   b. Type your birthdate. 10101945
4. Print the form with your entry on it by holding down the [Shift] key and pressing the [Print Enter] key.

If you want to type anything else on the screen, touch the FORMAT MODE label to turn Format Mode off (no asterisk).

The Extended Characters Mode

While you are using the base character set, you may occasionally want to use symbols that are not part of the ordinary character set such as tilde (~). By using the [Extend char] key, you add extended characters to your base set. See **Appendix C** for a list of the extended characters and their keyboard assignments. (To use the extended character set, your Terminal Configuration menu must be set to YES in the ASCII 8-bit mode field. For configuration information refer to the *Getting Started With Your HP Touchscreen Personal Computer.*)

For example, to produce a tilde (~):

Hold down [Extend char] and press [W] at the same time.

To produce a (Å),

hold down [Extend char] and [Shift], and press [A] at the same time.

Using Your Terminal With a Host Computer

When you connect your terminal to a host computer, you gain access to the strength, features, programs, and storage capacity of the host computer. While your terminal is connected to the host computer, it becomes an extension of the host computer. The host computer can be an HP 3000, or some other large or small computer. To communicate with a host computer, you will use your terminal in Remote Mode.

This chapter explains how to:

- prepare the terminal for communication with the host computer
- initiate communication with the host computer
- send data character-by-character
- change and retransmit lines
- send blocks of data
- send host computer output directly to the printer

Physical Connections Between Your Terminal and the Host Computer

You can connect your terminal to the host computer through direct cable connection, or through a modem. Usually, this connection is made through Port 1 at the back of the terminal. If the ports have been configured otherwise, connection can be made through Port 2. Refer to **Chapter 10** of *Using Your HP Touchscreen Personal Computer* for information about port configuration.

Direct Connection

Direct connection between the terminal and the host computer is accomplished by connecting a cable from a port at the back of the terminal to a port connected to the host computer.

Modem Connection

A modem enables you to use the telephone lines to communicate with the host computer. A modem converts the digital signals received from a terminal or host computer into audio signals. It also converts audio signals received over the telephone lines into digital signals that the terminal or host computer can understand. Figure 5-1 shows how the connection looks.

Figure 5-1. Modems Connecting a Terminal and Host Computer.

You can use ordinary voice-grade telephone connections to connect to your host computer. Sometimes, however, ordinary voice connections are noisy and cause problems with the transmitted data. In many areas, the telephone company has special data lines that are less noisy. You might want to consider renting a data line.

To use a modem, you must first set its baud rate and parity settings to match your terminal's settings. Refer to **Chapter 10** of *Using Your HP Touchscreen Personal Computer* and to your modem's user's guide.

You have to dial the host computer's telephone number every time you want to communicate with it. After you dial you hear the high-pitched sound of the "carrier." When the sound of the carrier begins, you know that communication can begin. Some modems have automatic dialing features. Others work in conjunction with an ordinary telephone. Read your modem's user's guide to find out exactly how to operate your modem.

Preparing the Terminal for Communication

Before communicating with the host computer you must tell the terminal how it is to send and receive data. This is a one-time operation unless you change host computers. Read **Chapter 10** of *Using Your HP Touchscreen Personal Computer* to find out how to set and change communication parameters.

Turning on Caps Lock

Some host computers accept only uppercase characters. If your host computer is one of these, you can change your terminal's configuration so that it sends only uppercase teletype-compatible) data.

Do not confuse Caps Lock with the [Caps] key on your keyboard. The [Caps] key does not provide the precise teletype-compatible characters that you get when you specify Caps Lock in the Terminal Configuration Menu.

Turn on Caps Lock

If your host computer accepts only uppercase characters, go to the Terminal Configuration menu to change the Caps Lock setting.

1. Display the Terminal Configuration menu:
   a. Press the [User System] key.
   b. Touch `config keys` .
   c. Touch `terminal config` .

This display appears on the screen:

```
                        TERMINAL CONFIGURATION

      Bell On        Cursor Type Line                        Tab = Spaces No

  RETURN Def CR      RETURN=ENTER No     PrinterCode4 Ext    PrinterNulls 0
  Local Echo Off       Caps Lock Off       Start Column 1    ASCII 8 Bits Yes

XmitFnctn(A) No          SPOW(B) No      InhEolWrp(C) No     Line/Page(D) Line
InhHndShk(G) No      Inh DC2(H) No       Auto Term(J) No     Clear Term(K) No
InhSlfTst(L) No                          Esc Xfer(N) No      InhDcTest(W) No
                                                             Graph Compat Off

    Field Separator US          Block Terminator RS          Alternate Set Line(B)

     Terminal Id 1508                                        Transmit All Fields
```

2. Change the Caps Lock entry:
   a. Use the [Tab] key to move the cursor to the Caps Lock field.
   b. Touch the `NEXT CHOICE` label to change the setting from Off to On.
   c. Touch the `SAVE CONFIG` label to make the change permanent.

Your new terminal configuration remains in effect until you go to the menu again and change the configuration.

Press the [User System] key to return to the User/System labels.

Disabling Automatic Linefeed

Most host computers send your terminal an automatic linefeed every time you press the Return key. If you have the terminal's automatic linefeed function on, the communication may not work right. Therefore, in almost all cases, you should turn off automatic linefeed when you are in Remote Mode.

To turn off automatic linefeed, press the User System key, then touch the modes label. If there is an asterisk in the AUTO LF label, touch the AUTO LF label to remove the asterisk.

Remember to turn AUTO LF back on by touching its label when you leave Remote Mode.

Initiating Communication

When you are ready to communicate with the host computer, make sure that Remote Mode is on and automatic linefeed is off.

If you are using a modem, dial the host computer's telephone number and wait for the sound of the carrier. This procedure varies with the kind of modem you have.

When you press the Return key, the host computer sends a command prompt. Instead of displaying a command prompt, the host computer may place you directly into an application program. This depends on how the host computer is programmed to respond to your terminal and user name.

At this point, your terminal is under the control of the host computer. Refer to the host computer's manuals to find out how to use its programs.

After you have finished communicating with the host computer, return to Local Mode and turn AUTO LF back on if necessary.

Logging On and Off an HP 3000

Assume that your terminal is physically connected to an HP 3000, is properly configured and you have a user name and a password. You can log onto an HP 3000 by performing the following:

1. First, prepare the terminal:
   a. Press the [User System] key.
   b. Touch the modes label.
   c. If necessary, touch the REMOTE MODE label to add an asterisk.
   d. Touch the AUTO LF label to remove the asterisk (if necessary).
2. If you have a modem, dial the host computer's telephone number and wait for the sound of the carrier.
3. Initiate communication with the HP 3000:
   a. Press the [Return] key to display the command prompt (:).
   b. Type: hello username
   (Substitute your user name for username.)
   c. Press the [Return] key.
   d. In response to the prompt:
   ENTER ACCOUNT PASSWORD:
   type: your password
   Your password is not displayed on the screen.
   e. Press the [Return] key.

The HP 3000 now displays another command prompt (:) and waits for your instruction. Your HP 3000 computer may not behave exactly as the one illustrated in this example. It might place you directly into an application program. It might not even ask you for a user name and password.

4. Log off and return to Local Mode:
   a. Type BYE in response to the HP 3000 prompt. :BYE
   b. Press the [Return] key.
   c. Touch the REMOTE MODE label to remove the asterisk.
   d. Touch the AUTO LF label to restore automatic linefeed.

Sending Data Character-by-Character

When you first put your terminal into Remote Mode, it is in Character Mode as well. This means that characters are sent to the host computer one-by-one as you type them. Your terminal is in Character Mode whenever there is no asterisk in the BLOCK MODE label.

Character Mode is useful when you must have constant interaction with the host computer. While the terminal is in Character Mode, you can use the [Backspace] key to edit your text before you press [Return] which sends the line to the host computer. However, you cannot use the other editing features such as [Insert line], [Delete char], etc.) to edit the line before you press [Return].

After you have pressed the [Return] key to tell the host computer that you have finished the line, you can use the Modify Line or Modify All functions to change the line and then retransmit it to the host computer. Line Modify and Modify All operate only in Character Mode.

Using Line Modify

Line Modify allows you to change, and then retransmit, a line that you have already sent to the host computer. This is very useful if you have typed a complex line incorrectly and need to correct it. It is also useful if you want to transmit the same correct line several times with no changes or with minor changes.

Line Modify allows you to use all of the terminal's editing keys to change the data on a line. When you press the Return key, the terminal sends the entire line to the host computer and then turns Line Modify off.

Turn Line Modify off and on by touching its label. (Line Modify is on when the asterisk is present in the label.)

Using Modify All

Modify All works like Line Modify except that it remains active after you press the Return key. This allows you to modify several lines without having to reenter the modify mode for each line. Turn off Modify All by touching its label.

Sending New and Modified Lines to the Host Computer

You can send a line to the host computer; if you type it incorrectly, or if you want to correct the line and send it again, you can use one of the modify modes.

1. First, set the terminal to Character Mode:
   a. Press the [User System] key.
   b. Touch the modes label.
   c. The modes labels are displayed:

```
LINE     MODIFY    BLOCK    REMOTE          SMOOTH    MEMORY    DISPLAY    AUTO
MODIFY     ALL      MODE     MODE *          SCROLL    LOCK      FUNCTNS    LF
```

2. Send an incorrect line to the host computer by typing LISTR (instead of LISTF) at the HP 3000 prompt (:).
   a. Type: :LISTR
   b. Press the [Return] key:
      The host computer returns this message:

```
UNKNOWN COMMAND NAME: LISTR :
```

3. Correct the error and then retransmit it:
   a. Move the cursor to the line to be corrected.
   b. Touch the LINE MODIFY label to display the asterisk.
   c. Use the line-editing keys to change the entry from LISTR to LISTF.
   d. Making sure the cursor is still on the line you changed, press the [Return] key to retransmit the line.

After the line is sent, LINE MODIFY turns off automatically.

Sending Blocks of Data to the Host Computer

When the terminal is in Block Mode, it sends characters to the host computer in blocks rather than character-by-character. Usually, you do not touch the BLOCK MODE label to turn it on; it is under control of the host computer. Sometimes, however, you must turn it off if, for example, the host computer's program terminates abruptly and returns you to the system prompt (:).

Block Mode sends data either line-by-line or page-by-page. The number of lines transmitted at one time is determined by the Line/Page field in the Terminal Configuration menu. A page is 24 lines long. A line can be up to 80 characters long. Also, the setting of the G and H strap fields in the Terminal Configuration menu affect how data is transmitted in Block Mode. See **Chapter 10** of *Using Your HP Touchscreen Personal Computer* for more information on how to configure these fields.

Using the Start Column

The Start Column feature applies only when you have used Line Modify or Modify All and then retransmit a line to the host computer. Under ordinary circumstances, the terminal knows not to send the prompt back to the host computer. It starts its transmission in column 1 (for example).

Transmission begins from the Start Column value. This Start Column position is marked only in lines where data is entered and it is the last line in display memory.

Gain access to the START COLUMN label by first pressing the User System key then touching the margins/tabs/col label. Then touch START COLUMN and enter the correct start column.

Sending Space-filled Columns to the Host Computer

When you are sending data to the host computer you often have to fill in the right side of a numeric field with spaces. If the program on the host computer requires this type of format, you can provide it easily by turning on the TABS=SPACES label when you are sending data while Format Mode is on.

If Format Mode is turned on and the field on your screen looks line this:

|123 |

the host computer receives this if TABS=SPACES is turned off:

|123|

the host computer receives this if TABS=SPACES is turned on:

|123 |

Receiving Data from the Host Computer

When the terminal is in Remote Mode, anything the host computer sends is displayed on the screen unless you specify another destination.

The HP 3000 sometimes changes the block setting and automatic linefeed status of your terminal whenit sends data to your terminal. Usually, but not always, it changes the settings back to the way you had them when it is finished transmitting data. If the host computer does not change the settings back (because the program terminates abruptly, or the program is not designed to change the settings back), you will have to change them back yourself by touching the proper labels.

Recording Communication from the Host Computer

You can divert the communication from the host computer to your printer (if available). When you place your terminal in Record Mode, the communication from the host computer goes directly to the printer; it is not shown on the screen. The keyboard is locked while printing takes place.

To use Record Mode, first specify which printer the data is to be sent to, then switch to Record Mode to send the data. When you no longer want to direct the data to the printer, turn Record Mode off.

Recording Data from a TDP File on the HP 3000

Suppose you are using the TDP editor on the HP 3000 and you want to print the contents of one of your files on your serial printer. We will assume that you are already in communication with the HP 3000 and have gained access to TDP.

1. Create a new work file:

   Following the TDP prompt /, type add

2. Enter the text below, then leave the add mode. Press the [Return] key after you enter each line:

```
1. Mary had a little lamb.
2. Its fleece was white as snow.
3. And everywhere that Mary went,
4. The lamb was sure to go.
5. //
/
```

3. Display the text on the screen:

   Type: /list all

   Press the [Return] key.

4. Print the text on the printer, but do not display it on the screen:

   Type: /list all

   Do NOT press the Return key.

5. Choose the printer if it is not already chosen:

   a. Press the User System key.

   b. Touch the device control label, then the ''to'' devices label.

   c. Make sure the label that indicates the device you want to print on, contains an asterisk.

6. Turn on Record Mode:

   a. Touch the device control label.

   b. Touch the device modes label.

   c. Touch the RECORD MODE label.

7. Send the contents of the work file to the printer:

   Press the Return key.

8. Leave Record Mode after the file has been printed by touching the RECORD MODE label again.

6 Creating and Using User-Defined Functions

The terminal performs a built-in function whenever you touch a label on the screen or press its corresponding function key. You can define eight terminal functions of your own as well as use the built-in functions to perform tasks like printing text, calling a program, or even moving the cursor.

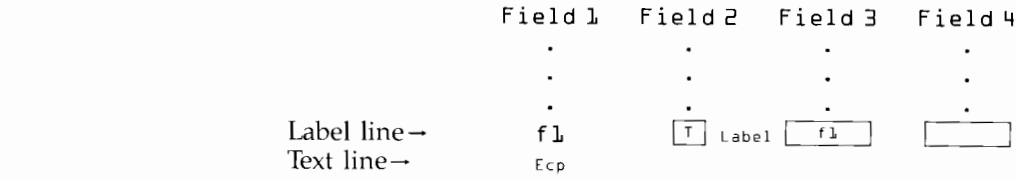
This chapter explains how to:

- gain access to the User Function menu
- define functions
- gain access to the User Function labels
- use the user functions

The User Function Menu

The User Function menu displays the current assignments of the eight user-defined functions and lets you make new function assignments. You gain access to the User Functions menu by pressing the [CTRL] key and the [Menu] key at the same time.

The screen displays two lines for each of the user-defined functions. The first line is called the Label line and the second line is called the Text line:



Label line:

Field 1 tells you the number of the function. You cannot change this field. In the example above, the number of the function is f1.

Field 2 tells the terminal where to send the text on the second line when you touch the function label. Field 2 can have one of three values T, N, or L:

T means Transmit. This is the default setting. When you touch the associated lab is transmitted to the host computer. The function can only be used in Remote Mode.

N means Normal. When you touch the associated label, the text is treated as if it were data entered from the keyboard. You can use the function in either Remote or Local Mode. When the terminal is in Remote Mode and the Local Echo field in the Terminal Configuration menu is On, the line is transmitted to the host

computer and it is executed at the terminal. If Local Echo is `Off`, the text is transmitted only to the host computer.

`L` means Local. The text is executed locally and not sent to the host computer.

Fields 3 and 4 are the function label fields. For example, if the label fields contain:

```
Address   Tab   Phone No
```

the label looks like this: Address / Phone No

Text line:

The Text line contains the text for the function. The text can consist of characters to appear on the screen, codes for actions such as [Tab], [Backspace], [Del] [ESC], etc.
The labels at the bottom of the screen are:

NEXT CHOICE and PREVIOUS CHOICE — These functions change the settings in Field 2 and to T, N, or L.

DEFAULT VALUES — This function returns all the settings for all the user definable functions to the terminal's default values.

DISPLAY FUNCTNS — This function disables action keys such as [Return], [Backspace], and [DEL]. When you press a function key while DISPLAY FUNCTNS is turned on, the function does not take place. Instead, the code for the function key appears on the screen.

Entering Information for a User-defined Function

Use the [Tab] key to move the cursor from field to field on each function's lines. (The default text you see on each text line is a code that is meaningful to the HP 3000 when it is a host computer. In some cases, the host computer inserts words into the user labels and changes or uses the default text entries.)

When you want to enter text on the text line, DISPLAY FUNCTNS must be turned on and AUTO LF must be turned off. If you leave AUTO LF turned on, alphanumeric text will be double spaced when it is displayed on the screen.

Type over the current text to enter new text. The maximum length of your text line is 80 characters. For example, if you want [f4] to operate in Local Mode and produce A:, B:, and C: on separate lines, the lines should look like this:

```
f4   L   Label   ALPHA   LIST   A:cr   B:cr   C:cr
```

Create a Text Entry Function

If you were writing many business letters containing your own return address, you might want to program a function key to enter your return address for you:

```
John Jones
123 Main Street
Santa Clara, CA 95000
```

1. First, disable the automatic linefeed so that you don't get a double-spaced return address:
   a. Press the [User System] key to display the User/System labels.
   b. Touch the modes label.
   c. Touch the AUTO LF label to remove the asterisk.
2. Gain access to the User Function menu:
   a. Press the [CTRL] and Menu keys at the same time.
   b. The menu appears on the screen.

3. Let's assign the return address to the second function:

   Use the cursor control keys to move the cursor to the first line of function `f2`.

4. You want to use this function in Local Mode, so an `L` for Local must be in the `type` field:

   a. Move the cursor to the `T` in the Label line line by pressing the [Tab] key.

   b. Touch NEXT CHOICE until `L` appears in the field.

5. You should always choose a meaningful name for your functions, so name the function RETURN ADDRESS:

   a. Press the [Tab] key to move the cursor to the first Label field

   b. Type: RETURN

   c. Press the [Tab] key to move the cursor to the second Label field.

   d. Type: ADDRESS

6. Prepare to enter text on the second line:

   a. Press the [Tab] key to move the cursor to Function 2's second line

   b. Touch the DISPLAY FUNCTNS label to disable the action keys.

7. Type John Jones' address, using the same keystrokes you would if you were typing on an electric typewriter:

   a. Press the [Tab] key.

   b. Type: John Jones

   c. Press the [Return] key, then the [Tab] key.

   d. Type: 123 Main Street

   e. Press the [Return] key, then [Tab].

   f. Type: Santa Clara, CA 95000

   g. Press [Return] three times.

You entered the last three carriage returns for the sake of convenience. After you have used this function, the cursor will be positioned where you would enter the addressee's address.

Your entry should look like this:

```
HTJohn JonesCRHT123 Main StreetCRHTSanta Clara,
CA 95000CRCRCR
```

8. Turn on the action keys again and leave the User Function menu:

   Touch the DISPLAY FUNCTNS label to remove the asterisk.

You have now defined a function key.

Using Your User-Defined Functions

You can use a function key immediately after you have defined it.

Press CTRL and the Menu key at the same time to display the User Function labels. You can display these labels at any time. If you have defined f4 as described earlier, the labels look like this:

When you touch the ALPHA LIST label, your screen displays:

```
A:
B:
C:
```

To return to the set of labels you that were displayed before you displayed the user-defined functions, press the User System key.

Performing a User-Defined Function

In the last example, you created a return address. Let's use it now.

1. Turn on the automatic linefeed.
   a. Press the [User System] key.
   b. Touch the `modes` label.
   c. Touch the `AUTO LF` label to display the asterisk.
2. Set a tab to column 50. That way, the tabs you put in your return address will cause the return address to begin in column 50 instead of the first column. To set the tab stop at column 50, do the following:
   a. Touch the `margins/tabs/col` label.
   b. Move the cursor to column 50.
   c. Touch the `SET TAB` label.
3. Gain access to the User Function labels by pressing the [CTRL] and [User System] keys at the same time.
4. Place your return address on the screen.
   a. Use the cursor control keys to move the cursor to the line where the return address should start.
   b. Touch the `RETURN ADDRESS` label.

   You should see this on your screen:

```
John Jones
123 Main Street
Santa Clara, CA 95000
```

5. Return to the the previous set of labels by pressing the [User System] key.

Computer Museum

7 Graphics Fundamentals

Introduction

Your HP Touchscreen PC provides you with some graphics capabilities that can be easily used to draw lines and graphics text. In this chapter you will become familiar with the use of the graphics keypad, how to move the graphics cursor, how to move the graphics pen, how to use the rubberband line, and how to copy graphics data to a printer.

The intent of this chapter is to familiarize the user with the fundamentals of graphics through the use of the graphics keypad and some basic escape-sequence programming. Advance users and programmers desiring additional graphics information should read the following documents:

- *HP 150/MS-DOS User's Guide*, product no. 45624A
- *HP 150 Programmer's Tools*, product no. 45635A

Graphics Drawing Tools

Performing graphics operations on the terminal can be accomplished with the understanding of its graphics tools:

- graphics display
- graphics cursor
- graphics pen

Graphics Display

Your terminal has two display memories: (1) alphanumeric and (2) graphics. Alphanumeric display memory displays and stores alphanumeric characters. Graphics display memory displays and stores graphics characters and text received from the keyboard and programs using escape sequences. The graphics keypad and escape-sequence programming are discussed later in this chapter.

Graphics display memory has an area measuring 512 by 390 addressable points. That is, there are 512 points on the (horizontal) X-axis and 390 points on the (vertical) Y-axis. This means that you can address or specify any point (coordinate) in the 512 by 390 display area. Addressing these points is done through escape-sequence programming.

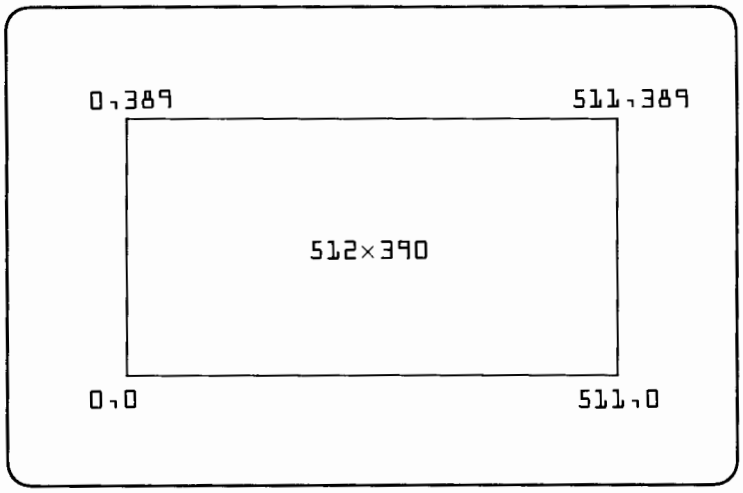


Figure 7-1. Graphics Display Memory

Both graphics and alphanumeric data are stored in separate display memories. This feature allows you to read and modify graphics and alphanumeric data separately. Although both display memories can be displayed at the same time, it is only practical to display one. If you have both alphanumeric and graphics data on the graphics screen, and you wish to copy it, only the the graphics data is copied when you press the [Graph copy] key (see "The Graphics Keypad").

Graphics Cursor

To make it easier to address the 512 by 390 addressable points in graphics display memory, a separate graphics cursor is used. The graphics cursor is a crosshair symbol that locates points on the display. Initially, when the graphics cursor is turned on, it is located in the lower left corner of the display.

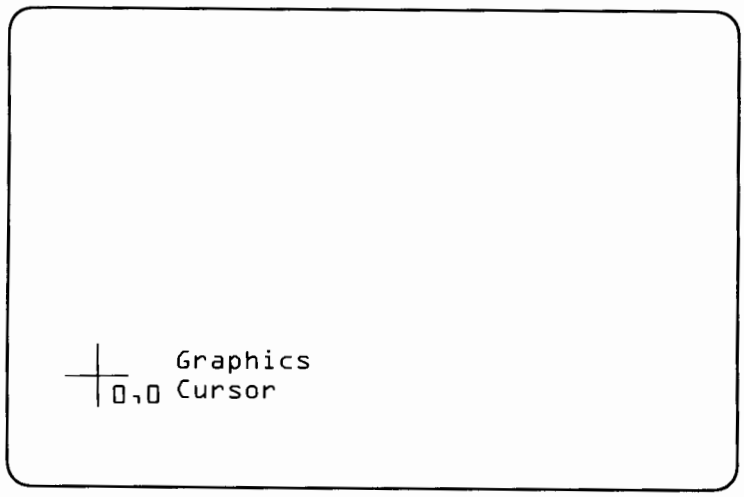


Figure 7-2. Graphics Cursor

By moving the graphics cursor to specified points, you can draw points, draw lines by connecting the points, and create geometric shapes. The graphics cursor also helps you to locate the starting point for making labels in graphics text.

Graphics Pen

The graphics pen is used to draw line segments. The graphics pen is an imaginary pen that is either up or down. Initially, when power is turned on, the pen is in the down state and positioned at location 0,0. When the pen is down and a new point is specified, the pen is moved from its current position to the new point, creating a line. When the pen is up and a new point is specified, the pen is moved to the new point and automatically lowered, but no line is drawn.

How Can I Get Started?

In order to use the graphics capabilities of the HP Touchscreen PC, you should know a little about the display. The display can tell you what mode the numeric keypad is currently in. The bottom line of the display is called the status line. It indicates whether the terminal's numeric keypad is a numeric keypad (`Num Pad`) or a graphics keypad (`Grph Pad`). The status line also indicates the terminal's current time. If the terminal's clock has been set, you can use it to check the time of day.

The numeric keypad is two keypads in one. When the numeric keypad is a numeric keypad, the status line displays:

```
Num Pad
```

When the numeric keypad is a graphics keypad, the status line displays:

```
Grph Pad
```

Changing the Numeric Keypad

You can change the operating mode of the numeric keypad from numeric to graphics or vice versa by performing the following:

1. Observe the status (bottom) line on the display.
2. Hold down the [CTRL] key and press the [-] (minus) key on the numeric keypad. Note that the current numeric keypad operating mode changes to the other. That is, if it was `Num Pad`, it changes to `Grph Pad`. If it was `Grph Pad`, it changes to `Num Pad`.

Your HP Touchscreen PC comes with a plastic graphics template. This graphics template is found inside your guide, *Using Your HP Touchscreen Personal Computer as a Terminal*. Remove the template from the manual and install it over the numeric keypad. Your numeric keypad can now be used as a graphics keypad. Shown below is the graphics keypad with the template installed.

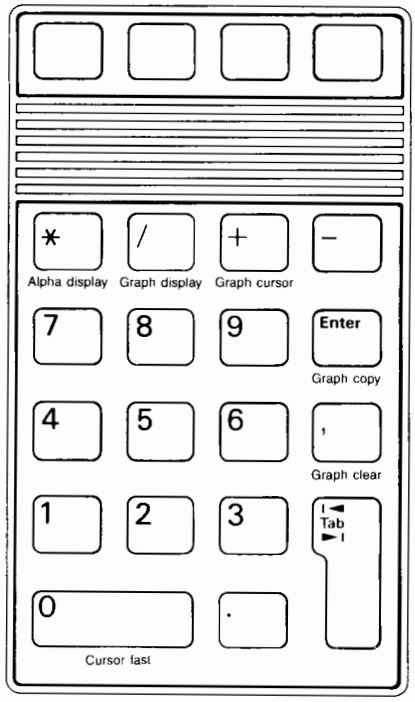


Figure 7-3. The Graphics Keypad

The Graphics Keypad

The graphics keypad consists of the following keys:

Key(s)	Description
[-] (Minus)	When the [CTRL] key is held down and the [-] (minus) key is pressed on the graphics keypad, the terminal selects either the `Num Pad` or `Grph Pad` as the current numeric keypad operating mode.
[Graph cursor]	Turns the graphics cursor on and off. Initially, the graphics cursor is off. When the [Graph cursor] key is pressed, the graphics cursor appears in the lower left corner of the screen (if graphics memory is on).
[Graph display]	Turns graphics display memory on and off. Initially, graphics display memory is on.
[Alpha display]	Turns alphanumeric display memory on and off. Initially, alphanumeric display is on.
[Graph copy]	Copies the contents of graphics display memory to a printer.
[Graph clear]	Erases all data from graphics display memory.
[▲] [◄] [►] [▼] (Cursor control)	Moves the graphics cursor up, down, left or right. Simultaneously pressing an up or down key with a left or right key causes the graphics cursor to move diagonally.
[Cursor fast]	Speeds up the graphics cursor if pressed simultaneously with the cursor control keys. Normal speed returns when this key is released.

The other keys ([Tab], [.], [4], [6], [7], [8], and [9]) on the graphics keypad are disabled (inactive).

Switching Between the Numeric and Graphics Keypads

Hold down the CTRL key and press the - (minus) key on the numeric keypad. Notice how the status of the numeric keypad changes from one keypad to the other. The status line reads `Grph Pad` or `Num Pad` to indicate that the keypad is currently operating as a graphics or numeric keypad, respectively.

Using the Graphics Keypad

To use the graphics keypad, make sure that you have done the following:

1. Installed the plastic graphics template over the numeric keypad.
2. Selected the graphics keypad and verified that the status line reads `Grph Pad`.
3. You are now ready to use the graphics keypad. Turn on the graphics cursor by pressing the Graph cursor key. The graphics cursor should appear in the lower left corner of the screen. If the graphics cursor is not visible, then graphics display may not be on. Both the graphics cursor and graphics display must be on at the same time in order to see the graphics cursor. If you do not see the graphics cursor, perform the following steps:
   a. Press Graph display to turn on graphics display. Does the graphics cursor come on? If it doesn't, perform the step b.
   b. Press Graph cursor. Does the graphics cursor come on? If it doesn't, perform step c.
   c. Repeat steps a and b until the graphics cursor comes on. Remember that the cursor will only appear if both graphics display and graphics cursor are on at the same time.

Exercises:

- Using the cursor control keys, move the graphics cursor up, right, left, and down.
- Try moving the cursor diagonally, by simultaneously pressing an up or down key with a left or right key.
- Using the [Cursor fast] key simultaneously with the cursor control keys, repeat the above exercises. Note how quickly the cursor moves.

Why Escape Sequences?

Performing graphics operations from the graphics keypad are limited to moving the graphics cursor, clearing graphics display memory and, clearing the cursor. In order to increase the terminal's graphics capabilities, you need to know some fundamental graphics programming. Graphics programming is accomplished through escape sequences, which are codes that the terminal recognizes and then performs them.

An escape sequence is a series of characters preceded by an escape character "ESC". When activated, an escape sequence can perform a specified type of action. An escape sequence can be activated in two ways: (1) entered from the keyboard by pressing the [ESC] key followed by one or more succeeding keys, or (2) executed from a program in a "print" statement such as in BASIC.

An example of the first type:

```
ESC*dk
```

causes the graphics cursor (crosshair image) to appear in the lower left corner of the screen.

The second type using BASIC statements:

```
10 ESC$=CHR$(27)
20 PRINT ESC$''*dk''
```

activates the graphics cursor to appear in the lower left corner of the display.

In this chapter, you will learn how to use escape-sequence programming from the keyboard.

Using Escape Sequences

Although graphics is limited from the graphics keypad, the user can expand the terminal's graphics capabilities through the use of escape sequences. From a beginner's viewpoint, only a few escape sequences will be introduced in this chapter to familiarize the user with some graphics fundamentals. Additional escape-sequence programming is provided in the *HP 150 Programmers's Tools* (Product 45435A) and the *HP 150 MS-DOS User's Guide* (Product 45624A).

As previously mentioned, an escape sequence consists of an escape character [ESC] followed by a character or a series of characters. The final character in an escape sequence is called a "terminator." Escape sequences require a terminator. The terminator must be a uppercase letter so that the terminal knows that the sequence has ended. If the terminator is not an uppercase letter, then the requested function will not be performed.

More than one function may be performed in the same escape sequence. However, multiple functions require that the terminator be an uppercase letter.

A typical escape sequence appears below:

```
ESC*d300,400pK
```

where: ESC is the escape character
*d is the escape sequence type for "Display Control" 300,400 is the specified point in the 512 by 390 area
p specifies positioning the point relative to the previous point
K indicates that the cursor is turned on and because it is an uppercase letter, the sequence ends

The following graphics operations are a small portion of the escape-sequence programming available. The paragraphs that follow will discuss these graphics operations.

Escape Sequence	Graphics Operation
ESC*d<X>,<Y>o	Moving the Graphics Cursor (Absolute)
ESC*p<X1>,<Y1> <X2>,<Y2>. .Z	Moving the Pen to Draw a Line
ESC*pa	Lifting the Pen
ESC*pc	Moving the Pen to the Current Cursor Position
ESC*dm	Turning On Rubberband Line
ESC*dn	Turning Off Rubberband Line
ESC*ds	Turning On Graphics Text
ESC*dt	Turning Off Graphics Text
ESC*wr	Graphics Full Reset

Moving the Graphics Cursor

Moving the cursor to a new position on the screen involves specifying the position. The new position can either be exact (absolute) on the 512 X 390 display, or else relative to the current cursor position.

The escape sequence for these two choices are as follows:

Position Graphics Cursor Absolute: ESC*d<X>,<Y>o

Position Graphics Cursor Relative: ESC*d<X>,<Y>p

The <X> and <Y> give the new cursor position.

When you first turn the terminal on, the graphics cursor is in the lower left corner of the screen or position (0,0). You can move the cursor to a different position even if the cursor is turned off.

Example 1: Assume that the cursor is currently at position (0,0) and is turned off. Move it 480 points to the right and 365 points up from its current position, and turn it on.

Type the following sequence: ESC*d480,365oK

Note that the new cursor position is near the upper right corner.

Example 2: Now move the cursor relative to the current position (480,365) about 100 points directly below it.

Type the following sequence: ESC*d0,-100P

The cursor is now located at position (480,265).

Moving the Pen to Draw a Line

Initially when the terminal is turned on, the pen is in the down and at position (0,0). Drawing a line involves the use of moving the pen from one point to another. The escape sequence to draw (plot) a line segment is:

ESC*p<X1>,<Y1> <X2>,<Y2>. . .Z

where <X1>,<Y1> <X2>,<Y2> are delimited by spaces or commas, and the uppercase letter or capital "Z" (a non-operative terminator) terminates the sequence.

Example: Draw a line from the current position (0,0) to (200,200).

1. Turn on graphics display by typing the escape sequence:

   ESC *dC

2. Draw a line from (0,0) to the new end point (200,200) by typing the escape sequence:

   ESC *pa0,0 200,200Z

Lifting the Pen

You can lift the pen from the drawing surface by typing the following escape sequence:

ESC *pa

If you move the pen from its current position while the pen is up, the pen will not draw a line. When you specify a new position, the pen is moved to the new position and automatically lowered.

Moving the Pen to the Current Cursor Position

You can draw a line from the current pen position to the current cursor position by typing the following escape sequence:

ESC *pc

When used in conjunction with the rubberband line (discussed below), you can easily draw lines on the screen.

Rubberband Line

The rubberband line allows you to display a temporary line connecting the graphics cursor to the current pen position. As the graphics cursor is moved (using the cursor control keys), the temporary line moves, stretches, or contracts as required to maintain the connection. The temporary line is "set" when the cursor position is entered as a new point using the "ESC*pc" command. This allows you to visualize drawing lines on the display and then saving them. The following escape sequences turn the rubberband line on and off:

Turning On Rubberband Line ESC *dm
Turning Off Rubberband Line ESC *dn

Exercise: Turn on the rubberband line and use the cursor control keys to move the temporary line in various directions. Type the following escape sequence:

ESC *dM

Use the cursor control keys to move, stretch, and shrink the temporary line on the screen.

Entering Text

Graphics text can be entered directly from the keyboard. The backspace, carriage return, and line feed functions work as expected, making it easy to add or edit titles and labels. To add graphics text, you need to turn graphics text on. Graphics text can be turned on and off using the following escape sequences.

Turn On Graphics Text: ESC *ds
Turn Off Graphics Text: ESC *dt

Example: Turn on graphics text, position the cursor at (100,100) and type this is graphics text.

Type the following sequence: ESC *dsk 100,100
O this is graphics text

Notice how the graphics cursor moves with the text as you type.

Graphics text uses the HP Touchscreen's default assignments for size and orientation. The *HP 150 MS-DOS User's Guide* explains how to change the size and orientation of text.

Graphics Full Reset

You can cause a full (hard) reset only by entering the following escape sequence:

ESC *wr

A graphics full reset is sets all graphics parameters to their default values. These values appear in table 17-5 of the *HP 150 MS-DOS User's Guide.*

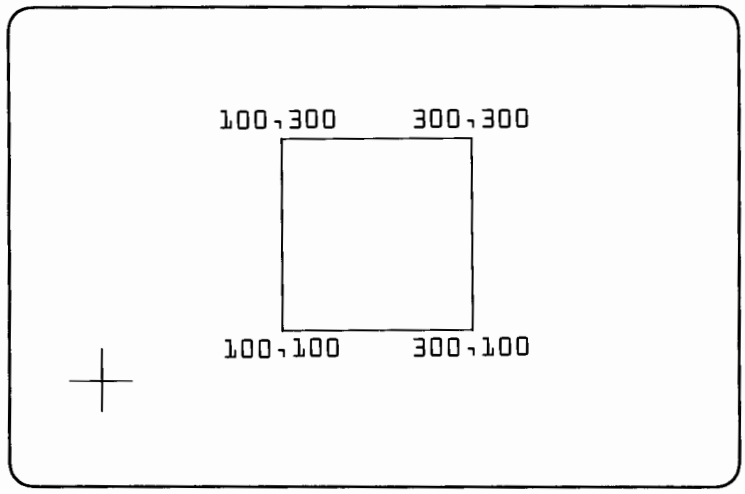
Copying Graphics Data

Your graphics lines and text can be copied to a printer using the Graph copy key located on the graphics keypad. You may copy the contents of graphics display memory to either an internal printer (if available) or to a printer that is compatible with the Hewlett-Packard Interface Bus (HP-IB).

Example: Assume you want to create a box, label it "This is a box", and sent it your printer (internal or external).

1. Press the [Alpha display] key to turn off alpha display memory. Notice that both the alphanumeric cursor and the contents of alpha display memory disappear.
2. Turn on the graphics cursor by pressing the [Graph cursor] key. The graphics cursor should appear in the lower left corner of the screen.
3. Lift the pen and move the cursor to position (100,100). Draw a line to (300,100), then to (300,300), then to (100,300), and finally to (100,100). You can draw this box by typing the following escape sequence:

```
ESC *pa100,100 300,100 300,300
100,300 100,100Z
```



When the box is completely drawn, the graphics cursor reappears at position (0,0).

4. Move the graphics cursor to a position below the box. use graphics text to type the caption "This is a box".

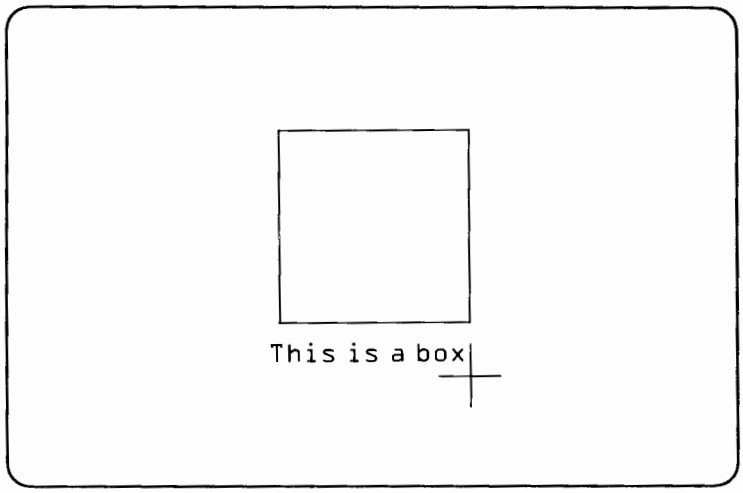
   a. Use the graphics cursor control keys to position the graphics cursor below the box.

   b. Turn on graphics text:

      ESC *dS

   c. Type the caption This is a box.

   The graphics text should appear at the current location of the graphics cursor.



5. Copy the box and title to a graphics printer. Refer to **Chapter 8**, "Printing Your Data" for information on how to configure your printer.

   a. If your terminal comes equipped with the built-in (internal) printer, simply press the [Graph copy] key. This will print the box and title.

   b. If your graphics printer is an external printer that has been properly installed (refer to *Using Your HP Touchscreen Personal Computer*) follow the steps listed below:

   c. Press the [Alpha display] key to restore alpha display memory.

   d. Press the [User] key. Touch `device control` , `''to'' devices` , and `HP-IB` labels.

      An asterisk (*) should appear in the `HP-IB` label. The asterisk indicates that the HP-IB device is the designated external printer.

   e. Press the [Graph copy] key. The external printer should print the box and title.

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8 Printing Your Data

You can print data directly from the host computer or from your terminal's display memory on your printer. You can print everything in display memory, or just a selected portion of it.

Your printer can be the optional internal printer that is located at the top of the terminal. Or you might have an external printer that is connected to your terminal with a cable. Your HP Touchscreen PC can also be connected to two printers, to a plotter, or to both printer and a plotter.

This chapter explains how to:

- tell the terminal which printer to print on
- print everything in display memory with the Print Enter key
- print selected parts of the text in display memory
- print directly from the host computer, bypassing the screen
- specify methods of sending text to the printer

If your printer is not yet connected to your terminal, you must connect it to the proper port and configure the terminal to send data to it. Refer to *Using Your HP Touchscreen Personal Computer* for installation instructions.

Special Terminology

On the screen labels the term "copy" is used for "print." The word "device" is used for "printer." This is because the terminal is only concerned with sending data to the selected port; the kind of device that is connected to the port is not relevant to the terminal. When you want to print, the terminal sends a copy of whatever you have in display memory to the selected port.

Selecting the Printer(s)

Before you can print anything, you have to tell your terminal where to send the text. If you change back and forth between printers, you have to change the terminal's `''to'' devices` label every time you change printers.

If you have an internal printer you can see it in the top of your terminal. You can tell whether you have a serial printer or an HP-IB printer by checking the port your printer is connected to. Look at the back of the terminal. Serial printers are connected to Port 1 or Port 2 (usually Port 2). HP-IB printers are connected to the HP-IB port. Figure 8-1 shows where the printer ports are located on the back of your terminal.

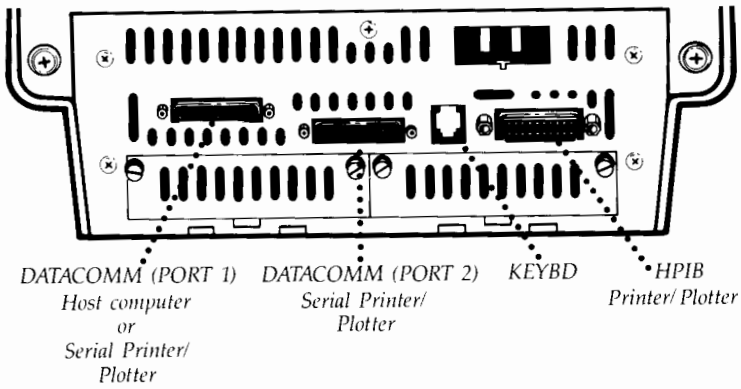


Figure 8-1. Local External Printer-to-Port Assignments

To select a printer, you must access the "to" device set of labels by first pressing the [User System] key, then by touching the `device control` label followed by the `''to'' devices` label. This set of labels should appear:

```
device    SERIAL   INTERNAL     TO              HPIB
control   DEVICE   PRINTER   DISPLAY          DEVICE
```

Touch the label that names the printer that you want to use. An asterisk should appear in that label. (The `INTERNAL PRINTER` label is shown only if you have an internal printer.) You can use on more than one printer at the same time if you wish.

One of the `''to'' device` labels is the `TO DISPLAY` label. Use function when you want to send data from a device (such as a disc drive to display memory).

Selecting the Serial Printer

If you have a serial printer, this is how you select it. If you have another printer, select a different printer in step 2.

1. Gain access to the `''to'' devices` labels:
   a. Press the [User System] key.
   b. Touch the `device control` label.
   c. Touch the `''to'' devices` label.
2. Select the serial printer:
   a. If no asterisk is present in the `SERIAL DEVICE` label, touch this label.
   b. If there is an asterisk in any other printer's label, touch the label to remove the asterisk.

Now when you request the terminal to send text to the printer, the text will go to the printer connected to one of the serial ports.

The Easiest Way to Print: The Print/Enter Key

The easiest way to print data on the selected printer is to press Shift and Print Enter keys at the same time. Pressing these keys causes the entire contents of display memory to be printed on the selected printer. This function works in both Local and Remote modes.

Printing Selected Portions of Display Memory

The device control functions allow you to specify exactly what text is to be printed. These functions also let you advance the printer line-by-line or page-by-page. To gain access to the device control labels, press the User System key, and then touch device control .

The device control function labels are:

device modes — This function displays the labels that specify how text is sent to the printer.

"to" devices — This function displays the labels with the names of the destination devices to which you can send your text.

ADVANCE PAGE — This function advances the paper in the printer a full 66-line page.

COPY ALL — This function prints the contents of the display memory from the cursor position to the end of the display memory.

COPY PAGE — This function prints from the cursor position to the bottom of the displayed page.

COPY LINE — This function prints only the line that contains the cursor.

The ADVANCE and COPY functions work in both Local and Remote modes.

To turn on a function label, touch a device control label. When you do so, an asterisk appears' in the label. Touching it again will remove the asterisk and thus, the function is turned off.

Print Selected Lines in Display Memory

Suppose the following nursery rhyme is displayed on the screen:

```
Mary had a little lamb.
Its fleece was white as snow.
And everywhere that Mary went,
The lamb was sure to go.

Mary had a little lamb.
Its fleece was black as soot.
And everywhere that Mary went,
His sooty foot he put.
```

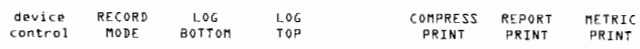
You might have typed the poem onto the screen in Local Mode or you might have retrieved it from a file in the host computer and the terminal is still in Remote Mode. Assume that you want to print the second verse of the poem and you have already selected the destination device (printer).

1. Gain access to the device control function labels:
   Press the [User System] key.
   Touch the `device control` label.
2. Print the second verse of the poem:
   Move the cursor to the beginning of the second verse.
   Touch the `COPY ALL` label.

Only the second verse is printed on the selected printer.

How to Send Text to the Selected Printer

You can specify how the text will be sent to the printer and how the printer will print it. These functions work in both Local and Remote modes. To display the device modes labels, first press the [User System] key, then touch device control , and then touch device modes . This set of labels is displayed:



The device modes labels are:

device control — This function displays the labels that enable you to print text.

RECORD MODE — While in Local mode, this function prints everything in display memory. In Remote Mode it prints the host computer's output. The output is not shown on the screen. Recording begins immediately after you touch the label to display the asterisk. The keyboard is locked while Record Mode is active.

LOG TOP and **LOG BOTTOM** — These two function specify whether text is and to be printed as it leaves display memory or as it is placed in display memory.

When Top Logging is active, the first line of text in display memory is printed as it is forced out of display memory. In Local mode, The first (top) line in display memory is printed every time you press the [Return] key after display memory is full. In Remote Mode, the first (top) line in display memory is printed every time the terminal receives a new line of text after display memory is full.

When Bottom Logging is active, the line most recently placed in display memory is printed. In Local Mode, the text of the line you most recently typed is printed as soon as you press the Return key. (If the cursor jumps to the next line by itself as a result of having reached the end of the line, this is also considered a new line.) In Remote mode, the text of the line most recently received from the host computer is printed.

Both modes have advantages and disadvantages. In top logging, text that is not forced out of the top of display memory is not printed. In bottom logging, all text is printed. Also, in bottom logging, if you insert text, the insertion is printed in the order in which it is added, not in the order it appears on the screen.

COMPRESS PRINT — This function prints half-size characters on the internal printer. You cannot use this function with external printers. Some external printers have the capability to produce half-size characters, but you have to specify the print size in another way. See the user's manual for your external printer.

REPORT PRINT — This function causes the printer to print a tic mark at the beginning of each new 11-inch page.

METRIC PRINT — This function causes the printer to print a tic mark at the beginning each new metric page.

To turn on a device modes label, touch it. An asterisk appears in the label. To turn off a device modes label, touch it again. The asterisk disappears.

Printing from Graphics Memory

Graphics (including graphics text) stored in graphics display memory can be printed using the optional internal printer or an external graphics printer.

Information on how to print your graphics data is discussed in **Chapter 7** of this guide.

A

HP Touchscreen Keyboards

This appendix contains the keyboard layouts and HP part numbers for the HP Touchscreen keyboard assemblies, listed below.

United States
Belgian
Canadian English
Canadian French
Danish
Dutch
Finnish
French
German
Italian
Norwegian
Spanish (Europe)
Spanish (Latin America)
Swedish
Swiss French
Swiss German
United Kingdom

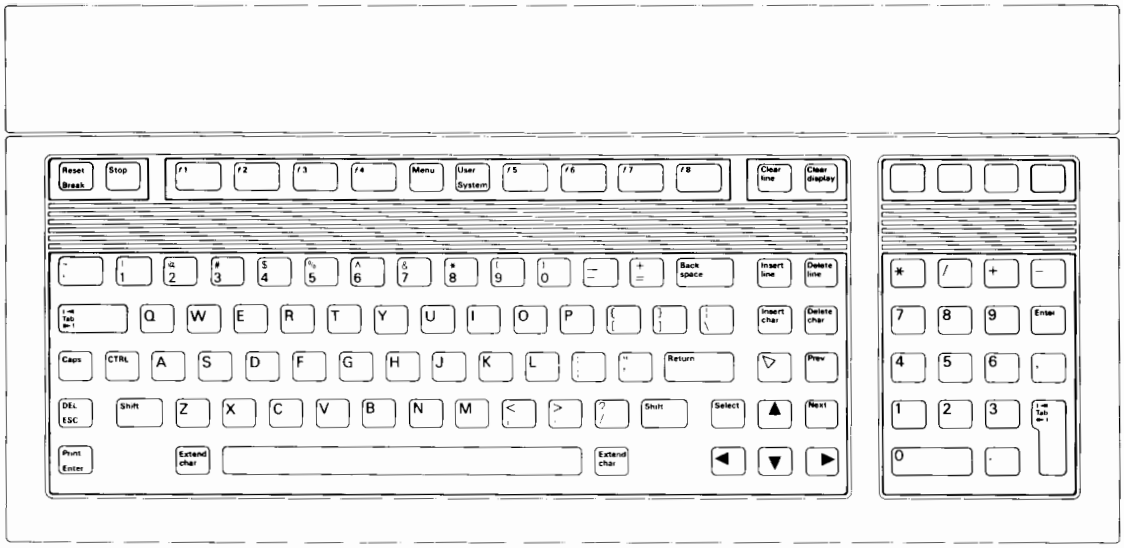


Figure A-1. United States Keyboard (HP Part No. 46010AA)

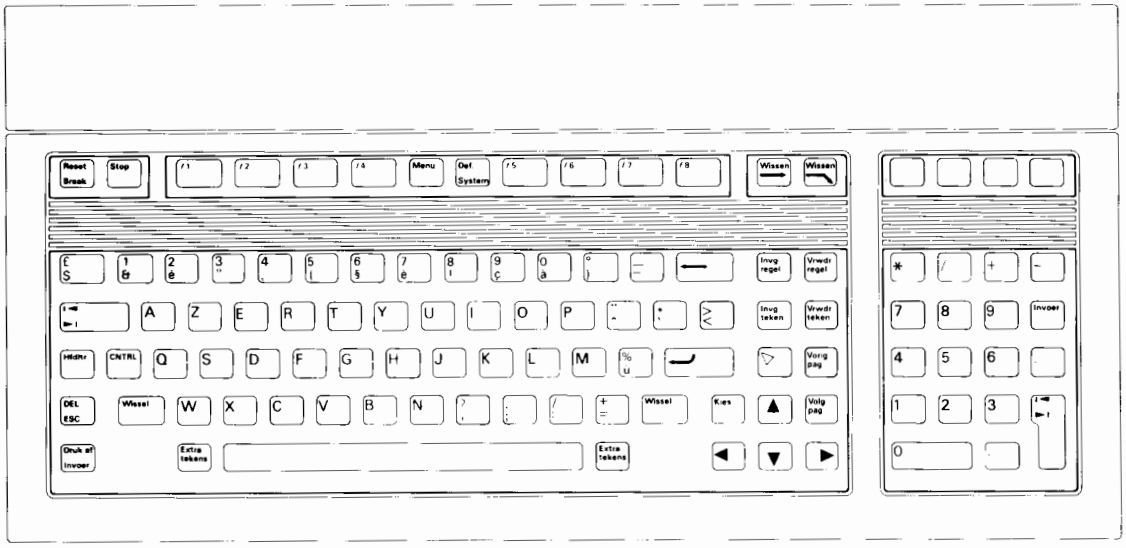


Figure A-2. Belgian Keyboard (HP Part NO. 46010AW)

A-2 HP Touchscreen Keyboards

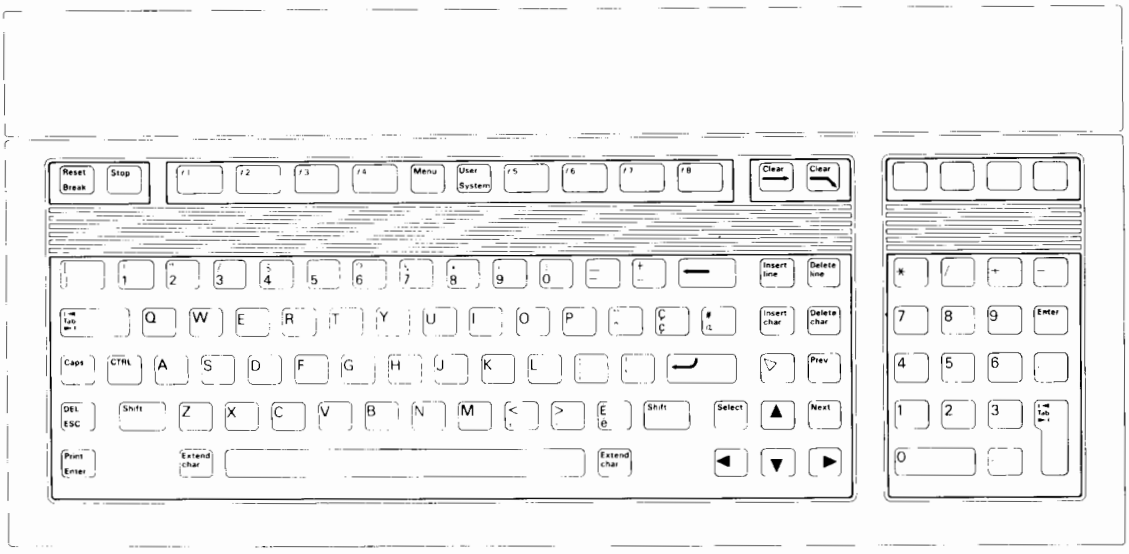


Figure A-3. Canadian English Keyboard (HP Part No. 46010AL)

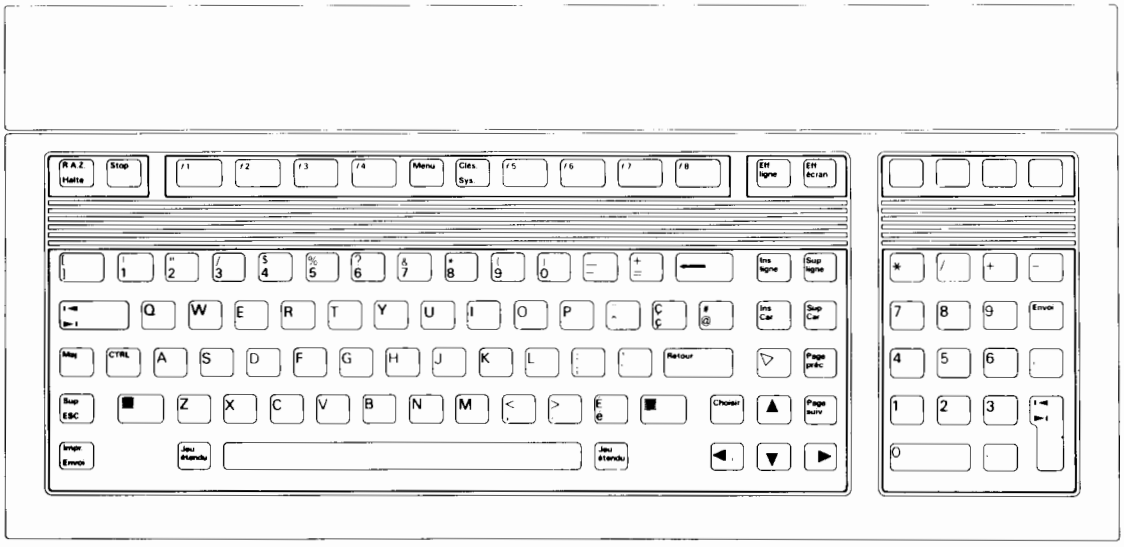


Figure A-4. Canadian French Keyboard (HP Part No. 46010AC)

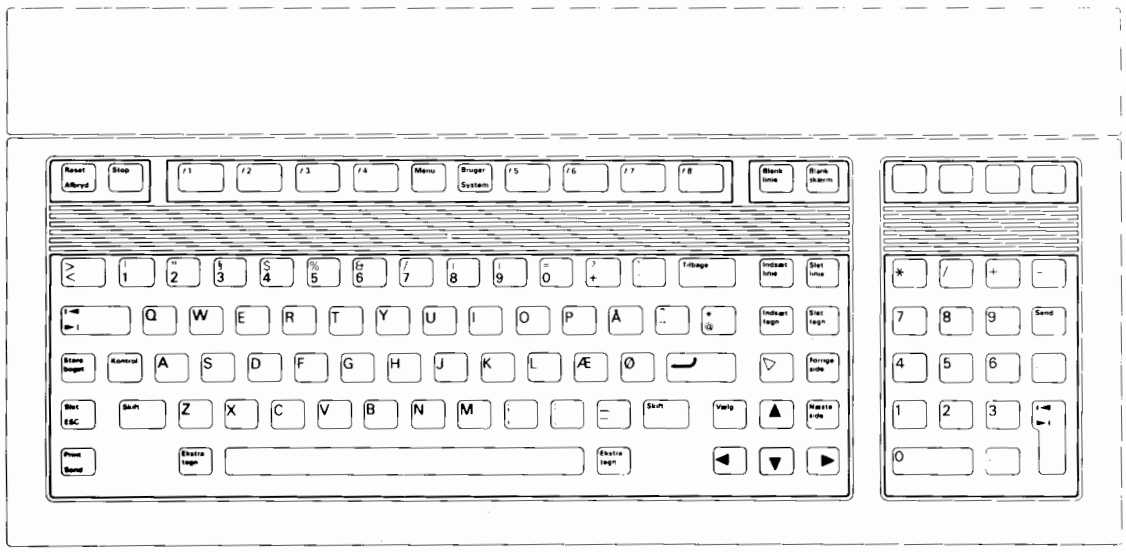


Figure A-5. Danish Keyboard (HP Part No. 46010AY)

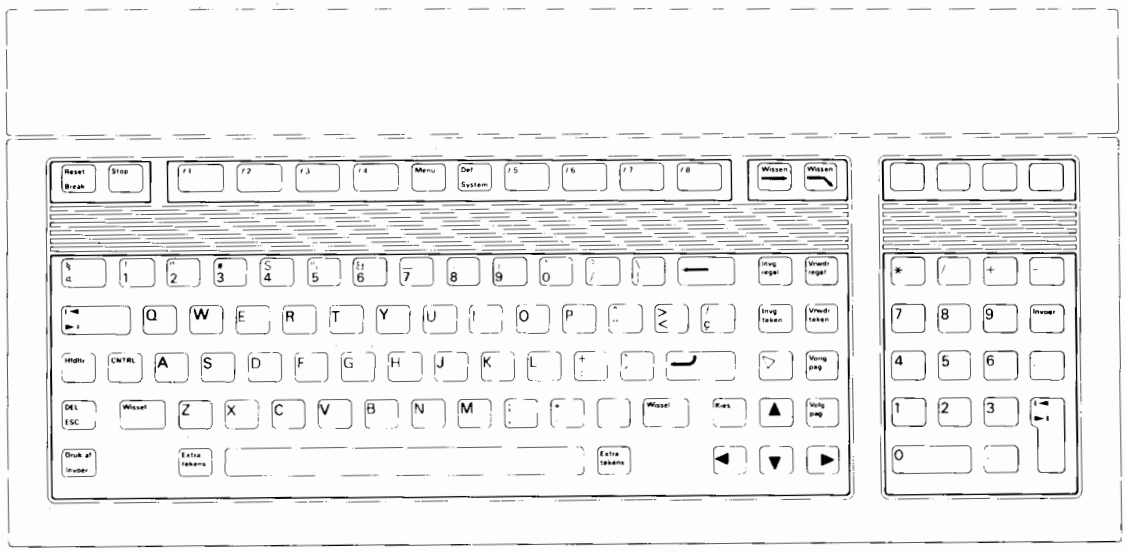


Figure A-6. Dutch Keyboard (HP Part No. 46010AH)

A-4 HP Touchscreen Keyboards

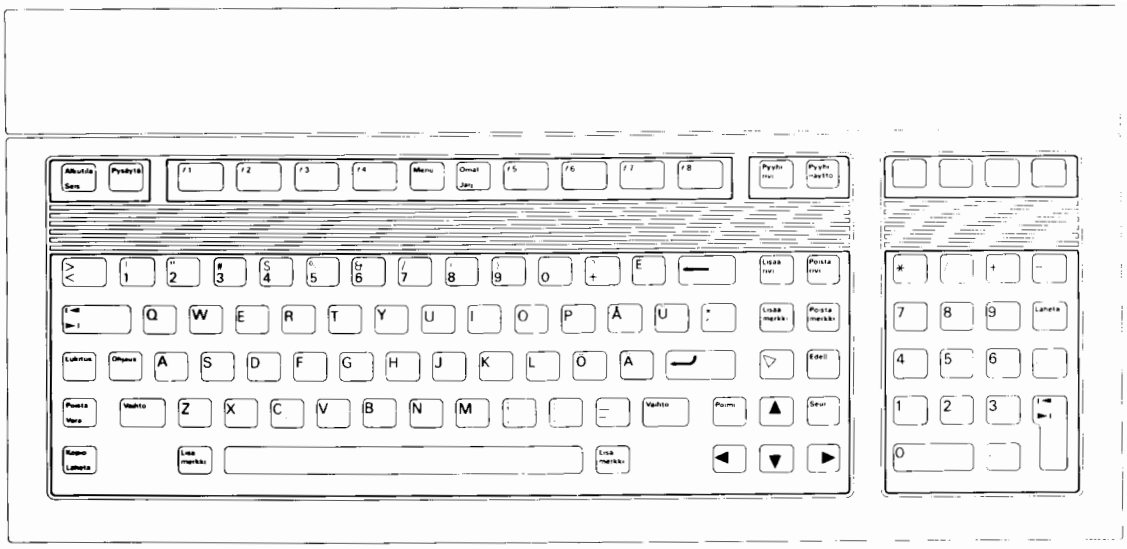


Figure A-7. Finnish Keyboard (HP Part No. 46010AX)

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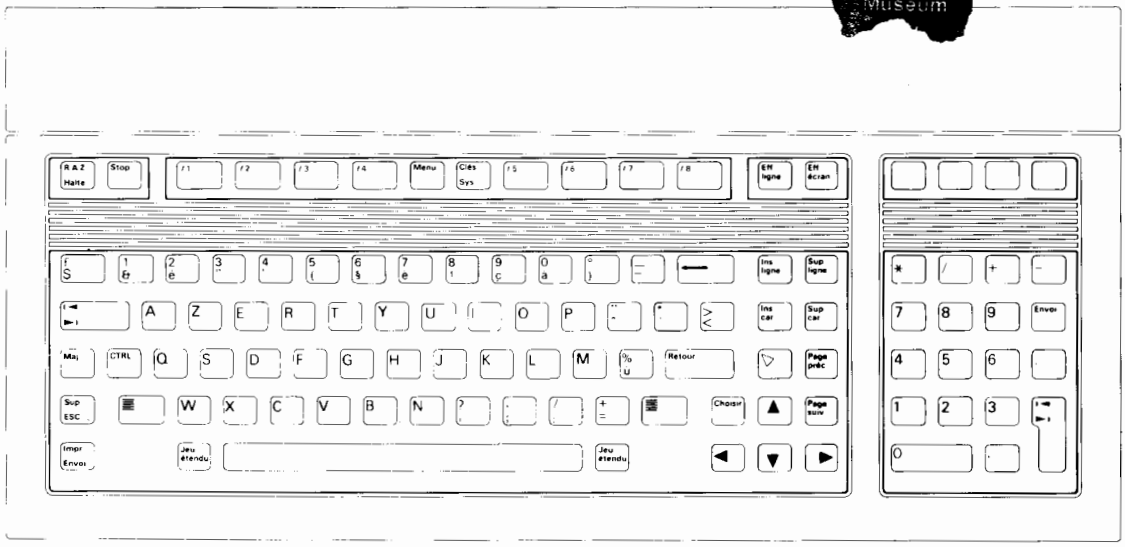

Figure A-8. French Keyboard (HP Part No. 46010AF)

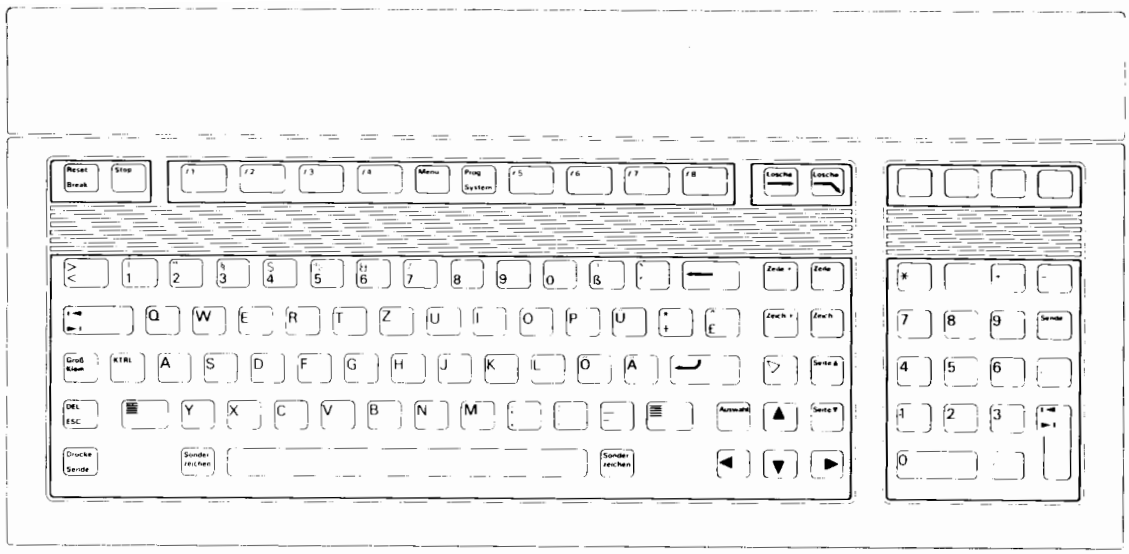

Figure A-9. German Keyboard (HP Part No. 46010AD)

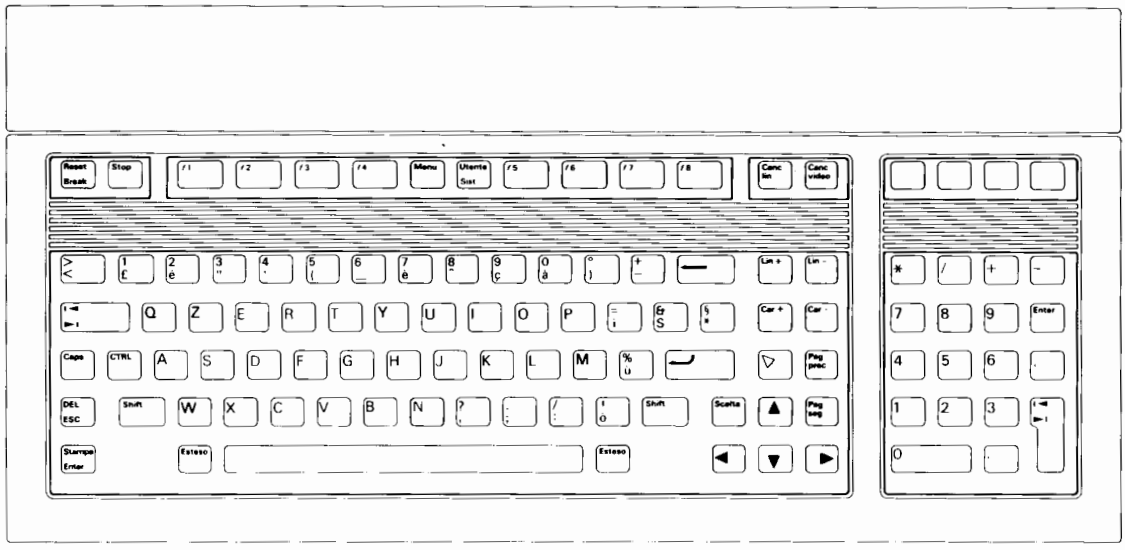

Figure A-10. Italian Keyboard (HP Part No. 46010AZ)

A-6 HP Touchscreen Keyboards

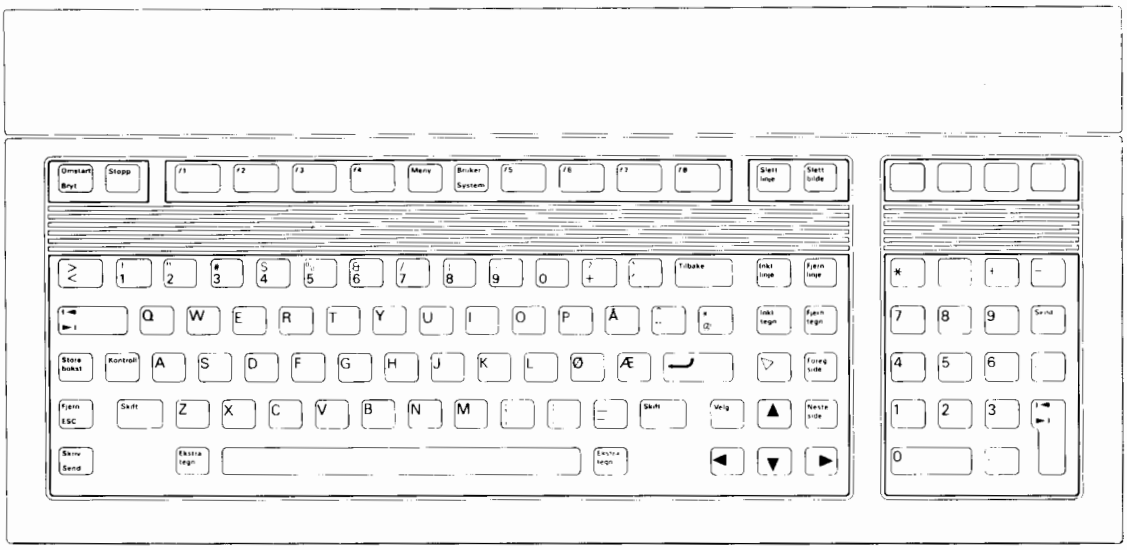

Figure A-11. Norwegian Keyboard (HP Part NO. 46010AN)

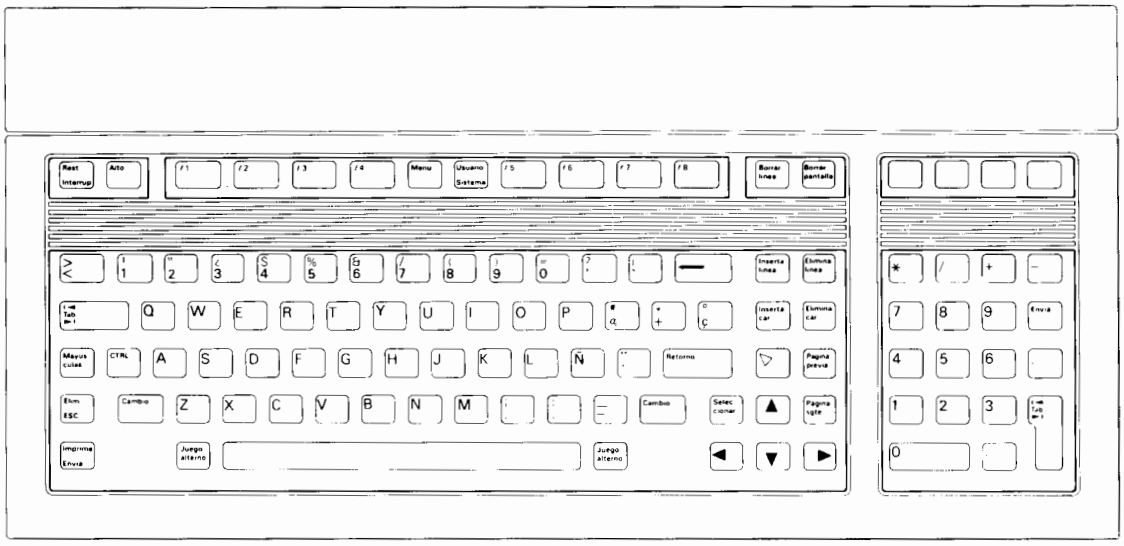

Figure A-12. Spanish (Europe) Keyboard (HP Part No. 46010AE)

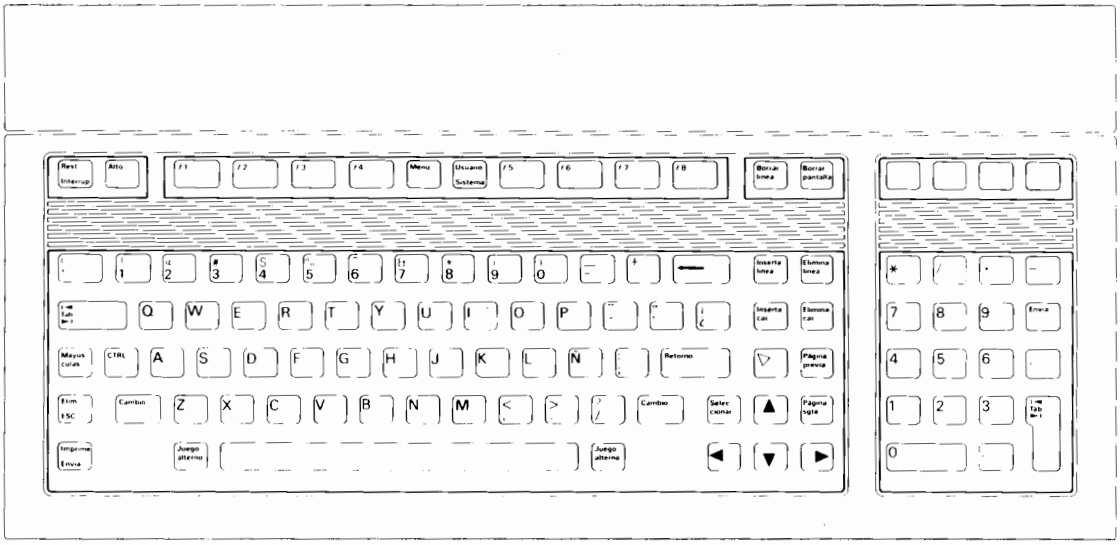

Figure A-13. Spanish (Latin Amer.) Keyboard (HP Part No. 46010AM)

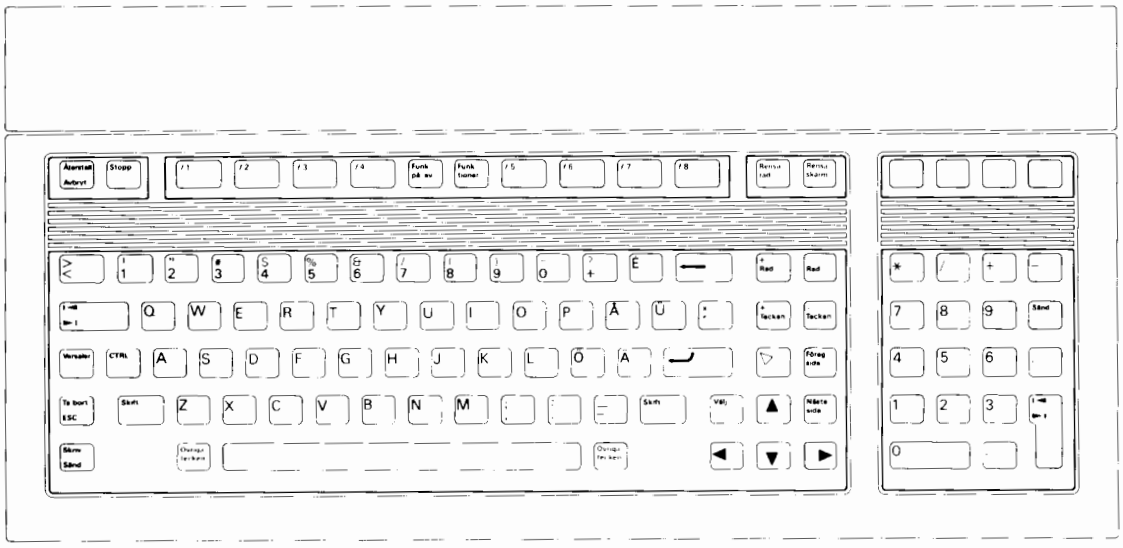

Figure A-14. Swedish Keyboard (HP Part No. 46010AS)

A-8 HP Touchscreen Keyboards

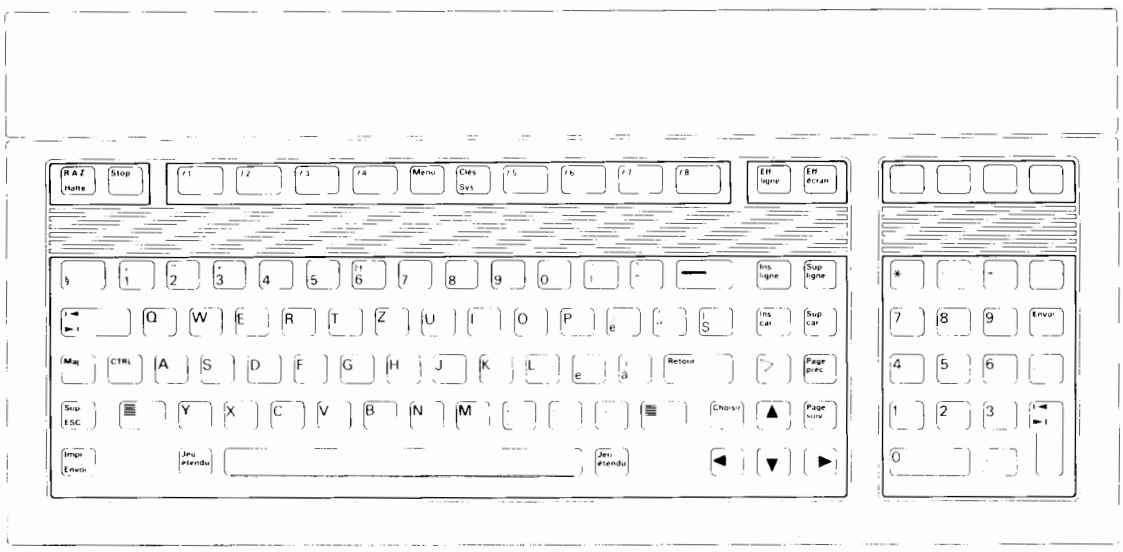

Figure A-15. Swiss French Keyboard (HP Part NO. 46010AQ)

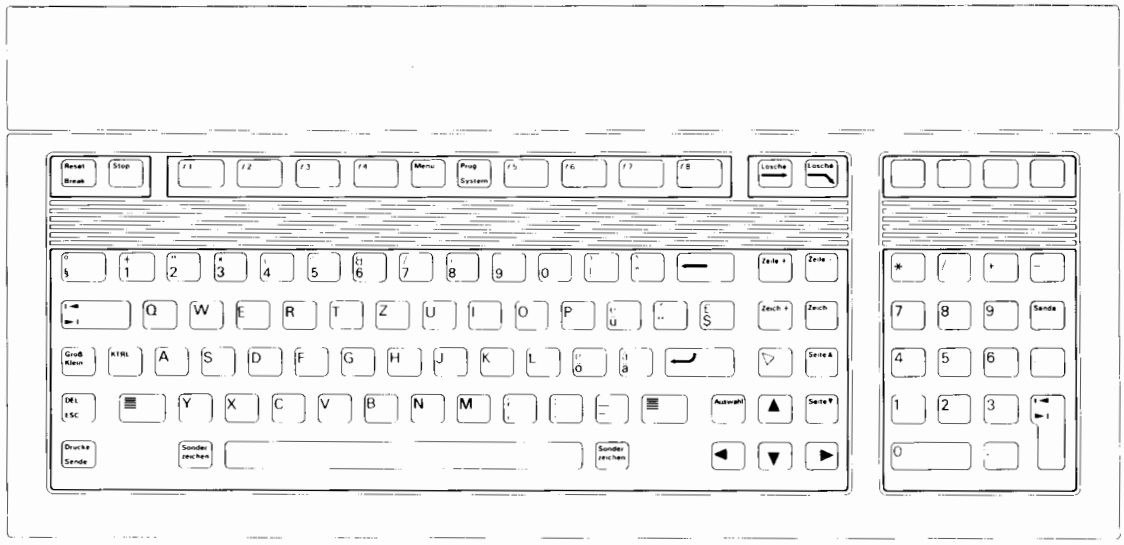

Figure A-16. Swiss German Keyboard (HP Part No. 46010AR)

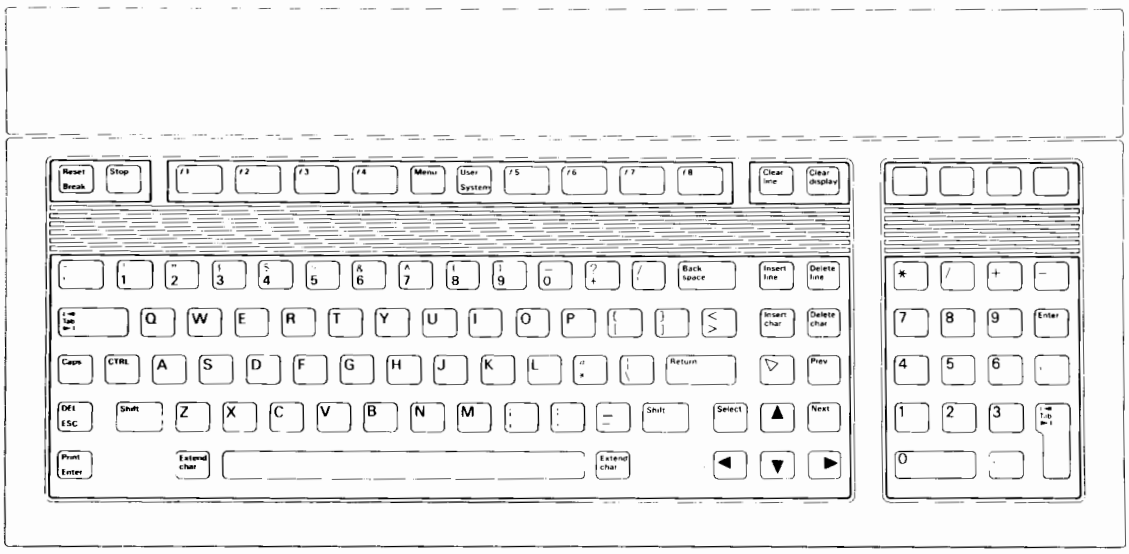

Figure A-17. United Kingdom Keyboard (HP Part No. 46010AU)

B

Function Labels

This appendix provides a chart to the function key labels. The chart below shows all the label sets. Each label set is arranged as an horizontal row and corresponds with the [f1] – [f8] keys located at the top of the keyboard. The first column on the left represents the key or function key label that you press or touch to obtain the label set on its immediate right.

For example, assume you need to select the device modes label. You can select the device modes label by doing the following:

1. Press the [User System] key to access the top level.
2. Touch the `device control` label and you have selected the device modes label.

	f1	f2	f3	f4	f5	f6	f7	f8
User System	device control	margins/ tabs/col	service keys	modes	enhance video	define fields	set time	config keys
device control	device modes		''to'' devices	ADVANCE PAGE	ADVANCE LINE	COPY ALL	COPY PAGE	COPY LINE
device modes	device control	RECORD MODE	LOG BOTTOM	LOG TOP		COMPRESS PRINT	REPORT PRINT	METRIC PRINT
"to" devices	device control	SERIAL DEVICE	INTERNAL PRINTER	TO DISPLAY	HP IB DEVICE			
margins/ tabs/col	START COLUMN	SET TAB	CLEAR TAB	CLR ALL TAB	LEFT MARGIN	RIGHT MARGINS	CLR ALL SPACES	TABS
service keys	POWER ON TEST	MEMORY TEST	TOUCHSCN ALGNMNT		SYSTEM TEST	IDENTIFY ROMS	DATACOMM TEST	INT PRT TEST
modes	LINE MODIFY	MODIFY ALL	BLOCK MODE	REMOTE MODE	SMOOTH SCROLL	MEMORY LOCK	DISPLAY FUNCTIONS	AUTO LFZ
enhance video (etc.)	define fields	SET ENHNCMNT	SECURITY VIDEO	INVERSE VIDEO	BLINK VIDEO	UNDRLINE VIDEO	HALF BRIGHT	etc
etc	CHANGE TO BASE	CHANGE TO MATH	CHANGE TO LINE					
define fields	enhance video	START UNPROTCT	START XMIT FLD	STOP FIELD	ALL CHARS	ONLY ALPHA	ONLY NUMERIC	FORMAT MODE
set time	HOURS FORWARD	HOURS BACK	MINUTES FORWARD	MINUTES BACK				
config keys	global config		port 1 config	port 2 config	terminal config	accessory config		

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C

Character Sets

Alternate Character Sets

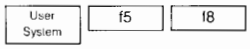
Your terminal can display symbols from three different character sets:

- the Roman 8 set, consisting of Roman style letters
- the Math set, consisting of mathematical symbols
- the Line-drawing set, consisting of various line segments

You may switch between these character sets on a character-by-character basis. For example, you may mix mathematical symbols within written text. You do this by defining different protions of a line to contain symbols from the appropriate character sts. You may envision each group of characters as a "field."

Selecting Alternate Sets

To use an alternate character set, you much first make the desired character set the active character set. From the keyboard, you may select between the three character sets by using the second level of the Video Enhancement function key labels. You access these keys by pressing:



This keystroke sequence displays the following labels:

Pressing [f2] selects the Math set to be the active character set and simultaneously updates the `Alternate Set` field in the Terminal Configuration menu to `''Math(A)''`. Pressing [f3] selects the Line-drawing set to be the active character set and simultaneously updates the `Alternate Set` field in the Terminal Configuration menu to `''Line(B)''`. Pressing [f1] returns the terminal to the base character set, but leaves unchanged the setting of the `Alternate Set` field in the Terminal Configuration menu.

You may also select the various character sets programmatically. However, this is a two-step process as you first specify which character set is to be the alternate character set; then, explicitly activate the alternate character set.

You select the base set at the alternate character set by issuing the escape sequence:

```
Ec)@
```

The assignment of the base set as the alternate character set results in no character distinction between characters displayed when the alternate character set is enabled and when it is not.

To select the Math character set as the alternate character set, you issue the escape sequence:

```
Ec)A
```

To select the Line Drawing set as the alternate character set, you issue the escape sequence:

```
Ec)B
```

Once you have specified an alternate character set, you access these characters by executing a "shift-out." From the keyboard, you shift-out from the base set by simultaneously pressing the CTRL and N keys. A running program may shift-out from the base set by issuing an ASCll <So> code. Once activated, all non-control characters received from the keyboard or over datacomm lines are displayed as the select symbols until one of the following conditions occurs:

- the base set is "shifted-in" by simultaneously pressing the CTRL and O keys or by receiving an ASCII <Si> code over the datacomm line
- a previously defined video enhancement is encountered
- the end of the line is reached

When the Math or Line-drawing set is used in 8-bit mode, the terminal interprets it as a 256 element set. The lower 128 elements are accessed when Extended Character mode is off. (This is the default state.) The upper 128 elements remain undefined. Accessing these characters through the keyboard when Extended Characters mode is on prints blank characters.

The placement of alternate character set symbols varies, in part, between the different keyboard options. The following discussions and illustrations pertain to the USASCII keyboard.

The Math Character Set

When the Math Set is selected as the active alternate character set, the keyboard generates the mathematical symbols shown in Figure C-1. You may construct the integral sign to occupy two, or several, screen rows. Similarly, you may construct left and right brackets of varying sizes. However, drawing the top and bottom "corner" segments of these figures requires your accessing the Line-drawing character set. Some examples of all three symbols follow. (For the bracket symbols, "L:" signifies that you must activate the Line-drawing character set. The remaining symbols correlate to the Math character set.)

Once the Math set has been selected as the Alternate Character set, you enable it with a <So> control code (control-N) and disable it with a <Si> control code (control-O).

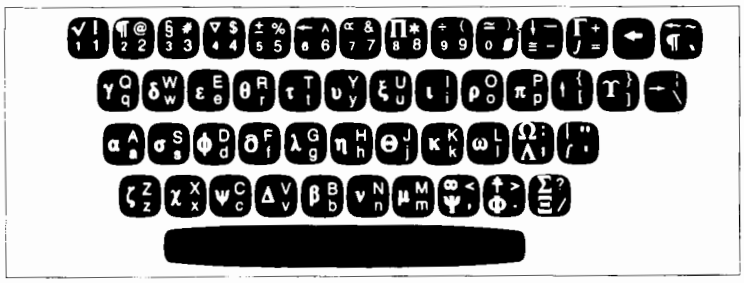


Figure C-1. Math Character Set

The Line Drawing Set

When the Line Drawing set is selected as the active alternate character set, you can construct data entry forms by combining different types of line segments. Figure C-2 shows the correspondence between the line-drawing characters and the USASCII keyboard.

Once the Line-drawing set has been selected as the Alternate Character set, you enable it with a <So> code (control-N) and disable it with a <Si> control code (control-O).

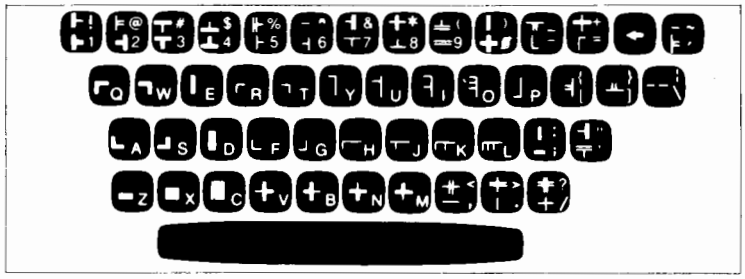


Figure C-2. Line Drawing Set Elements

Support For International Languages

Depending upon its keyboard option number, your terminal supports one of the following languages:

- Danish
- Dutch
- English (United Kingdom)
- English (USASCII)
- Finnish
- French

- French Canadian
- German
- Italian
- Norwegian
- Spanish
- Swedish

The national language keyboards approximate the standard typewriter layouts for their respective countries. Additionally, the terminal provides "translated" versions for the various menus, softkeys, status line indicators, and error messages.

For keyboard options whose local language support "mute" characters, the terminal processes diacritic and accent keystrokes as follows:

When you enter a diacritic mark (such as ör), the cursor retains its current position. If the next-typed character is a vowel that can be combined with that mark, the two characters are merged before the cursor advances to the next position. If the next-typed character is unacceptable, the just entered character replaces the mute symbol as the displayed character, and the cursor advances to the next position. The case may arise, however, when you want to enter just the diacritic mark or accent character. Therefore, if you type a space after a mute symbol, the mute symbol remains displayed and the cursor advances to the next character position.

7-Bit Vs 8-Bit Operation

The terminal has two modes of operation that affect how characters received from datacomm are interpreted by the terminal. The modes are named for the number of significant bits they contain. In 8-bit mode all bits are significant; thus no bit is available for parity checking. In 7-bit mode, the seven low-order bits contain valid data. The eighth bit may be used for parity checking, or it may be ignored.

7-BIT MODE. When the terminal is configured for 7-bit mode, the least significant seven bits of the character byte determine the character's identity. When you are in 7-bit mode, only USASCII characters are accessible.

To configure the terminal for 7-bit mode, set the `ASCII 8 Bits` field in the Terminal Configuration menu to `No` or send the escape sequence:

```
Ec&01
```

8-BIT MODE. When the terminal is configured for 8-bit mode, the host and termial can access any alphanumeric character. For keyboard access, refer to the following section on Extended Characters mode.

In interpreting data transfers from the host computer, the terminal uses all eight data bits. If the eighth bit is set (value = 1), the terminal interprets the code as a Roman Extension character. If the eighth fit is cleared (value = 0) the terminal interprets the code as appropriate for its national language (that is, the terminal's base character set).

When using 8-bit mode, you must set the `Parity` field in the Datacomm Configuration menu to `None`, and you must set the `DataBits` field to `8`. Failure to do so will cause data communication problems with the host computer.

8-bit mode also changes with operation of the numeric keypad. When the terminal is in 8-bit mode and the keypad is defined for numeric operation, the numeric keys have shifted functions as shown in table C-1.

Table C-1. Shifted Functions of the Numeric Pad in 8-Bit Mode

Key	Shifted Character
0	^
.	~
1	{
2	|
3	}
4	[
5	\
6	]
7	#
8	'
9	@

To configure the terminal for 8-bit mode, set the `ASCII 8 Bits` field in the Terminal Configuration menu to `Yes`, or send the escape sequence:

```
Ec&k1I
```

The extended character set is used by the HP 3000 and HP 250 computer systems and the HP 2631 and HP 2608 printers. Also, since the default parity used by the HP 3000 system is 000, you must log onto the computer using `Term Type 12` in order to receive all 8 data bits.

Extended Characters

The terminal comes with an extended character set that supports the special characters associated with several international languages. Regardless of the keyboard used, the [Extend char] key allows you to type the characters shown in Figure C-3. This key grants full access to the Roman 8 character set. Two critical points are:

- You must configure the terminal for 8-bit mode (set the `ASCII 8 Bits` field in the Terminal Configuration menu to `Yes`.
- You can only enter Extended Characters through the keyboard.

Using the [Extend char] key, you may select any character foreign to your "native" base character set. Figure C-3 shows the correspondence between keys on the USASCII keyboard and the extended characters they generate.

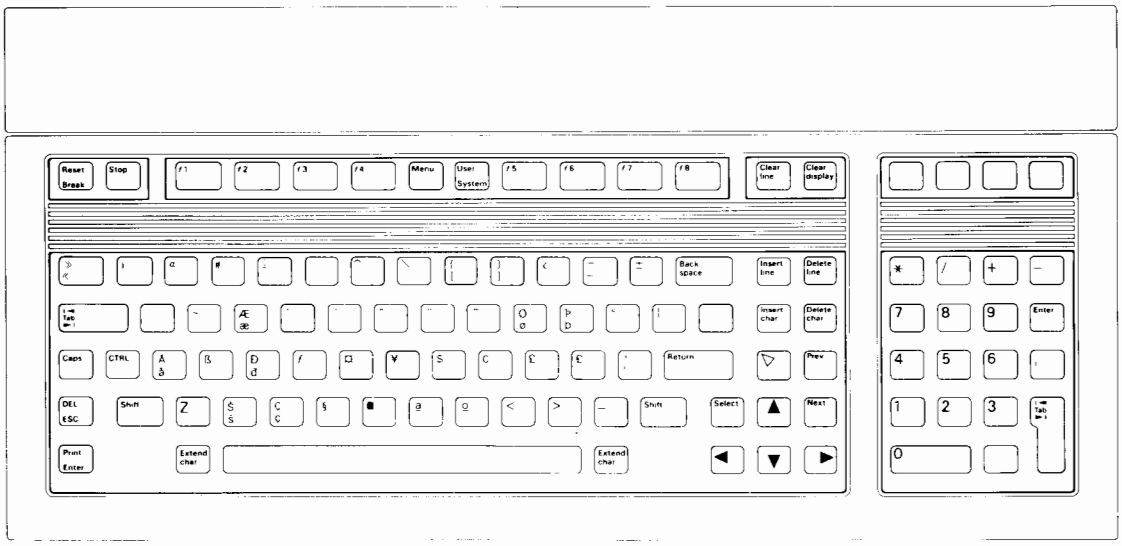


Figure C-3. Mapping of Roman 8 Character Set Accessed by the [Extend char] key.

From the keyboard, you enter Extended Characters by holding down the [Extend char] key and typing the desired extended character key. When you release the [Extend char] key, you return to the base character set. Unlike the alternate character sets which end when a new line begins, Extended Characters remains active until you release the [Extend char] key.

Example: Type the extended character ¢.

1. Refer to Figure C-3 for the corresponding key to the character "¢". This key is the [K] key.
2. Hold down the [Extend char] key and press the [K] key. The corresponding ¢ character should appear on the screen.

Being a keyboard function, Extended Characters only affect data entered from the keyboard. It has no effect on data received over the datacomm lines.

Figure C-4 shows the bit-mapping for the Roman extension character set, and Table C-2 summarizes this set.

b_8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
b_7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
b_6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
b_5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

b_4	b_3	b_2	b_1		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p				—	â	Å	Á	Þ
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q			À		ê	î	Ã	þ
0	0	1	0	2	STX	DC2	"	2	B	R	b	r			Â		ô	ø	ã	
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s			È	°	û	Æ	Đ	
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t			Ê	Ç	á	å	đ	
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u			Ë	ç	é	ı	Í	
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v			Î	Ñ	ó	ø	Ì	—
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w			Ï	ñ	ú	æ	Ó	¼
1	0	0	0	8	BS	CAN	(	8	H	X	h	x			´	¡	à	Ä	Ò	½
1	0	0	1	9	HT	EM	)	9	I	Y	i	y			`	¿	è	ì	Õ	a
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z			^	¤	ò	Ö	õ	º
1	0	1	1	11	VT	ESC	+	;	K	[	k	{			¨	£	ù	Ü	Š	«
1	1	0	0	12	FF	FS	,	<	L	\	|	\			~	¥	ä	É	š	■
1	1	0	1	13	CR	GS	-	=	M	]	m	}			Ù	§	ë	ï	Ú	»
1	1	1	0	14	SO	RS	.	>	N	△	N	~			Û	ƒ	ö	ß	Ÿ	±
1	1	1	1	15	SI	US	/	?	O	_	o	DEL			₤	¢	ü	O	ÿ	

Figure C-4. Bit Mapping For Roman 8 Character Set

Graphic	Hex	Dec	Oct	Description
	00	0	000	NUL (null)
	01	1	001	SOH (start of heading)
	02	2	002	STX (start of text)
	03	3	003	ETX (end of text)
	04	4	004	EOT (end of transmission)
	05	5	005	ENQ (enquiry)
	06	6	006	ACK (acknowledge)
	07	7	007	BEL (bell)
	08	8	010	BS (backspace)
	09	9	011	HT (horizontal tabulation)
	0A	10	012	LF (line feed)
	0B	11	013	VT (vertical tabulation)
	0C	12	014	FF (form feed)
	0D	13	015	CR (carriage return)
	0E	14	016	SO (shift out)
	0F	15	017	SI (shift in)
	10	16	020	DLE (data link escape)
	11	17	021	DC1 (device control 1 or X-ON)
	12	18	022	DC2 (device control 2)
	13	19	023	DC3 (device control 3 or X-OFF)
	14	20	024	DC4 (device control 4)
	15	21	025	NAK (negative acknowledge)
	16	22	026	SYN (synchronous idle)
	17	23	027	ETB (end of transmission block)
	18	24	030	CAN (cancel)
	19	25	031	EM (end of medium)
	1A	26	032	SUB (substitute)
	1B	27	033	ESC (escape)
	1C	28	034	FS (file separator)
	1D	29	035	GS (group separator)
	1E	30	036	RS (record separator)
	1F	31	037	US (unit separator)
	20	32	040	Space
!	21	33	041	Exclamation point
"	22	34	042	Quotation mark
#	23	35	043	Number sign (bash mark)

Table C-2. Roman 8 Character Set

Graphic	Hex	Dec	Oct	Description
$	24	36	044	Dollar sign
%	25	37	045	Percent sign
&	26	38	046	Ampersand
'	27	39	047	Apostrophe (closing single quote)
(	28	40	050	Opening parenthesis
)	29	41	051	Closing parenthesis
*	2A	42	052	Asterisk
+	2B	43	053	Plus
,	2C	44	054	Comma
-	2D	45	055	Hyphen (minus)
.	2E	46	056	Period (point)
/	2F	47	057	Slant (solidus)
0	30	48	060	Zero
1	31	49	061	One
2	32	50	062	Two
3	33	51	063	Three
4	34	52	064	Four
5	35	53	065	Five
6	36	54	066	Six
7	37	55	067	Seven
8	38	56	070	Eight
9	39	57	071	Nine
:	3A	58	072	Colon
;	3B	59	073	Semicolon
<	3C	60	074	Less than sign
=	3D	61	075	Equal sign
>	3E	62	076	Greater than sign
?	3F	63	077	Question mark
@	40	64	100	Commercial at
A	41	65	101	Uppercase A
B	42	66	102	Uppercase B
C	43	67	103	Uppercase C
D	44	68	104	Uppercase D
E	45	69	105	Uppercase E
F	46	70	106	Uppercase F
G	47	71	107	Uppercase G

Table C-2. Roman 8 Character Set (Continued)

Graphic	Hex	Dec	Oct	Description
H	48	72	110	Uppercase H
I	49	73	111	Uppercase I
J	4A	74	112	Uppercase J
K	4B	75	113	Uppercase K
L	4C	76	114	Uppercase L
M	4D	77	115	Uppercase M
N	4E	78	116	Uppercase N
O	4F	79	117	Uppercase O
P	50	80	120	Uppercase P
Q	51	81	121	Uppercase Q
R	52	82	122	Uppercase R
S	53	83	123	Uppercase S
T	54	84	124	Uppercase T
U	55	85	125	Uppercase U
V	56	86	126	Uppercase V
W	57	87	127	Uppercase W
X	58	88	130	Uppercase X
Y	59	89	131	Uppercase Y
Z	5A	90	132	Uppercase Z
[	5B	91	133	Opening square bracket
\	5C	92	134	Reverse slant
]	5D	93	135	Closing square bracket
^	5E	94	136	Caret (circumflex)
_	5F	95	137	Underscore (low line)
`	60	96	140	Opening single quote
a	61	97	141	Lowercase a
b	62	98	142	Lowercase b
c	63	99	143	Lowercase c
d	64	100	144	Lowercase d
e	65	101	145	Lowercase e
f	66	102	146	Lowercase f
g	67	103	147	Lowercase g
h	68	104	150	Lowercase h
i	69	105	151	Lowercase i
j	6A	106	152	Lowercase j
k	6B	107	153	Lowercase k
l	6C	108	154	Lowercase l
m	6D	109	155	Lowercase m
n	6E	110	156	Lowercase n
o	6F	111	157	Lowercase o

Table C-2. Roman 8 Character Set (Continued)

Graphic	Hex	Dec	Oct	Description
p	70	112	160	Lowercase p
q	71	113	161	Lowercase q
r	72	114	162	Lowercase r
s	73	115	163	Lowercase s
t	74	116	164	Lowercase t
u	75	117	165	Lowercase u
v	76	118	166	Lowercase v
w	77	119	167	Lowercase w
x	78	120	170	Lowercase x
y	79	121	171	Lowercase y
z	7A	122	172	Lowercase z
{	7B	123	173	Opening brace (curly bracket)
|	7C	124	174	Vertical line
}	7D	125	175	Closing brace (curly bracket)
~	7E	126	176	Tilde
	7F	127	177	Delete (rubout)
	80	128	200	--undefined control code--
	81	129	201	--undefined control code--
	82	130	202	--undefined control code--
	83	131	203	--undefined control code--
	84	132	204	--undefined control code--
	85	133	205	--undefined control code--
	86	134	206	--undefined control code--
	87	135	207	--undefined control code--
	88	136	210	--undefined control code--
	89	137	211	--undefined control code--
	8A	138	212	--undefined control code--
	8B	139	213	--undefined control code--
	8C	140	214	--undefined control code--
	8D	141	215	--undefined control code--
	8E	142	216	--undefined control code--
	8F	143	217	--undefined control code--
	90	144	220	--undefined control code--
	91	145	221	--undefined control code--
	92	146	222	--undefined control code--
	93	147	223	--undefined control code--
	94	148	224	--undefined control code--
	95	149	225	--undefined control code--
	96	150	226	--undefined control code--
	97	151	227	--undefined control code--

Table C-2. Roman 8 Character Set (Continued)

Graphic	Hex	Dec	Oct	Description
	98	152	230	--undefined control code--
	99	153	231	--undefined control code--
	9A	154	232	--undefined control code--
	9B	155	233	--undefined control code--
	9C	156	234	--undefined control code--
	9D	157	235	--undefined control code--
	9E	158	236	--undefined control code--
	9F	159	237	--undefined control code--
	A0	160	240	--undefined--
À	A1	161	241	Uppercase A grave accent
Â	A2	162	242	Uppercase A circumflex
È	A3	163	243	Uppercase E grave accent
Ê	A4	164	244	Uppercase E circumflex
Ë	A5	165	245	Uppercase E umlaut or diaeresis
Î	A6	166	246	Uppercase I circumflex
Ï	A7	167	247	Uppercase I umlaut or diaeresis
´	A8	168	250	Acute accent
`	A9	169	251	Grave accent
^	AA	170	252	Circumflex accent
¨	AB	171	253	Umlaut (diaeresis) accent
~	AC	172	254	Tilde accent
Ù	AD	173	255	Uppercase U grave accent
Û	AE	174	256	Uppercase U circumflex
£	AF	175	257	Italian Lira symbol
¯	B0	176	260	Over line (high line)
	B1	177	261	--undefined--
	B2	178	262	--undefined--
°	B3	179	263	Degree (ring)
Ç	B4	180	264	Uppercase C cedilla
ç	B5	181	265	Lowercase c cedilla
Ñ	B6	182	266	Uppercase N tilde
ñ	B7	183	267	Lowercase n tilde
¡	B8	184	270	Inverse exclamation mark
¿	B9	185	271	Inverse question mark
¤	BA	186	272	General currency symbol
£	BB	187	273	British pound sign
¥	BC	188	274	Japanese yen symbol

Table C-2. Roman 8 Character Set (Continued)

Graphic	Hex	Dec	Oct	Description
§	BD	189	275	Section sign
ƒ	BE	190	276	Dutch guilder symbol
¢	BF	191	277	U.S. cent symbol
â	C0	192	300	Lowercase a circumflex
ê	C1	193	301	Lowercase e circumflex
ô	C2	194	302	Lowercase o circumflex
û	C3	195	303	Lowercase u circumflex
á	C4	196	304	Lowercase a acute accent
é	C5	197	305	Lowercase e acute accent
ó	C6	198	306	Lowercase o acute accent
ú	C7	199	307	Lowercase u acute accent
à	C8	200	310	Lowercase a grave accent
è	C9	201	311	Lowercase e grave accent
ò	CA	202	312	Lowercase o grave accent
ù	CB	203	313	Lowercase u grave accent
ä	CC	204	314	Lowercase a umlaut or diaeresis
ë	CD	205	315	Lowercase e umlaut or diaeresis
ö	CE	206	316	Lowercase o umlaut or diaeresis
ü	CF	207	317	Lowercase u umlaut or diaeresis
À	D0	208	320	Uppercase A degree
î	D1	209	321	Lowercase i circumflex
Ø	D2	210	322	Uppercase O crossbar
Æ	D3	211	323	Uppercase AE ligature
å	D4	212	324	Lowercase a degree
í	D5	213	325	Lowercase i acute accent
ø	D6	214	326	Lowercase o crossbar
æ	D7	215	327	Lowercase ae ligature
Ä	D8	216	330	Uppercase A umlaut or diaeresis
ì	D9	217	331	Lowercase i grave accent
Ö	DA	218	332	Uppercase O umlaut or diaeresis
Ü	DB	219	333	Uppercase U umlaut or diaeresis
É	DC	220	334	Uppercase E acute accent
ï	DD	221	335	Lowercase i umlaut or

Table C-2. Roman 8 Character Set (Continued)

Graphic	Hex	Dec	Oct	Description
				diaeresis
ß	DE	222	336	Sharp s
Ô	DF	223	337	Uppercase O circumflex
Á	E0	224	340	Uppercase A acute accent
Ã	E1	225	341	Uppercase A tilde
ã	E2	226	342	Lowercase a tilde
Đ	E3	227	343	Uppercase D with stroke
đ	E4	228	344	Lowercase d with stroke
Í	E5	229	345	Uppercase I acute accent
Ì	E6	230	346	Uppercase I grave accent
Ó	E7	231	347	Uppercase O acute accent
Ò	E8	232	350	Uppercase O grave accent
Õ	E9	233	351	Uppercase O tilde
õ	EA	234	352	Lowercase o tilde
S	EB	235	353	Uppercase S with caron
s	EC	236	354	Lowercase s with caron
Ú	ED	237	355	Uppercase U acute accent
Ÿ	EE	238	356	Uppercase Y umlaut or diaeresis
ÿ	EF	239	357	Lowercase y umlaut or diaeresis
Þ	F0	240	360	Uppercase Thorn
þ	F1	241	361	Lowercase thorn
	F2	242	362	--undefined--
	F3	243	363	--undefined--
	F4	244	364	--undefined--
	F5	245	365	--undefined--
—	F6	246	366	Long dash (horizontal bar)
¼	F7	247	367	One fourth (one quarter)
½	F8	248	370	One half
a	F9	249	371	Feminine ordinal indicator
º	FA	250	372	Masculine ordinal indicator
<<	FB	251	373	Opening guillemets (angle quotes)
■	FC	252	374	Solid
>>	FD	253	375	Closing guillemets (angle quotes)
±	FE	254	376	Plus/minus sign
	FF	255	377	--undefined--

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