

# HEWLETT-PACKARD

- ◆ Software Development System  
Getting Started Guide



HP-94  
Handheld Industrial  
Computer

# **HP-94 Handheld Industrial Computer**

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## **Software Development System Getting Started Guide**

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## NOTICE

**BEFORE USING THIS HP94 HANDHELD INDUSTRIAL COMPUTER, YOU MUST DO THE FOLLOWING:**

- **Install the lithium memory-backup batteries.** Refer to the *User's Documentation Kit* for instructions on how to do this.
- **Fully charge the main Nickel-Cadmium (NiCad) battery.** Refer to the *User's Documentation Kit* for instructions on how to charge the battery.

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### NOTE

To bring the main battery up to full charge for the first time or after the battery has been stored for a period of two or more months, perform the charging procedure for 12 to 16 hours. At any other time, the battery should not be charged for more than the normal 7 to 13 hours.

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### STORAGE RECOMMENDATIONS

If you wish to store the HP-94 for more than two months, it is recommended that you remove the lithium and main batteries, and store them separately.

Make sure the lithium batteries are stored so that they can not accidentally be shorted out and discharged.

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### NOTE

If you wish to retain a program installed in the HP-94 while the computer is in storage, do not remove the lithium batteries. (Refer to the *User's Documentation Kit* for further information regarding the lithium batteries.)

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*Whenever the main battery has been stored for more than two months, it should be fully charged as described above.*

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## Introduction

Application programs for the HP-94 are created and compiled on a development computer. Program files thus created, as well as any data files, must then be converted into suitable form before being transferred to the HP-94 or to an EPROM programmer. The HP 82520A Software Development System (SDS) provides you with the software needed to perform these tasks.

This guide will help you get started using the SDS. It is organized as follows:

- Introduction
- A guide to the documentation available for the SDS. This is in tabular format and shows the relationship between various functions of the system and the documentation associated with them.
- A list of required equipment.
- Diagrams showing equipment connections.
- A step-by-step description of the development process, including the development of two sample programs and the transfer of the programs to the HP-94.
- A section covering what to do in case of difficulty.

There are more detailed manuals in the software development system, but if you read this manual thoroughly first you will have a good insight into the software development process for the HP-94.

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**NOTE** Be sure that the memory backup batteries have been installed in your HP-94. Also, be sure that the main battery pack on the HP-94 is fully charged. Refer to the *User's Documentation Kit* for complete information on these tasks.

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## Creating an SDS Work Disc

Before proceeding further, make a work copy of your SDS master disc. Refer to your development system computer documentation for information on making a work copy. Place the SDS master disc in a safe place, and use your work copy for all SDS work.

## Documentation Guide

Use the table below to find the proper document for the specific task you have in mind.

If You Are Interested In	And You Want To Do This	Read This
Software Development	Get a brief description Find detailed information	This guide <i>Utilities Reference Manual</i>
HXBASIC Program Development Utility	Learn file management, debugging, and program editing commands	<i>Utilities Reference Manual</i> , chapter 2
HXC File Conversion Utility	Get a brief description Find detailed information	This guide <i>Utilities Reference Manual</i> , chapter 3
HXCOPY File Copy Utility	Get a brief description Find detailed information	This guide <i>Utilities Reference Manual</i> , chapter 5
HXMODE Handshaking Utility	Get a brief description Find detailed information	This guide <i>Utilities Reference Manual</i> , chapter 6
HP-94 BASIC Language	Find detailed information Interpret error messages	<i>BASIC Reference Manual</i> <i>BASIC Reference Manual</i> , appendix B
Assembly language programming	Find detailed information	<i>HP 82521A Technical Reference Manual</i> *
HP-94 Operating System	Find detailed information Learn the Commands Interpret error messages	<i>HP 82521A Technical Reference Manual</i> *
Setting up the HP-94	Install memory backup batteries Charge main battery	<i>Utilities Reference Manual</i> , chapter 7 <i>Utilities Reference Manual</i> , appendix A <i>User's Documentation Kit</i> <i>User's Documentation Kit</i>

\*Available from your HP representative.

## Equipment Required

In order to develop software to be used on the HP-94, you must have access to one of the following personal computers:

- Hewlett-Packard Vectra.
- IBM PC.
- IBM PC/XT.
- IBM PC/AT.

An RS-232-C Level Converter (HP 82470A) may be required between the development computer and the HP-94, depending on which personal computer is used. The following table shows when a level converter must be used for a given type of computer and serial interface, and the cables necessary to connect the equipment.

<b>Development Computer</b>	<b>Interface Used</b>	<b>Level Converter Required?</b>	<b>Cables</b>		
			<b>Computer to Level Converter</b>	<b>Level Converter to HP-94</b>	<b>Computer to HP-94</b>
HP Vectra	HP 24540A Serial/Parallel (9-pin male)	No	—	—	HP 82436A
HP Vectra	HP 24541A Dual Serial (9-pin male)	No	—	—	HP 82436A
HP Vectra	HP 24541A Dual Serial (25-pin female)	No	—	—	No Cable
IBM PC	Serial (25-pin male)	Yes	HP 17255D*	HP 82435A	—
IBM PC/XT	Serial (25-pin male)	Yes	HP 17255D*	HP 82435A	—
IBM PC/AT	Serial (9-pin male)	Yes	HP 24542G	HP 82435A	—

\*The HP 17255D is a 1 meter cable. Also available are 2 and 5 meter cables, HP 82974D and HP 13242H, respectively.

From the table above, determine which cables you will need to connect your equipment. If you are using an HP Vectra, note that there are two interface cards available, the HP 24540A Serial/Parallel and the HP 24541A Dual Serial. Be sure to use the cables for the type of interface you have.

If you wish to build your own cables, use the connector wiring diagrams on the following pages. In all cases, the connector housings should be wired together using the braid or shield in the cable. Note that if you wish to use the HP Vectra 25-pin serial port on the HP 24541A Dual/Serial interface, you must build your own cable as there is none available.

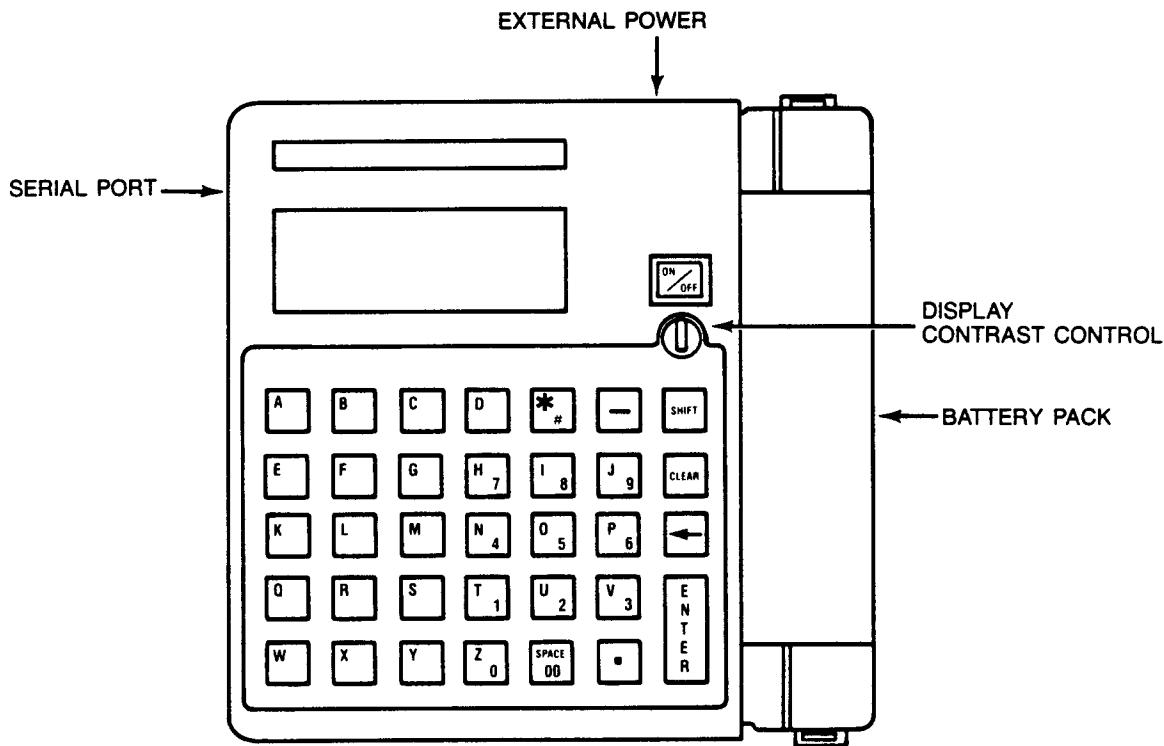
If you are using a personal computer other than those shown above, you may need to use a level converter if the device you are using has an input low-to-high transition threshold greater than 4.2 volts, a high-to-low transition threshold less than 0.2 volts, and the input impedance is greater than 3000 ohms. Refer to your owner's documentation or ask the manufacturer for this information.

**NOTE**

The maximum cable length recommended for use without a level converter is three meters. If you use a longer cable you **must** use a level converter regardless of which PC you are using for development. If you must use a level converter with a Vectra because of cable length, the 9-pin serial ports should use the AT-to-level converter cable (HP 24542G). The 25-pin port (dual serial) does not have a cable available. You will have to build a cable using the wiring diagram shown on page 6.

## The HP-94

The HP-94 is a handheld, battery operated computer suitable for use in many applications. The figure below shows the HP-94 keyboard and external connections. Refer to the section entitled "Getting Acquainted With Your HP-94" in the *User's Documentation Kit* for more detailed information. The section entitled "Setting Up the HP-94" on page 22 of this guide will show you how to operate the HP-94.



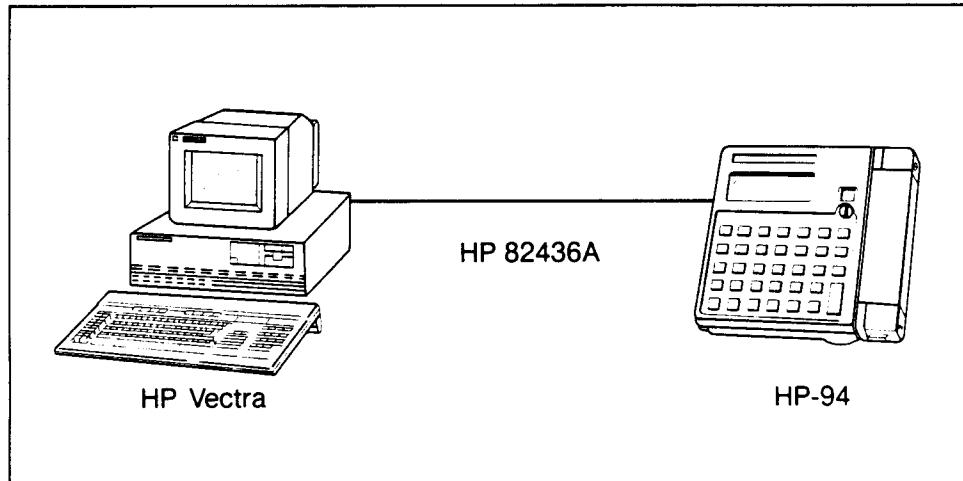
## Connecting the Equipment

You will need the proper cables to connect the various pieces of equipment. The type of cable to use depends on the computer you are using as a development computer, and whether or not a level converter is needed. The following information is intended as a guide in case you want to build your own cables. The pin assignments are shown for each end of the cable, and all of the possible system configurations are covered. Connect the equipment as shown in the diagram which most nearly represents your system.

**HP Vectra to HP-94 Cable (HP 82436A)**  
**9-Pin Serial/Parallel or Dual Serial Interface\***

HP Vectra 9-Pin Female Connector			HP-94 15-Pin Male Connector		
Signal Name	Symbol	Pin Number	Pin Number	Symbol	Signal Name
Receive Data	BB	2	2	TXD	Transmit Data
Transmit Data	BA	3	3	RXD	Receive Data
Data Terminal Ready	CD	4	5	CTS	Clear to Send*
Data Terminal Ready	CD	4	6	DSR	Data Set Ready*
Signal Ground	AB	5	7	SG	Signal Ground
Data Set Ready*	CC	6	15	DTR	Data Terminal Ready
Clear to Send*	CB	8	15	DTR	Data Terminal Ready

\*Pins 6 and 8 on the Vectra side are tied together and connected to pin 15 on the HP-94 side. Pins 5 and 6 on the HP-94 side are tied together and connected to pin 4 on the HP Vectra side.



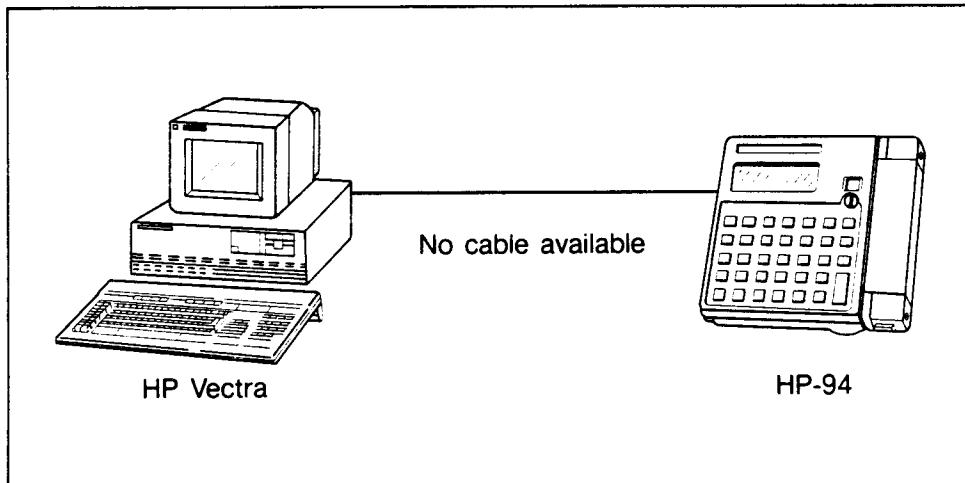
**HP Vectra (9-Pin Connector) to HP-94**

\* This is the recommended method of connecting the HP Vectra to the HP-94 when the cable length is less than three meters.

**HP Vectra to HP-94 Cable (No cable available)**  
**25-Pin Dual Serial Interface\***

<b>HP Vectra 25-Pin Male Connector</b>			<b>HP-94 15-Pin Male Connector</b>		
<b>Signal Name</b>	<b>Symbol</b>	<b>Pin Number</b>	<b>Pin Number</b>	<b>Symbol</b>	<b>Signal Name</b>
Transmit Data	BA	2	3	RXD	Receive Data
Receive Data	BB	3	2	TXD	Transmit Data
Clear to Send	CB	5	15	DTR	Data Terminal Ready*
Data Set Ready	CC	6	15	DTR	Data Terminal Ready*
Signal Ground	AB	7	7	SG	Signal Ground
Data Terminal Ready*	CD	20	5	CTS	Clear to Send
Data Terminal Ready*	CD	20	6	DSR	Data Set Ready

\*Pins 5 and 6 on the HP Vectra side are tied together and connected to pin 15 on the HP-94 side. Pins 5 and 6 on the HP-94 side are tied together and connected to pin 20 on the HP Vectra side.



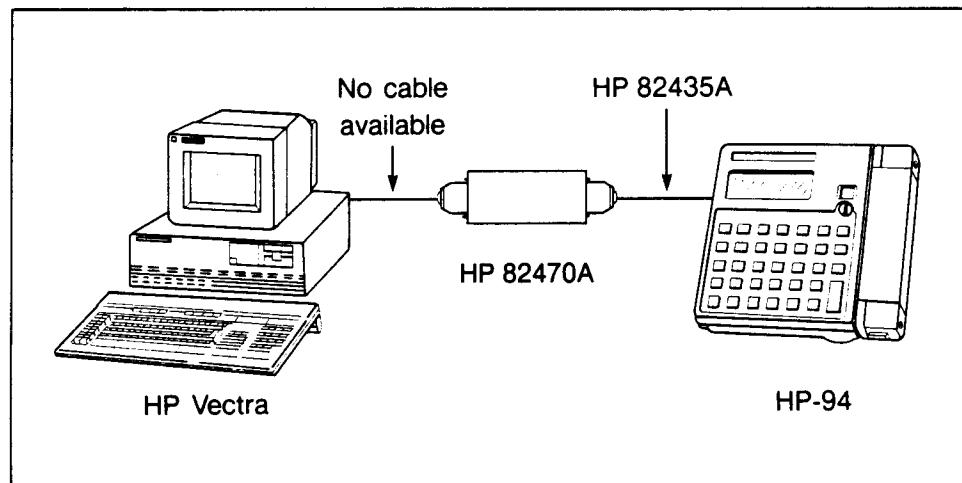
**HP Vectra (25-Pin Connector) to HP-94**

\* This is the recommended method of connecting the HP Vectra to the HP-94 when the cable length is less than three meters and the 9-pin serial connector on the Vectra is in use.

**HP Vectra to HP-82470A Level Converter Cable  
25-Pin Dual Serial Interface\***

HP Vectra 25-Pin Male Connector			Level Converter 25-Pin Male Connector		
Signal Name	Symbol	Pin Number	Pin Number	Symbol	Signal Name
Frame Ground	FG	1	1	FG	Frame Ground
Transmit Data	TXD	2	3	RXD	Receive Data
Receive Data	RXD	3	2	TXD	Transmit Data
Clear to Send	CTS	5	20	DTR	Data Terminal Ready*
Data Set Ready	DSR	6	20	DTR	Data Terminal Ready*
Signal Ground	SG	7	7	SG	Signal Ground
Data Terminal Ready*	DTR	20	5	CTS	Clear to Send
Data Terminal Ready*	DTR	20	6	DSR	Data Set Ready

\*Pins 5 and 6 on the HP Vectra side are tied together and connected to pin 20 on the level converter side.  
Pins 5 and 6 on the level converter side are tied together and connected to pin 20 on the HP Vectra side.



**HP Vectra (25-Pin Connector) to Level Converter**

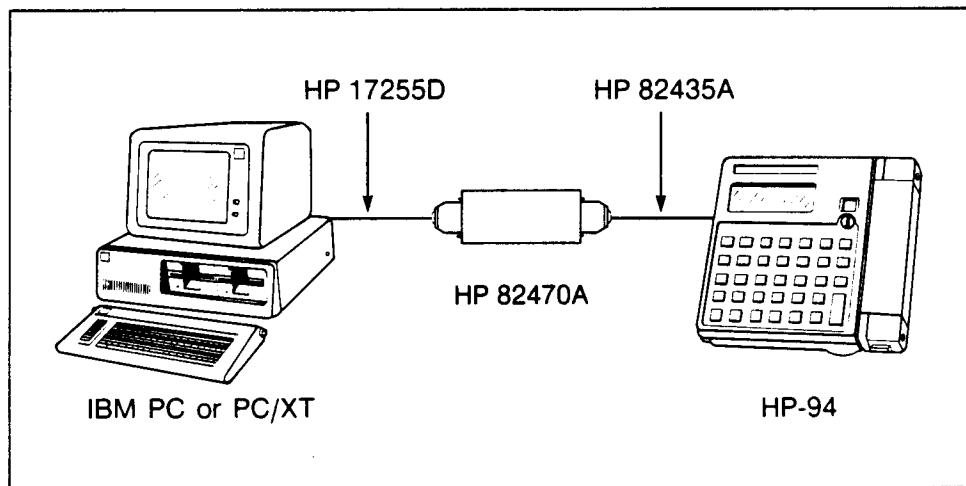
\* This is the required method of connecting the HP Vectra to the HP-94 when the cable length is greater than three meters and the 9-pin serial connector is in use.

### IBM PC or PC/XT to HP 82470A Level Converter Cable (HP 17255D)

IBM PC or PC/XT 25-Pin Female Connector			Level Converter 25-Pin Male Connector		
Signal Name	Symbol	Pin Number	Pin Number	Symbol	Signal Name
Frame Ground	FG	1	1	FG	Frame Ground
Transmit Data	TXD	2	3	RXD	Receive Data
Receive Data	RXD	3	2	TXD	Transmit Data
Clear to Send	CTS	5	20	DTR	Data Terminal Ready*
Data Set Ready	DSR	6	20	DTR	Data Terminal Ready*
Signal Ground	SG	7	7	SG	Signal Ground
Data Terminal Ready*	DTR	20	5	CTS	Clear to Send
Data Terminal Ready*	DTR	20	6	DSR	Data Set Ready

\*Pins 5 and 6 on the IBM side are tied together and connected to pin 20 on the level converter side.

Pins 5 and 6 on the level converter side are tied together and connected to pin 20 on the IBM side.

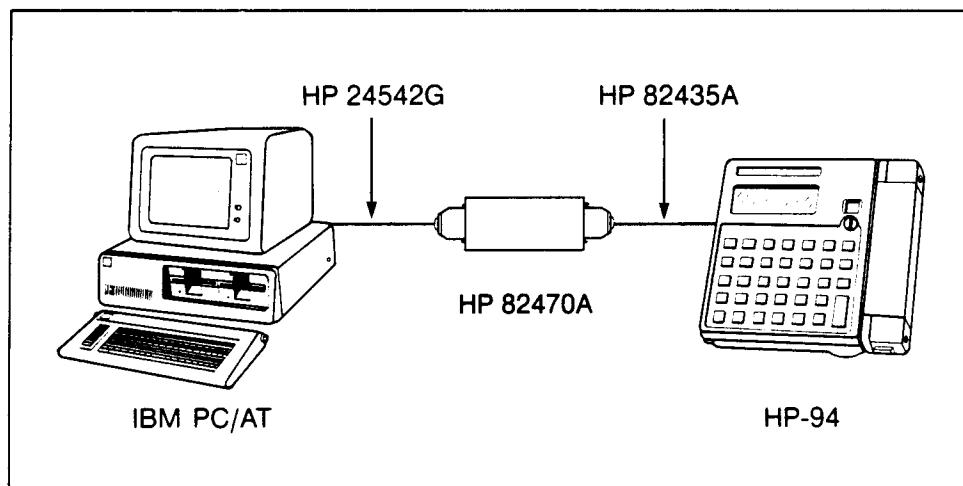


### IBM PC or PC/XT to Level Converter

**IBM PC/AT or HP Vectra (9-pin) to  
HP 82470A Level Converter Cable (HP 24542G)\***

IBM PC/AT 9-Pin Female Connector			Level Converter 25-Pin Male Connector		
Signal Name	Symbol	Pin Number	Pin Number	Symbol	Signal Name
Data Carrier Detect	CF	1	4	RTS	Request to Send
Receive Data	BB	2	2	TXD	Transmit Data
Transmit Data	BA	3	3	RXD	Receive Data
Data Terminal Ready	CD	4	5	CTS	Clear to Send*
Data Terminal Ready	CD	4	6	DSR	Data Set Ready*
Signal Ground	AB	5	7	SG	Signal Ground
Data Set Ready*	CC	6	20	DTR	Data Terminal Ready
Clear to Send*	CB	8	20	DTR	Data Terminal Ready
Request to Send	CA	7	8	DCD	Data Carrier Detect

\*Pins 6 and 8 on the IBM side are tied together and connected to pin 20 on the level converter side. Pins 5 and 6 on the level converter side are tied together and connected to pin 20 on the IBM side.



**IBM PC/AT to Level Converter**

\* This is the required method of connecting the IBM PC/AT to the HP-94. It is also the required method of connecting the HP Vectra to the HP-94 when the cable length is greater than three meters.

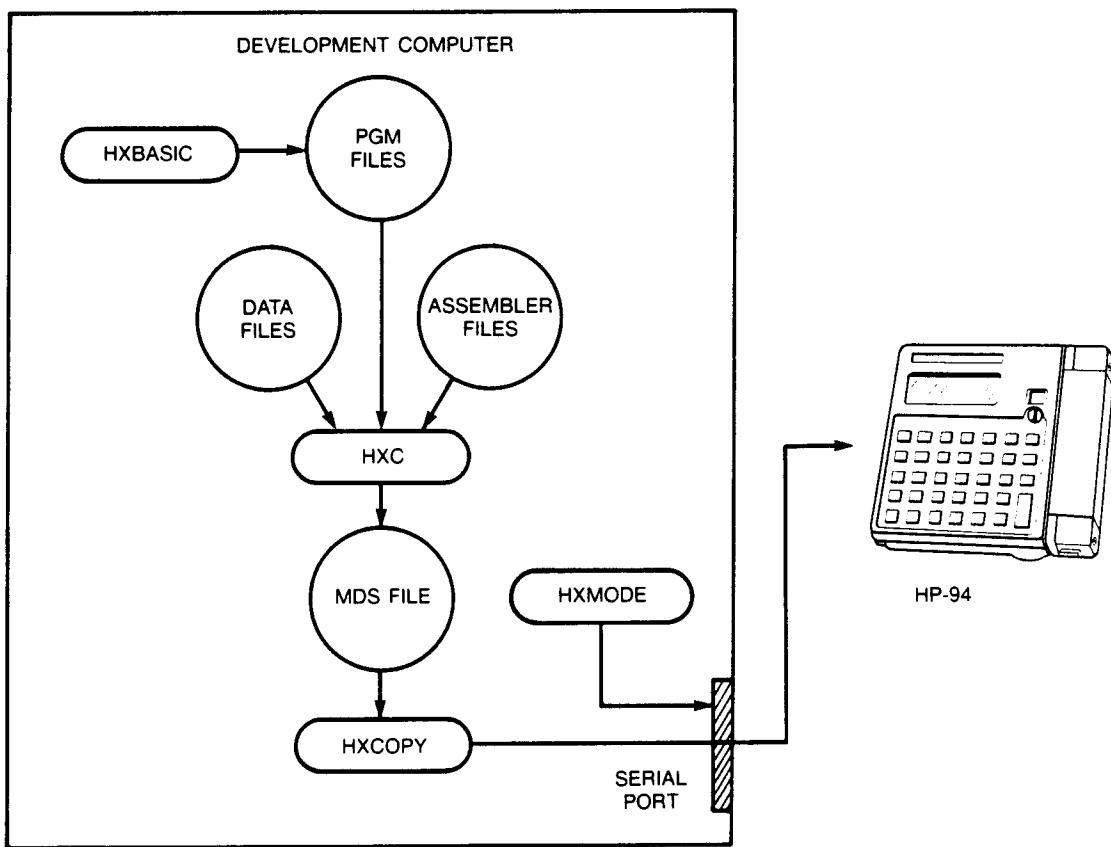
**HP 82470A Level Converter to HP-94 Cable (HP 82435A)**

<b>Level Converter 15-Pin Female Connector</b>			<b>HP-94 15-Pin Male Connector</b>		
<b>Signal Name</b>	<b>Symbol</b>	<b>Pin Number</b>	<b>Pin Number</b>	<b>Symbol</b>	<b>Signal Name</b>
Transmit Data	TXD	2	2	TXD	Transmit Data
Receive Data	RXD	3	3	RXD	Receive Data
Request to Send	RTS	4	4	RTS	Request to Send
Clear to Send	CTS	5	5	CTS	Clear to Send
Data Set Ready	DSR	6	6	DSR	Data Set Ready
Signal Ground	SG	7	7	SG	Signal Ground
Data Carrier Detect	DCD	8	8	DCD	Data Carrier Detect
Supply Voltage	Vrs	9	9	Vrs	Supply Voltage
Data Terminal Ready	DTR	15	15	DTR	Data Terminal Ready

## The Software Development Process

When you have your equipment connected, you are ready to begin the software development process. This process consists of the following steps:

- Use HXBASIC to create the program.
- Use HXC to convert the BASIC program to a microprocessor development system (MDS) file. This is an executable file which will be transferred to the HP-94.
- Use HXMODE to set up the serial port in the development computer.
- Use HXCOPY to transfer the MDS file from the development computer to the HP-94.



### Software Development Process

All the development program utilities are contained on the Software Development System disc. You may execute the programs directly from this disc or you may copy them to a hard disc and execute them from there. In either case, you must start all operation from the MS-DOS prompt.

---

**NOTE**

The examples in this guide assume that the development computer has a key with the word "Enter" on it. This key is used to enter data into the computer. If your development computer does not have a key with "Enter" on it, use the key that performs the same function whenever you see **[Enter]** in this guide. Also, the following descriptions of the utilities you will use contain instructions on how to run the utilities. Do not actually run any utility until you get to the section entitled "Creating A BASIC Program" on page 14.

---

## **HXBASIC**

HXBASIC is the utility used to create your program. It has three operating modes, each with its own set of commands:

- File management mode.
- File edit mode.
- Program debugging mode.

Refer to chapter 2 of the *Utilities Reference Manual* for detailed information on each of these sets of commands.

When you are ready to execute HXBASIC, simply type:

**HXBASIC** **[Enter]**

The file management mode is the default mode, and the prompt is a dollar sign (\$). The EDIT command invokes the file edit mode, the prompt for which is the percent sign (%). Edit mode commands create or modify programs via keyboard entry or by merging existing programs. The program debugging mode is entered when the /D option is used with the RUN command. The program debugging prompt is the at sign (@).

## **HXC**

HXC converts specified BASIC program, assembler, and data files to a single MDS file which can then be transferred to the HP-94. Before running HXC, be sure that your CONFIG.SYS file contains the following:

**FILES=18**  
**DEVICE=ANSI.SYS**

You can use the MS-DOS TYPE command to check your CONFIG.SYS file. If your CONFIG.SYS file does not contain these statements, you must modify that file and then reboot your development computer before running HXC. Refer to your development computer's MS-DOS reference manual for further information.

---

**NOTE** The FILES = 18 statement above specifies the number of files that HXC may have to have open simultaneously. The value 18 is a minimum required by HXC, therefore, if your configuration file has a "FILES =" statement specifying a value greater than 18, you do not need change it. The DEVICE=ANSI.SYS statement is necessary to provide the proper displays.

---

When you are ready to execute HXC, simply type:

HXC <filename> **[Enter]**

where <filename> is the name of the MDS file to be transferred.

Refer to chapter 3 of the *Utilities Reference Manual* for complete information on HXC.

## **HXMODE**

Before transferring the converted file to the HP-94, you must insure that the handler which controls the RS-232-C port in the development computer is installed. The utility HXMODE performs this function for you. To execute HXMODE, type:

HXMODE <COMn> **[Enter]**

<COMn> specifies the port where n is the port number in which the RS-232-C interface is installed. The default configurations for the other parameters are:

- The AUTO XON/XOFF handshake is used.
- The baud rate is 9600.
- The bit configuration is seven data bits, even parity, and one stop bit.

These parameters may be changed if needed. Refer to chapter 6 of the *Utilities Reference Manual*.

When HXMODE is executed, the handler is installed, and you use it by executing the HXCOPY utility.

## **HXCOPY**

The HXCOPY utility program transfers data and program files from the development computer to the HP-94. When you are ready to execute HXCOPY, type:

HXCOPY <filename> <COMn> **[Enter]**

where

- <filename> is the name of the MDS file (including the .MDS extension) to be transferred.
- <COMn> is the name of the port to which the MDS file will be sent.

Refer to chapter 5 of the *Utilities Reference Manual* for complete information on HXCOPY.

---

## **Creating A BASIC Program**

This section describes how to create a BASIC program using the utility HXBASIC. You will create two BASIC programs which will then be converted and transferred to the HP-94.

### **The Programs**

The two BASIC programs you will create are called MAIN and SUBA. MAIN is the driver program and will call SUBA, a subprogram, and pass it a parameter. Both programs will print a line to identify themselves, and SUBA will print the parameter that was passed. Loops are used as timing devices to allow time to view the messages from the two programs. When control is passed back to MAIN, it will request the user to enter the letter "Q" to terminate the program. When the HP-94 is turned on, it will automatically execute any program named MAIN. Therefore, once you have installed the programs in this example, you only need to turn on the HP-94 to see them run.

### **To Begin**

Begin by booting the system so that you have the MS-DOS prompt on the screen. You should have the disc with the SDS programs installed on your hard disc if you have one, or placed in a flexible drive. Since the proper path name depends on where the SDS disc is installed, the references to SDS programs will assume it is in the current directory. Keep this in mind as you go through the examples that follow, and if your SDS disc is not in the current directory, be sure to preface each command to execute a program with the proper path name.

---

**NOTE** Screens shown in the following examples contain program version numbers and available memory amounts which may not agree with your screen. Disregard these differences.

---

### **HXBASIC**

Begin the process by typing:

HXBASIC **[Enter]**

You will see the following:

HXBASIC (A.01.06) HP82520 (c) Copyright Hewlett-Packard Co., 1985

Available Memory 177712 Bytes

\$

The \$ is the prompt for HXBASIC. To create the programs you must enter the EDIT mode of HXBASIC. To do this, type:

EDIT MAIN **[Enter]**

EDIT will respond with:

Creating Program MAIN  
10

You have directed HXBASIC to enter the EDIT mode and create a new file called MAIN. If a file called MAIN.BAS already existed, EDIT would have loaded that program and displayed the first 20 lines. Note that you do not need to specify the .BAS extension when requesting a file.

You are now ready to enter the statements for program MAIN. After you enter a statement, press return and the next line number will appear with the cursor positioned one space to the right of the line number, ready for the next statement. When you have completed entering the program lines and the cursor is one space to the right of the next line number, press **Enter** without entering anything else. This will cause the automatic line numbering feature to be stopped, and you will see the EDIT prompt (%).

---

**NOTE**

If you make a mistake while entering the following lines, you can easily correct it by using the C (change) command from the EDIT mode (%) prompt. For example, to correct line number 30, the command is:

C 30

The line you specified will be displayed, and you can make any changes you want to it. Refer to chapter 2 of the *Utilities Reference Manual* for detailed information.

---

Enter the following lines now (be sure to press **Enter** after completing each program line):

```
10 DIM K$1, SPARAM$20
20 SPARAM$ = "I came from MAIN!"
30 PRINT "In MAIN...."
40 FOR I = 1 TO 1000 : NEXT I
50 CALL SUBA (SPARAM$)
60 PRINT "Press Q to quit."
70 PRINT "&0F" : REM Change keyboard to alpha mode (block cursor)
80 K$ = INPUT$(1)
90 IF K$ <> "Q" AND K$ <> "q" GOTO 70
100 PRINT "End of MAIN."
110 END
120 Enter
```

At this point you should have the program entered and the EDIT mode cursor (%) showing. Refer to the HXBASIC Program Editing Commands in chapter 2 of the *Utilities Reference Manual* for complete information on the EDIT mode commands.

The next step is to save the MAIN program. From the percent (%) prompt type

e **Enter**

This should put you back to the file management mode of HXBASIC and you should see the \$ prompt. To save the file you just entered, type

**save**

HXBASIC will respond with the following:

**Save to MAIN.BAS (Y/N) ?**

Answer **Y** and press  and HXBASIC will save the file on disc and respond with the **\$** prompt.

You are now ready to enter the second program. This program is the subprogram called SUBA. Begin by invoking the EDIT mode as you did before:

**EDIT SUBA**

Now enter the program below (be sure to press  after completing each program line):

```
10 PARAM INPTS
20 PRINT "In program SUBA!"
30 PRINT "The parameter is: "
40 PRINT INPTS
50 FOR I = 1 TO 1000 : NEXT I
60 PRINT "Now return to MAIN."
70 END
80 
```

Exit from the EDIT mode and save the program exactly as you did before. When you have finished, you are ready to convert the program files to an MDS file. Before doing this however, you may wish to test the programs on your development computer. From HXBASIC (the **\$** prompt) type:

**RUN MAIN**

The programs should execute and display the following:

```
In MAIN....
In program SUBA!
The parameter is:
I came from MAIN!
Now Return to MAIN
Press Q to quit
```

Press Q to terminate the program and you should see

**End of MAIN.**

**\$**

If you did not get the expected results, list each program you entered and compare them with the listings shown above. To list a program, enter EDIT with the desired file name. For example:

**EDIT MAIN**

This should list all the lines of the program on the screen. Refer to the Program Editing Commands section of chapter 2 of the *Utilities Reference Manual* for more information.

To exit HXBASIC, type:

**bye**

The development computer will return to the MS-DOS prompt.

---

**NOTE** You must be in file management mode (\$ prompt) to execute the bye command.

---

---

## Converting the BASIC Program Files

The next step in the development process is to convert the two BASIC program files into an MDS file which will be executable on the HP-94. This task is performed by the HXC utility. Refer to chapter 3 of the *Utilities Reference Manual* for complete information on HXC.

### The Files

The input files to HXC are the two BASIC files, MAIN.BAS and SUBA.BAS, created in the previous section. The output files, all of which have the program name specified when HXC was started, are listed below:

- The CBK file (XXXX.CBK) is a backup file for the CMD file.
- The CMD file (XXXX.CMD) is a command file created by HXC. If you wish to convert the same string of files a second time you can use this file instead of typing in each file name.
- The BMP file (XXXX.BMP) is a special map file created by HXC for each BASIC program it converts.
- The MBK file (XXXX.MBK) is a backup file. If a file with the name of the MDS file already exists, the older file is renamed with the extension MBK.
- The MDS file (XXXX.MDS) is the file ready to be transmitted to the HP-94 or an EPROM programmer.
- The MMP file (XXXX.MMP) is a text file containing the options provided to HXC as well as program size and error information. You can use the MS-DOS command TYPE to examine this file.

### Using HXC

Before starting HXC, be sure that your CONFIG.SYS file contains the following:

```
FILES=18
DEVICE=ANSI .SYS
```

If your CONFIG.SYS file does not contain these statements, you must modify that file to include them, and then reboot your system before running HXC. Refer to your computer owner's documentation for information on how to modify CONFIG.SYS.

To execute HXC, type:

```
HXC MAIN [Enter]
```

MAIN is the file which will contain the converted data. It will have the extension .MDS when it is completed.

**NOTE**

Although not demonstrated in this example, you may specify the name of a command file instead of the MDS file when executing HXC. For example, if you need to execute HXC a second time, you can use:

HXC @MAIN

This will cause HXC to use the command file that was automatically created when you first ran HXC. When you run HXC in this manner, there is no need to type in any file names; the command file has them all. Refer to chapter 3 of the *Utilities Reference Manual* for more information on using a command file.

You will then see the following screen:

The cursor will be blinking in the first column, waiting for you to enter the input file names. To enter the files you wish to convert, type:

main.bas   
suba.bas

Next press the function key (sometimes referred to as a "soft" key) **[12]**. When you press **[12]** the cursor moves to the column entitled "Handheld File Name", and you are to enter the file names for the HP-94. If the file names for the HP-94 are to be the same as those on the development computer (remember that the HP-94 file names may not be more than four characters), you only need to press **Enter**. HXC will automatically use the same file name. Also, notice that the information displayed has changed somewhat:

```
HXC (A.01.04) HP 82520 (c) Copyright Hewlett-Packard 1985
output file(s)           RAM MDS file           Status: Entering handheld names
main.MDS                  Files: 2
```

Development System	Handheld	File	Actual	Allocated	Size
File Name	File Name	Type	Size(byte)	Size(para)	Increment(para)
main.bas	-				
suba.bas					

Quit

Type in the names of the HP-94 files (note that HP-94 file names are limited to a maximum of four characters) or press **Enter**.

**main** **Enter** **suba** **Enter**

HXC will then perform the file conversion, write the MDS file to the default disc drive, and automatically terminate, returning control to MS-DOS. The final screen you will see will look like this:

```
HXC (A.01.05) HP 82520 (c) Copyright Hewlett-Packard 1985
output file(s)           Status: Conversion finished
main.MDS                  Files: 2
```

Development System	Handheld	File	Actual	Allocated	Size
File Name	File Name	Type	Size(byte)	Size(para)	Increment(para)
main.bas	MAIN	B	0000E6h	000Fh	
suba.bas	SUBA	B	00008Fh	0009h	

2 component files converted to 1 output file.  
Space required in handheld: 0018h paragraphs.

---

**NOTE**

If HXC does not display a B in the File Type field, you probably have entered a non-existent file name in the Development System File Name field. If so, press **f1** to terminate HXC and then run HXC again from the beginning. Refer to chapter 3 of the *Utilities Reference Manual* for further information.

---

You can check to see if the MDS file exists on the default disc by using the MS-DOS DIR command. The file **MAIN.MDS** should be found. You may or may not see all of the output files listed on page 18, depending on how many times HXC has been run for this conversion. The next step in the process is to transfer this file to the HP-94.

---

## Copying the MDS File to the HP-94

In order to copy the MDS file created by HXC, you must first set up the development computer's serial port using HXMODE, then transfer the file to the HP-94 using HXCOPY. In the examples to follow, the utility programs are assumed to be on the default disc drive, thus no path names are shown. If necessary, add path names to the calls to HXMODE and HXCOPY as appropriate for your installation.

## Setting Up the Serial Port

You will use the utility HXMODE to set up the serial port on the development computer. To execute HXMODE, type:

HXMODE COM1 **Enter**

This utility installs the handler which controls the serial port on the development computer. If the serial port for your development computer is not in COM1, change the parameter accordingly. The default parameters used by HXMODE are defined as follows:

- /AUTOX....AUTOX signifies that the AUTO XON/XOFF function is used.
- COM1.....The name of the serial port.
- 9600.....The baud rate for transfer.
- 7ES.....The bit configuration is 7 data bits, even parity, and one stop bit.

You may change any of these parameters by adding the new value to the call to HXMODE. Refer to chapter 6 of the *Utilities Reference Manual* for more information.

---

### NOTE

You may wish to include the call to HXMODE in an AUTOEXEC.BAT file so that the handler is installed at the time the development computer is booted. Simply place the command as shown above in the AUTOEXEC.BAT file, making sure that the proper path names are present, if necessary. Refer to your computer owner's documentation for more information on the AUTOEXEC.BAT file.

---

## Setting Up the HP-94

---

### NOTE

Be sure the main battery pack is fully charged and the lithium battery (some models of the HP-94 require two lithium batteries) has been installed. Refer to the *User's Documentation Kit* for detailed information on these procedures.

---

Before beginning the actual procedure, take a moment or two to familiarize yourself with the controls of the HP-94. Refer to the diagram on page 4 of this guide, or to the diagrams in the *User's Documentation Kit* for the location of the various controls.

- You turn on the HP-94 by pressing the **ON/OFF** button. The display will appear in a moment. If it does not, check the display contrast control and be sure it is set so that you can view the display. Turn off the HP-94 by pressing the **ON/OFF** button again.
- You can adjust the display contrast control for the display that suits you best. There is a backlight for the display that you can turn on by pressing and holding the **SHIFT** button. Turn off the backlight by pressing and holding the **SHIFT** button again. Note that battery life will be reduced by excessive use of the backlight.
- When you turn on the HP-94 you will see a blinking cursor, either a **■** or a **\_**. The **■** means the alphabetic characters are active, and the **\_** means the numeric characters are active. Alphabetic characters are printed in orange on the keys, and numeric characters are printed in white. You switch between the two by pressing the **SHIFT** key. As you do so, you will hear a beep and see the cursor change.
- The **←** key is the backspace key. If you make a mistake, you can correct it by moving the cursor to the left with this key.

Before transferring your files, you should insure that program files named MAIN and SUBA do not already exist on your HP-94. If you find that such files do exist on your HP-94, you will have to remove them before you copy the files you just created. The following steps will show you how to do this.

Turn on your HP-94 by pressing the **ON/OFF** button. The display will appear shortly. Adjust the display contrast control as necessary to obtain the display that suits you. If there is a MAIN program installed, the HP-94 will execute it immediately, and the display you see could be almost anything. The command mode prompt (**>**) will appear if a MAIN program is not being executed. If you do not see the command mode prompt (**>**), turn off the HP-94 by pressing the **ON/OFF** key, and then turn it on again in the following manner:

1. Press and hold the **ENTER** and **CLEAR** keys.
2. Press the **ON/OFF** key. You should see the command mode prompt (**>**) with a blinking cursor immediately to the right of it.
3. To see if there are any files in the HP-94, type:

**D SHIFT Ø ENTER**

If your HP-94 contains any files, their names and sizes will be displayed. Refer to chapter 8 of the *Utilities Reference Manual* for more information.

4. If there are no files that you need to erase, skip to step 1 of the next procedure.
5. Press **ENTER** to display the command prompt and cursor (**> ■**).
6. Type the following on your HP-94:

---

**CAUTION** The following steps will erase any files you specify on your HP-94. Be sure you have backup copies of each file on your development computer before proceeding.

---

**E SHIFT Ø SHIFT SPACE \* ENTER**

The HP-94 will display a **:** whenever you press **SPACE** while in the command mode. The HP-94

will respond with the name of each file it finds and ask if each is OK to erase. Respond with **ENTER** if you wish to erase the file, or **N** if you do not wish to erase the file.

To set up the HP-94 to receive the MDS file, perform the following steps:

1. With the HP-94 off, simultaneously press and hold the **CLEAR** and **ENTER** keys, then press the **ON/OFF** key. You will see the following display on the HP-94:

Copr. HP 1985 V 01.3  
>

This indicates that the HP-94 is ready to accept commands.

2. Type the following:

C. **SHIFT** Ø **ENTER**

The HP-94 will respond with the following:

Ok?

3. Press **ENTER** and the cursor will move to the left of the **Ok**.

The C command reads incoming files from the serial port and places them into directory 0, the main directory in the HP-94. The HP-94 is therefore ready to accept the MDS file from the development computer.

---

**NOTE**

The HP-94 has a default timeout of two minutes. Be sure the following steps are completed within that time. If the HP-94 times out before the next steps are completed, repeat the above process. You can change the default value by using the SYTO statement. Refer to chapter 2 of the *BASIC Reference Manual* complete information on this procedure.

---

## Using HXCOPY

The final step in the process is to copy the MDS file to the HP-94 using the HXCOPY utility. For more information on HXCOPY refer to chapter 5 of the *Utilities Reference Manual*.

On your development computer type:

HXCOPY MAIN COM1 **Enter**

If all goes well, you will see the following screen:

HXCOPY (A.01.07) HP 82520 (c) Copyright Hewlett-Packard Co. 1985  
Copy operation completed

HXCOPY will automatically terminate, returning control to MS-DOS. In addition, the following will be displayed on the HP-94:

```
Copying Ø:MAIN .  
Copying Ø:SUBA .  
>
```

Turn off the HP-94, then turn it back on again. You will see the following display (note that since the HP-94 display is limited to a maximum of 4 lines at a time, you will not see the entire display at once):

```
In MAIN....  
In program SUBA!  
The parameter is:  
I came from MAIN!  
Now return to MAIN.  
Press Q to quit.
```

Now press Q and the HP-94 will beep and display

**End of MAIN.**

And that's all there is to it! You are now ready to develop your own applications for the HP-94.

---

## In Case of Difficulty

There is a table on page 28 that contains an explanation of some HP-94 errors you might encounter during the software development process. The table has a a column that lists the error number or condition, a second column that lists the probable causes, and a third column that describes the appropriate action to take.

If you have difficulty during the process, the hints presented here may be helpful. There are also complete error message listings available in other manuals:

- BASIC language error numbers and messages are found in appendix B of the *Basic Language Reference Manual*.
- HP-94 error codes and messages are found in appendix B of the *BASIC Language Reference Manual*.
- HXC error messages are found in chapter 3 of the *Utilities Reference Manual*.
- HXCOPY error messages are found in chapter 5 of the *Utilities Reference Manual*.

## HXBASIC

If you have difficulty in HXBASIC, these hints may be of help.

- If a new line number does not appear after pressing **Enter** from EDIT mode, EDIT has found a syntax error in the line you just entered.
- Don't forget to exit HXBASIC with the **BYE** command. If you try to execute HXC without having exited from HXBASIC, HXBASIC will respond

**Error: HXC.BAS not found**

- Remember that **BYE** is not a valid command in EDIT mode.
- Don't forget to save the program files. You can only save a file from the **\$** prompt as the statement **SAVE** is not a valid command from the EDIT mode.

## HXC

If you have difficulty in HXC, these hints may be of help.

- Be sure to include the filename when invoking HXC.
- Be sure to include the extension **.BAS** for the Development System File Name field. If this extension is not included, HXC will interpret the file as a datafile, and D will appear in the File Type column.
- After entering the development system file names, be sure to press key **f2**.

## **HXMODE**

Be sure you have the correct device name for your serial port.

## **HXCOPY**

If you have difficulty in copying the files to the HP-94, these hints may be of help.

- Be sure that all connections are correct and that the cables are firmly seated. If you built your cables from the diagrams in the introduction, check to be sure they are connected correctly for the equipment configuration you are using.
- Be sure to set up the HP-94 to read a file with the `C` command. Remember that the HP-94 `SHIFT` key is a toggle, and to return to the original case the `SHIFT` key must be pressed again.

Refer to the documentation associated with the program in question for more information.

**HP-94 Error, Cause, and Correction Table**

<b>Error Number or Condition</b>	<b>Probable Cause</b>	<b>Corrective Action</b>
101 or 102	Typing error while typing command.	Retype the command, paying special attention to the use of the <b>SHIFT</b> key.
200	Battery needs recharging.	Press <b>ON/OFF</b> to turn off HP-94, then connect recharger.
201-208	Did not use HXMODE command, or used MS-DOS MODE command instead.	Use HXMODE, not MS-DOS MODE command, to configure development system serial port.
	Specified incorrect serial port configuration.	Specify the correct handshake, baud rate and data format.
	Used MS-DOS COPY command instead of HXCOPY.	Use HXCOPY to transfer the files.
209	Used HXCOPY to transfer a non-MDS file.	Transmit only MDS files using HXCOPY.
210 or 211	Did not install memory backup batteries.	Install the backup batteries.
212 or 214-216	Did not initialize main memory.	Press <b>I SHIFT Ø ENTER ENTER</b> to initialize main memory.
213 or 217	Did not initialize 40K RAM card.	Press <b>I SHIFT 1 ENTER ENTER</b> to initialize the RAM card.
The HP-94 did not turn on.	Battery needs recharging.	Connect recharger.
Copr. HP message did not appear.	Did not press <b>CLEAR</b> and <b>ENTER</b> while turning HP-94 on.	Press <b>ON/OFF</b> to turn the HP-94 off. While pressing <b>CLEAR</b> and <b>ENTER</b> at the same time, press <b>ON/OFF</b> to turn the machine on. When the message appears in the display, release <b>CLEAR</b> and <b>ENTER</b> .
Copying <filename> message did not appear.	Cable not connected.	Connect cable between development system computer and HP-94.
	Used incorrect cable.	Refer to "Connecting the Equipment" to select the proper cable to use.
	Cable connected to wrong serial port, or configured wrong port with HXMODE.	Verify that the port you configured with HXMODE is the one connected to the HP-94. Check which port the cable is connected to, and check the configuration jumpers on the development system computer's serial interface.

## **After Your Warranty Expires**

Hewlett-Packard is happy to offer a one-year Support Agreement to begin at the expiration of your warranty period. The low agreement price will provide you with a cost-effective service support program for your HP product. Several years of support can be obtained for less than the price of one repair in the event your product fails. After the initial agreement has been purchased, it is renewable on a year-by-year basis. We hope you will take the opportunity to purchase a Support Agreement for your HP product.

**Yes, I would like to receive a price quotation for a Support Agreement on my HP product.**

**Your Name/Company**

**Address** \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**Bus. Phone** **Home Phone**

**HP Model No.** **Serial No.** **Date of Purchase**

**Serial No.**

**Date of Purchase**

(Attach additional sheets if needed.)

**Tax exempt:** Please enclose tax exempt certificate.

This program is not offered outside the United States of America.

**MAIL COMPLETED FORM TO:** Hewlett-Packard Company  
Calculator Service Center  
1030 NE Circle Blvd.  
Corvallis, OR 97330  
Telephone (503) 757-7710



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# HEWLETT-PACKARD

## User's Documentation Kit



**HP-94  
Handheld Industrial  
Computer**

# **HP-94 Handheld Industrial Computer**

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## **User's Documentation Kit**

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**Edition 1 December 1986**  
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## READ THIS FIRST

When you receive your new HP-94, you must take the following four steps, in order, before you can load an application program into the computer:

1. Carefully remove the tape from the display. *Do not use a sharp instrument to remove the tape: the display is easily scratched.*
2. Fully charge the main battery (refer to the section in this manual on how to charge the main battery).
3. Install the lithium memory-backup batteries if they are not already installed (refer to the section in this manual on how to install the memory-backup batteries).
4. Initialize the memory. Do the following:

Press the **ON/OFF** key while pressing both the **CLEAR** and **ENTER** keys. When a blinking cursor appears in the display (ignore any error messages), press **I** **SHIFT** **0** **ENTER**. The message **Dir 0: Ok ?** will appear in the display. Press **ENTER**.

---

## HOW TO USE THIS MANUAL

This manual was prepared as a stand-alone introduction to the use and care of the HP-94 Handheld Industrial Computer. It can be used in its entirety, or any or all or portions of it can be incorporated in customer-developed documentation prepared for specific applications. (Be aware that some sections refer to information in other sections, however.) The manual was designed primarily for use by the people who actually use the equipment, some of whom may have no prior computer experience. Therefore, wherever possible, computer "jargon" or technical terminology was avoided; where not possible or inconvenient, a definition of the terminology used was included in a glossary. Some of the information covered will be of concern to other than end users; for example, personnel who are responsible for application programming of the HP-94 will need to know how to install a ROM or EPROM card. System administrators will need to know how to connect the HP-94 to external devices. Additional details may often be found in the HP-94 System Development System documentation or the device documentation. The following topics are covered:

- Getting acquainted with your HP-94
- Accessories
- Precautionary measures
- Some basic operations
- How to use the keyboard
- How to remove and install the main battery
- How to charge the main battery
- How to remove and install the memory-backup batteries
- How to install a memory card
- How to install ROM and EPROM ICs in a ROM/EPROM card
- The 128K field service upgrade
- How to install the carrying strap
- How to install the earphone
- How to use a bar-code reader
- How to connect external devices
- What to do if an error message is displayed
- The level converter
- The HP-94 external-device connector
- Equipment specifications
- A glossary
- RFI and air safety notices
- Limited warranty information

*A word of caution...* In order to be in compliance in the U.S. with government regulations, you should include the information on the potential for radio interference. You will probably also want to include the precautionary measures information. Otherwise, you are free to choose what you wish to use.

---

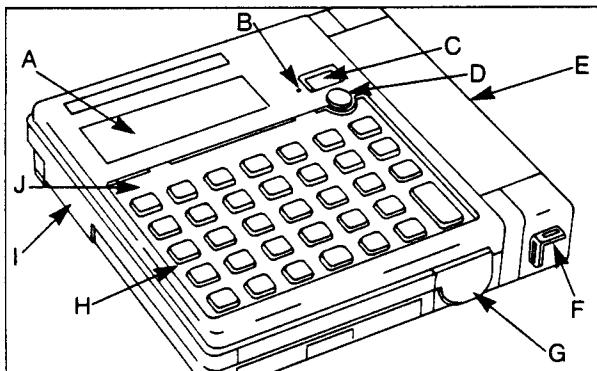
## INTRODUCTION

This manual contains the information needed to use and maintain the HP-94 Handheld Industrial Computer. Detailed information concerning the use of optional accessories and external devices is contained in the HP-82520A Software Development System and in the instruction manuals for the particular equipment.

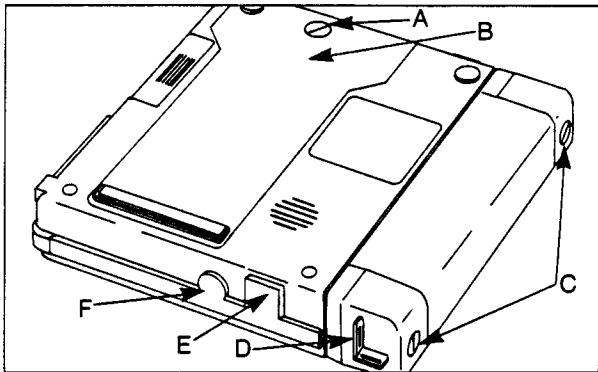
---

## GETTING ACQUAINTED WITH YOUR HP-94

The HP-94 is a small, battery-powered handheld computer designed for fast, accurate data collection and processing. Weighing less than two pounds, it can easily be carried with you wherever you need it. Data can be entered into the HP-94 from the keyboard, by scanning bar-code labels with a bar-code wand, or from another computer. Since it is programmable, the computer can be customized to meet your specific needs. Data can be read and changed if necessary as it is entered, and the computer can be instructed to request you to correct inaccurate entries. The display backlight makes the display easy to read even in dark places. Special batteries enable the computer to retain the data you have entered into it even when the power is turned off or the main battery is removed. Study the pictures below, and familiarize yourself with the location of the controls, connectors, and other features of your HP-94.



- A - Display
- B - Reset button
- C - ON/OFF switch
- D - Display contrast control
- E - Main battery
- F - Carrying strap brackets
- G - Bar-code-wand connector
- H - Keyboard
- I - External device connector
- J - Keyboard overlay



A - Back-cover retaining screw

B - Back cover

C - Main-battery retaining screws

D - Carrying strap brackets

E - Recharger connector

F - Earphone jack

Three models of the HP-94 are available depending upon your need for memory:

- The HP-94D with 64K bytes of built-in memory.
- The HP-94E with 128K bytes of built-in memory.
- The HP-94F with 256K bytes of built-in memory.

The following memory-expansion options are available to you:

Model	Memory Option
HP-94D	EITHER a 40K-byte RAM card, OR a ROM/EPROM card (128K bytes of ROM or EPROM)
HP-94E	EITHER a 40K-byte RAM card, OR a ROM/EPROM card (128K bytes of ROM or EPROM) OR a 128K-byte RAM memory board (must be installed at a service center).
HP-94F	Maximum capacity. No additional memory can be added.

If you are not experienced with computers, you may wish to refer now to the glossary to acquaint yourself with the computer terminology used in this manual.

---

## ACCESSORIES

The following accessories may be used with your HP-94 computer:

- The HP 82431A Recharger (used to recharge the main battery).
- The HP 39961D HP Smart Wand Low Resolution (used to read bar-code labels).
- The HP 39963D HP Smart Wand General Purpose (used to read bar-code labels).
- The HP 39965D HP Smart Wand High Resolution (used to read bar-code labels).
- The HP 82470A RS-232C Level Converter (used to adapt the system-development computer for use with RS-232C devices).
- The HP 82411A 40K RAM Card (used to expand the computer's memory).
- The HP 82412A ROM/EPROM Card (used to expand the computer's memory).
- The HP 82433A Cable (HP-94 to a Modem).
- The HP 82434A Cable (HP-94 to a Printer).
- The HP 82435A Cable (HP-94 to the Level Converter).
- The HP 82436A Cable (HP-94 to the Vectra).
- The HP 24542G Cable (IBM PC/AT to the Level Converter).
- The HP 17255D Cable (IBM PC or PC/XT to the Level Converter-2 meters).
- The HP 82974D Cable (IBM PC or PC/XT to the Level Converter-3 meters).
- The HP 13242H Cable (IBM PC or PC/XT to the Level Converter-5 meters).
- The HP 82430A Battery (spare battery pack).
- The earphone (used to listen to the beeper's audible note when the computer is used in noisy surroundings). \*

\* Not available from Hewlett-Packard.

For the cable between the level converter and other external devices, you may select other appropriate HP cables, or you may build your own. Refer to the level converter specification in this manual.

Before using your HP 82431A Recharger, you should be aware of the following precautions:

---

**CAUTION** Do not charge the battery for more than sixteen hours at a time. The life of the battery may be reduced if you do.

If your battery is low, you can operate your HP-94 by plugging in the recharger. However, do not leave the recharger connected to the HP-94 after you have fully recharged the battery. To do so, may reduce the life of your battery.

---

Use only the HP 82431A Recharger, or Hewlett-Packard-identified equivalent, with the HP-94.

Do not modify the recharger or use it with any other equipment.

The recharger is non-repairable. If it develops loose power contacts or if it fails to charge batteries, it must be replaced.

---

## **PRECAUTIONARY MEASURES**

Before using your HP-94 computer, you should be aware of the following precautions:

Your computer contains delicate, high precision electronic parts. It should be handled with care; in particular, it should not be dropped or subjected to excessive shocks or vibration.

It is recommended that you do not expose the HP-94 to temperatures and humidities that exceed the specified limits (refer to the equipment-specification section).

When your computer has been exposed to cold outside temperatures and is then brought into a warm room, water droplets may form inside the display. If this occurs, do not use the computer until the moisture has disappeared.

Never touch any of the contacts in the connectors.

A cloth dampened with a small amount of water should be adequate in most cases to clean your computer. Do not use cleaning fluids.

The HP-94 uses a rechargeable Nickel-Cadmium (NiCd) battery. NiCd batteries are generally designed to be recharged approximately 1000 times. To operate the battery safely, you should be aware of the following information:

- The battery should fully recharge in approximately 7 to 13 hours.
- When a message appears in the HP-94 display indicating that the the battery is low, you should recharge the battery as soon as possible. In order to prevent the battery from going dead while being used, you may wish to recharge it periodically, for example, overnight when it's not being used.
- When used in ambient temperatures below 10° C (50° F), the battery will require more frequent charging.

---

**WARNING Do not short circuit the main battery terminals. You may be seriously burned if you do.**

---

**CAUTION** If you recharged your battery and the low-battery error message is immediately displayed again when you turn the HP-94 on, check that the recharger is working. If it is, discard the battery, and replace it with a new one. If the error message is still displayed, you will need to send the HP-94 in for service.

---

**WARNING Dispose of the battery by placing it in a plastic bag or it shipping container and depositing it in your trash can. Do not incinerate or mutilate it. It may burst or release toxic materials.**

---

---

## SOME BASIC OPERATIONS

Although in actual use your HP-94 is controlled by the application program you have installed, you should be familiar with several basic operations.

- **Turning the power on and off** - Pressing the **[ON/OFF]** key turns the power on. Generally, your application program will start running automatically after a brief delay when the power is turned on. Pressing the **[ON/OFF]** key again will turn the power off unless the key has been disabled by the application program to prevent you from turning the power off at the wrong time. The program can also turn off the power automatically after a specified time delay. If the program has not redefined the time delay and no key has been pressed for two minutes, the computer will turn off automatically.

If the power does not turn on, try plugging in a recharger or replacing the main battery with a fully charged battery. The power will not turn on if you are pressing any of the other keys when you press the **[ON/OFF]** key. (The power will turn on, however, if the **[CLEAR]** and **[ENTER]** keys are both pressed at the same time.)

If the HP-94 turns off in the middle of an operation and turns on again briefly and stops again (or will not turn on again) you probably have a low main battery which must be recharged.

The application program may turn the power off at appropriate times to save the main battery. Either the main battery, or if the main battery is low, the memory-backup batteries will work to save your programs and data.

- **Display contrast** - You can adjust the contrast of the characters in the display by pressing your thumb or finger on the contrast-control knob and turning it.
- **Back light** - You can turn on the display back light by pressing the **[SHIFT]** key and holding it down for one second. Pressing the key again for one second turns the back light off. The back light will turn off automatically after two minutes. It can also be turned off by the application program. (Be aware that the back light places an extra drain on the main battery. Minimizing the use of the back light will extend its useful life, so you may wish not to use it more than absolutely necessary.)
- **Reset** - You can turn the power off as explained above. In the unlikely event that you should ever not be able to turn your computer off, press the reset switch with a toothpick or a straightened paper clip. Be careful not to press too hard. You can feel the switch click.

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## HOW TO USE THE KEYBOARD

**Installing the keyboard overlay.** To install the plastic keyboard overlay, first orient it so that the semi-circular cutout on the inlay coincides with the display contrast control. Engage the tabs along the bottom edge of the overlay in the slots in the lip around the bottom of the keyboard. Bend the overlay into a curve so that you can engage the tabs at the top of the overlay in the slots in the lip around the top of the keyboard, and then press the overlay down so that it lies flat on the keyboard.

**Entering data.** Turn the HP-94 on. If you have an application program called MAIN installed in the computer it will start running after a short delay. A cursor (□) or (□) may also appear in the display. If the cursor looks like this (□), the alphabetic characters are active; if the cursor looks like this (□), the numeric characters are active.

There are 28 keys marked in orange with the letters of the alphabet, an \*, and the word SPACE. Use these keys to type letters, \*s, and spaces into the computer. Note that when you press the key an audible beep will be heard, and the character may appear in the display if the application program allows it to. If you make a mistake, move the cursor to the left by pressing the **←** key. The incorrect character will disappear, and you can then type in the correct one. You cannot skip over correct characters to get to an incorrect one. If you do not notice a mistake, you will have to back up to the error in order to correct it.

There are 12 keys containing 10 digits, a # sign, and 00, in addition to orange characters. One key contains only a white minus sign, and another key contains only a white decimal point.

When the computer is turned on, the application program will determine which set of characters is active. If the cursor is a (□), the orange characters are active; if the cursor is a (□), the white characters are active. To change from one character set to the other, press **SHIFT**. (The white minus sign and the white decimal point are active in both character sets.) The characters remain shifted until you press the shift key again.

The key labeled **CLEAR** operates in both character sets to clear the current line of text, the line in which the cursor appears.

As you type in data, earlier lines of characters move up and out the top of the display. Your application program will tell you how to move the lines of characters down in the display if it is possible to do so.

You should be aware that your application program can redefine some of the keys to represent characters other than those printed on the keys.

You now know how to enter data from the keyboard.

---

## HOW TO REMOVE AND INSTALL THE MAIN BATTERY

To remove the main battery, do the following:

1. Use a coin to unscrew the two battery retaining screws. (Make sure the screws are completely disengaged; they should pull out approximately 5/8 inch.)
2. Pull the battery straight out from the computer. (Do not pull the battery off at an angle to the case. You may damage the screw posts if you do.) In so doing, you will disconnect the battery plug.

To install the main battery, do the following:

1. Align the retaining screw posts on the computer with the holes in the battery case. Make sure the male connector on the computer is aligned with the female connector on the battery.
2. Press the battery straight in firmly until it is seated flush up against the computer (the connectors will mate automatically), then tighten the two retaining screws.

---

## **HOW TO CHARGE THE MAIN BATTERY**

If the warning Error 200 appears in the display, or the computer turns off during an operation and won't turn on again (or won't stay on), you need to recharge the main battery. To do this, connect the recharger to an ac power source, and then plug the recharger into the recharger connector. The battery will immediately begin to recharge. A dead battery should be fully recharged in about 7 to 13 hours.

(You can use the computer when the main battery is removed or dead if the recharger is connected and plugged in.)

The warning message may appear at any time, either when you turn the HP-94 on, or during whatever operation you are performing.

---

## HOW TO REMOVE AND INSTALL THE MEMORY-BACKUP BATTERIES

Small lithium disc batteries are installed in the computer to make sure the computer does not "forget" your program or stored data when the main battery is removed or discharged. If the main battery is kept charged, the memory-backup batteries should give you several years of continuous service; however, they are not rechargeable, so when they die, they must be replaced. When they begin to die, a warning message in the display will remind you to replace the batteries very soon, or you may lose the data in the memory the next time the main battery is discharged.

If the warning Error 210 appears in the display, you should replace the main-memory-backup battery.

If the warning Error 211 appears in the display, you should replace the RAM-card-backup or the memory-board-backup battery.

---

**NOTE** The 210 and 211 warning messages will appear only when you turn on the HP-94.

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If either of the above warnings appears in the display, you may wish to connect the computer to a recharger as soon as possible; if the main battery goes dead while the backup batteries are in a low condition, you might lose all your programs and stored data. (For this reason, you may wish to replace the backup batteries on a periodic basis, say once a year.)

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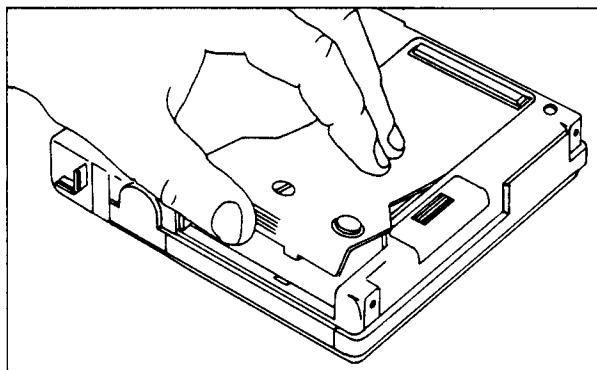
**NOTE** The main battery must be charged, or a recharger must be plugged into the HP-94 whenever you change the backup batteries, or you will lose the files and programs you have stored in memory.

If the 211 warning message is displayed, and you have a RAM card installed, you must leave the RAM card in the HP-94 while you are changing the backup battery. If you remove the RAM card while the backup battery is low, you may lose the contents of the RAM.

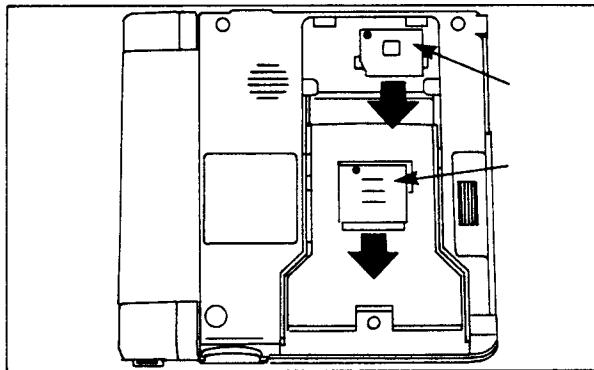
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To replace the memory backup batteries, do the following:

1. Remove the screw in the back cover on the bottom of the computer, then remove the cover. Do this by placing your thumb on the knurled surface on the front of the cover and your fingers in the middle of the cover. Gently pull up with your thumb; the cover will bend up and snap loose from the case.



2. Remove the small retaining screw in the access cover over the battery you wish to replace. (The picture illustrates the main-memory and the 128-K field-service-upgrade memory-board backup-battery access covers.)

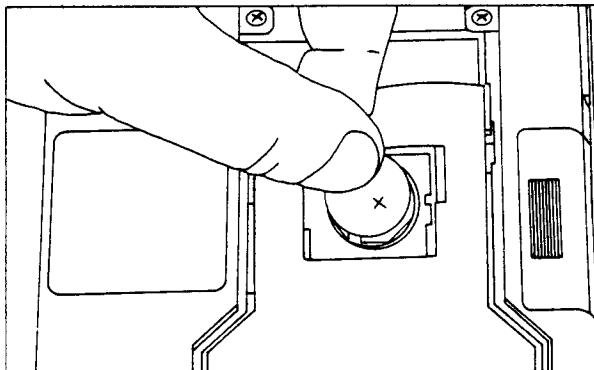


3. Using a finger, slide the battery cover in the direction away from the end with the retaining screw, and lift the cover off.

**NOTE**

If you are changing the battery in a RAM card, you will have to use a small screwdriver or knife blade to lift up the battery cover from the side that contains the retaining screw. The cover can then be disengaged and lifted off.

4. Remove the disc battery. (You may have to use a small screwdriver to pry it out gently.)
5. Tip the new battery up, and engage one side in the u-shaped spring in the battery cavity; then press the battery down into the battery cavity until it is flush with the surface. Make sure the side of the battery marked with a + is up. Always use a CR 2032, or equivalent, battery.



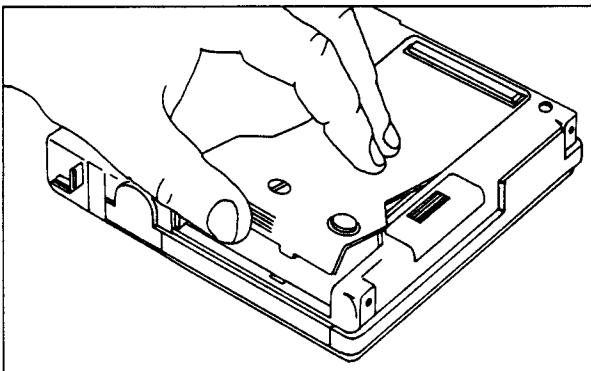
6. Replace the battery access cover. Make sure the cover is engaged properly before screwing it down.
7. Replace the back cover. Do this by engaging the tabs on the narrow end of the cover in the slots in the computer. Then press down along the edges of the cover until it snaps into place, and tighten the cover screw.

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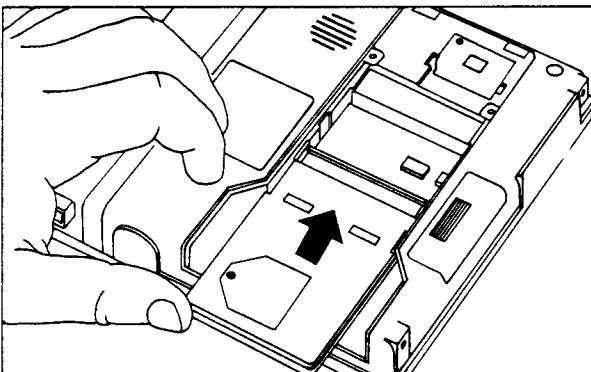
## HOW TO INSTALL A MEMORY CARD

If you need to install additional memory, either an HP 82411A RAM card or an HP 82412A ROM/EPROM card, do the following:

1. Make sure the HP-94 is turned off.
2. Remove the screw in the back cover on the bottom of the computer, then remove the cover. Do this by placing your thumb on the knurled surface on the front of the cover and your fingers in the middle of the cover. Gently pull up with your thumb; the cover will bend up and snap loose from the case.



3. Insert the memory card so that the two rails on either side of the opening are engaged in the slots on the sides of card. If the card is a RAM card, make sure the metal battery cover is showing. If the card is a ROM/EPROM card, make sure the side containing the label is showing.



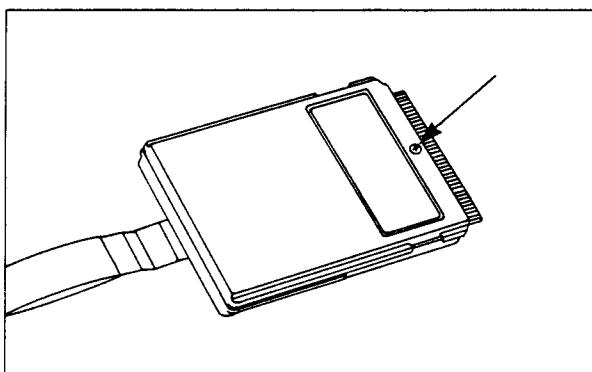
4. Press the card in along the rails until the connector on the card snaps into contact with the connector in the computer.
5. Fold the plastic handle down flat on top of the card making sure it does not interfere with the cover screw.
6. Replace the back cover. Do this by engaging the tabs on the narrow end of the cover in the slots in the computer. Then press down along the edges of the cover until it snaps into place, and tighten the cover screw.

---

## HOW TO INSTALL ROM AND EPROM ICS IN A ROM/EPROM CARD

You can install up to three 256 Kbit (32 Kbyte) ROM or EPROM integrated circuits (ICs) or two 512K-bit (63 Kbyte) ROM or EPROM ICs in a ROM card. You may *not* install 256K-bit *and* 512K-bit ICs at the same time. To install the ICs, do the following:

1. Remove the small retaining screw from the ROM card.



2. Using a small flat-blade screwdriver or a knife blade, pry the two halves of the ROM-card plastic case apart. Do not pry the case too far apart at any one point, but move carefully around the three sides of the case, more than one time if necessary.

**CAUTION**

To prevent damage from static discharge, be very careful not to touch any of the metal wires coming out of any of the ICs or any of the exposed pins in the card connector. You may destroy the IC if you do.

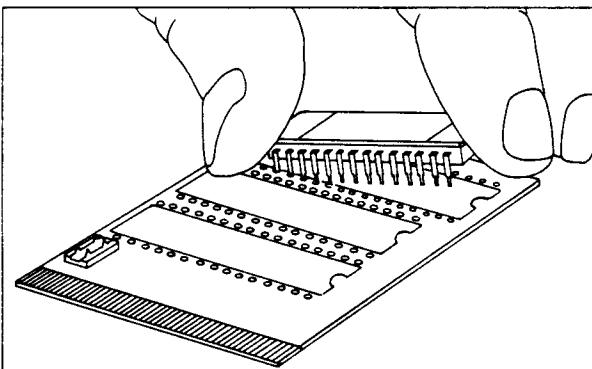
As an extra precautionary measure, you may wish to use a grounded wrist strap (available at your local electronics store) while you are handling the IC.

You should at least touch an earth ground before opening the case.

3. If you are replacing an IC, remove the original IC by pulling it up off the PCB. (You may need to use a small flat-blade screwdriver or an IC puller to loosen it.)

**NOTE**

The ROMs or EPROMs will be identified as to which sockets they must be installed in on the PCB. If they are not installed in the designated sockets, the programs they contain will not run properly. 256K-bit ROMs or EPROMs may be installed in sockets 1, 2, and/or 3; 512K-bit ROMs or EPROMs may be installed only in sockets 1 and/or 3.



4. With the PCB seated in the bottom of the case, orient the new IC so that the end containing the small half circle is at the same end as in the diagram printed on the PCB. Carefully align the wires coming out of the IC with the holes in the PCB. Gently press down on the IC until it is seated on the PCB as far as it will go.
5. Make sure the jumper is installed on the PCB correctly. To check this, pull the jumper off the PCB. Notice the four white rectangles printed on the PCB between the jumper pin connections. Two of the rectangles are labeled 256, and the other two are labeled 512.
  - If you have installed one, two, or three 256K-bit ROM or EPROM ICs on the PCB, you should install the jumper so that the connections at either end of the labels designated 256 are connected together.
  - If you have installed one or two 512K-bit ROM or EPROM ICs on the PCB, you should install the jumper so that the connections at either end of the labels designated 512 are connected together.
6. Replace the PCA in the bottom of the card case making sure it is seated properly on the two locating pins.
7. Reassemble the card case. Press firmly around the edges until the two halves snap together, then replace the screw.

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## **THE 128K FIELD SERVICE UPGRADE**

If you have an HP-94E computer, and you want to increase the built-in memory, you may send your HP-94 to an authorized Hewlett-Packard Service Center to have the 128K field service upgrade installed.

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## **HOW TO INSTALL THE CARRYING STRAP**

The strap can be installed across the side of the main battery if you carry the computer in your right hand or underneath the main battery if you carry the computer in your left hand. Just hook the strap onto the appropriate brackets.

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## **HOW TO INSTALL THE EARPHONE**

If you are working in a noisy environment, you may wish to use an earphone so you can hear the beeper. Just plug the earphone into the earphone connector; you will then be able to hear the beeper in the earphone. Use a conventional earphone with a 3.5-mm or 1/8-inch plug.

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## **HOW TO USE A BAR-CODE WAND**

You can enter data into your computer by using a bar-code wand.

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**NOTE** You must have the proper bar-code-wand application program installed in your HP-94.

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Do the following: Plug the bar-code-wand cable into the connector; then follow the instructions in the bar-code-wand user documentation and in the application-program on how to operate the wand.

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## HOW TO CONNECT EXTERNAL DEVICES

The voltage levels at the external-device connector in the HP-94 are 0 to 5V. These levels may not work with the device you are using. If they do not, you will need to install a level converter between the HP-94 and the device. Refer to the section on level converters for further information.

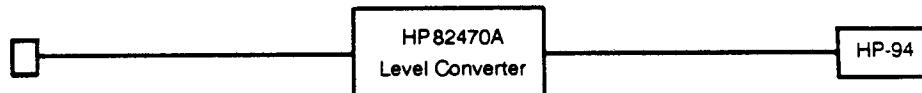
If you are using a Vectra PC, you will need an HP 82436A cable to connect the computer to the HP-94. Refer to the interconnection diagram below to determine your cable requirements.

Depending upon what computer or external device you are using, you may have to use other cables than those indicated. Refer to the sections on the level converter and the external-device connector to determine your cable requirements. (You may find an existing HP cable to meet your needs, or you can build your own cable.)

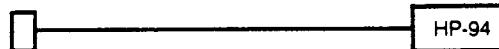
If you wish to use the HP-94 for data communications outside the U.S., you will need to use a level converter.

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## Interconnection Diagram



Device	Plug	Cable	Plug	Plug	Cable	Plug
IBM PC/AT SDS	9-pin (F)	HP 24542G	25-pin (M)		HP 82435A	15-pin (M)
IBM PC and PC/XT SDS	25-pin (F)	HP 17255D	25-pin (M)		HP 82435A	
	25-pin (F)	HP 82974D	25-pin (M)		HP 82435A	
	25-pin (F)	HP 13242H*	25-pin (M)		HP 82435A	



	Plug	Cable	Plug
Vectra SDS	9-pin (F)	HP 82436A	15-pin (M)
Modem	25-pin (M)	HP 82433A	15-pin (M)
Printer	25-pin (M)	HP 82434A	15-pin (M)
		Custom Made	

F - Female

M - Male

\* - Use only if 5-meter length is required.

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## WHAT TO DO IF AN ERROR MESSAGE IS DISPLAYED

If an error message, **Error** *nnn* or *mm* (where *nnn* is a three-digit decimal number and *mm* are two alpha characters), is displayed in the HP-94, consult the following table for the recommended action:

Error Number	Explanation and Action
101	You have an illegal character. Try again.
102	You have an invalid directory number. Try again.
200	Your main battery is low. Recharge it as soon as possible.
210	Your main-memory backup battery is low. Have it replaced as soon as possible.
211	The backup battery for your 128K field-upgrade memory or for your plug-in memory card is low. Have it replaced as soon as possible.
All other errors	Report the number to your supervisor.

For any other errors, refer to appendix A in the utilities reference manual.

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**NOTE** If the beeper turns on continuously when the HP-94 is turned on, or if **Error** followed by eight characters is displayed at turn on while the beeper beeps continuously, your HP-94 requires servicing.

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## THE LEVEL CONVERTER

The voltage levels on the external-device connector pins of the HP-94 are at 0 and +5V levels. If the device with which you wish to use the HP-94 requires +/-9V levels, you will need to connect an HP 82470A RS-232C Level Converter in the cable between the HP-94 and the device. To aid you in using the level converter, the following table lists the signals on the 25-pin female output connector.

Voltage levels at the output connector are +/- 9V.

Pin	Signal	Meaning)
1	GND	Shield ground
2	TxD	Transmitted data - output
3	RxD	Received data - input
4	RTS	Request to send - output
5	CTS	Clear to send - input
6	DSR	Data set ready - input
7	SG	Signal ground
8	DCD	Data carrier detect - input
20	DTR	Data terminal ready - output

If the device you wish to use has an input resistance greater than 3 kilohms and an input low-to-high transition threshold less than 4.2 volts and a high-to-low transition threshold greater than 0.2 volts, you will probably not need to use a level converter. Consult the device documentation or ask the manufacturer for this information.

The following devices can be used *without* a level converter:

HP 2225D ThinkJet Printer

HP 24540A Vectra Serial/Parallel Interface

HP 24541A Vectra Dual Serial Interface

HP PORTABLE computer

HP Portable PLUS computer

Hayes Smartmodem 1200

Black Box COS-4P and COS-8P Code Operated Switch

Black Box TLSI-4 and TLSI-8 Terminal Line Sharing Interface

The maximum length of cable recommended for reliable use without a level converter is three meters. If your cable is longer than three meters, you must use a level converter even though the device you are using does not require one.

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## THE EXTERNAL-DEVICE CONNECTOR

To aid you in designing your own interconnection cables, the following table lists the signals on the 15-pin external device connector in the HP-94.

Pin	Signal	Meaning)
1	GND	Shield ground
2	TxD	Transmitted data - output
3	RxD	Received data - input
4	RTS	Request to send - output
5	CTS	Clear to send - input
6	DSR	Data set ready - input
7	SG	Signal ground
8	DCD	Data carrier detect - input
9	SWVcc	Switched Vcc
10	Vrch	Recharger input
11	Gnd	Recharger ground
15	DTR	Data terminal ready - output

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## EQUIPMENT SPECIFICATIONS

### *Dimensions Power Requirements*

- Batteries: Rechargeable nickel-cadmium
- Battery voltage: 4.8 Vdc nominal

### *Operating Requirements*

- Operating temperature: Operating temperature: 0° to 55° C (32° to 131° F)
- Storage temperature: -40° to 65° C (-40° to 149° F)
- Humidity: Humidity: 0 to 95 relative.

### *Display (Liquid-crystal)*

- Character font: Character font: 5X8 dot matrix.
- Capacity: Capacity: 4 lines.
- Window size: Window size: 20 characters per line.
- Character set: Character set: Roman 8, 256 characters.

*Character Range* A-Z, a-z, 0-9, European characters, and punctuation, plus 16 user-defined characters.

### *Dynamic Range*

1. Real precision: 1.0E-64 to 1.0E63
2. Significant digits: 14
3. Integer precision: -32,768 to 32,767
4. Variable types: Integer, real, string, numeric and string arrays (up to 255 dimensions with a maximum of 64K bytes per array)

### *Clocks and Timers* Perpetual real-time clock calendar.

*Beepers* Programmable with parameters for high or low tones and varying durations (0.1 to 25.5 seconds).

### *Redefinable Keys* 16

### *Multiple File Structure*

- Maximum number of files: 63 to 189 depending on the memory configuration
- File types: BASIC, data, device driver, keyword extension *ROM/RAM*
- Built-in operating system *ROM*: 32K bytes.
- Built-in user *RAM*: 64K, 128K, or 256K bytes.
- User-installed options with 64K or 128K bytes built in: A 40K-byte *RAM* card or a maximum of 128K bytes of *ROM* or *EPROM*.
- Service upgrade with 128K bytes of *RAM* built in: One additional 128K-byte memory board can be installed.

- Maximum system RAM: 256K bytes
- Maximum capacity (RAM plus ROM or EPROM): 256K bytes

*Built-In Interfaces*

- RS-232C: Asynchronous up to 9600 baud, 0 to Vcc 15-pin D-type female connector
- Bar code: 0 to Vcc signal levels, 5-pin DIN female connector

*Communication Capability With RS-232C Devices Having The Following Characteristics:*

- Transmission mode: serial, asynchronous, full duplex  
Handshake: XON/XOFF or none
- Baud rate: 150 to 9600
- Data bits: 7 or 8
- Stop bits: 1 or 2  
Parity: Even, odd, or none
- Start bits: 1

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## **GLOSSARY**

**Application Program.** The application program contains the instructions that tell the computer and the user what to do. It may be contained in a memory card that you install in the HP-94, or you may download it from an external computer into the HP-94.

**Bar-Code Wand.** The bar-code wand is a device resembling a thick marking pen that you use to "read" the black-and-white stripes of a bar-code label.

**Cursor.** The cursor is the blinking ( ) or (□) in the HP-94 display that shows you where the next character will appear when you type it in.

**Data.** Data is information, such as an application program or inventory quantities, that you type into the computer or read from the computer.

**EPROM.** See Memory Cards.

**Level Converter.** A device installed in the cable between the HP-94 and an external device to enable them to work together.

**Memory Batteries.** The memory batteries are special very-long-life batteries that permit the computer to retain the data you have put into its memory even when the main battery is discharged or removed.

**Memory Cards.** Memory cards are of two types: ROM (read-only memory) provides memory storage space for instructions for a specific purpose. For example, an application program and the operational control system for your computer could each be designed and built into ROM cards at the factory. An EPROM (erasable-programable read-only memory) enables a software developer to install a program or data into a ROM card.

**RAM (Random-access memory)** provides storage space for your use when you enter data into your computer. The more RAM you have installed in your computer, the more data you can store.

**Printed-Circuit Assembly.** The printed-circuit board and the electrical parts mounted on it.

**Printed-Circuit Board.** The epoxy-glass board on which the electrical parts are mounted.

**ROM.** See Memory Cards.

**System Administrator.** The person responsible for supervising the use of the HP-94 and associated equipment by the end users.

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## POTENTIAL FOR RADIO FREQUENCY INTERFERENCE

(for U.S.A. only)

Your HP-94 generates and uses radio-frequency energy and may cause interference to radio and television reception. Although the HP-94 has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation, there is no guarantee that interference will not occur in a particular installation or configuration. In the unlikely event that there is interference to radio or television reception (which can be determined by turning the HP-94 off and on), you are encouraged to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the product with respect to the receiver.

If the interference is experienced when the HP-94 is operated with a recharger plugged in, plug the recharger into another ac outlet so that the recharger and the receiver are on different branch circuits.

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### NOTE

Hewlett-Packard is not responsible for any radio or television interference caused by unauthorized modifications to this equipment. It is the user's responsibility to correct such interference.

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If necessary, you should consult your field representative or an experienced radio/television technician for additional suggestions. You may find the following booklet, prepared by the Federal Communications Commission, helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock Number 004-000-00345-4. At the first printing of this manual, the telephone number was (202) 783-3238.

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## **AIR SAFETY NOTICE**

This product has been tested and qualified to the requirements of RTCA (Radio Technical Commission for Aeronautics) Docket 160B, Section 21 and has been found to comply with those requirements. Many airlines permit the use of portable computers in flight based on such a qualification. However, before boarding a flight, check with an airline representative on the carrier's policy regarding use of portable computers in flight.

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## **Limited One-Year Warranty**

### **What We Will Do**

The HP-94 is warranted by Hewlett-Packard against defects in materials and workmanship affecting electronic and mechanical performance, but not software content, for one year from the date of original purchase. If you sell your unit or otherwise transfer ownership of it, the warranty is transferred to the new owner and remains in effect for the original one-year period. During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, provided you return the product, shipping prepaid, to a Hewlett-Packard service center.

### **What Is Not Covered**

This warranty does not apply if the product has been damaged by accident or misuse or as the result of service or modification by other than an authorized Hewlett-Packard service center.

No other express warranty is given. The repair or replacement of a product is your exclusive remedy. **ANY OTHER IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS IS LIMITED TO THE ONE-YEAR DURATION OF THIS WRITTEN WARRANTY.** Some states, provinces, or countries do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. **IN NO EVENT SHALL HEWLETT-PACKARD COMPANY BE LIABLE FOR CONSEQUENTIAL DAMAGES.** Some states, provinces, or countries do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state, province to province, or country to country.

### **Warranty for Consumer Transactions in the United Kingdom**

This warranty shall not apply to consumer transactions and shall not affect the statutory rights of a consumer. In relation to such transactions, the rights and obligations of Seller and Buyer shall be determined by statute.

### **Obligation to Make Changes**

Products are sold on the basis of specifications applicable at the time of manufacture. Hewlett-Packard shall have no obligation to modify or update products once sold.

### **For More Information**

If you have questions about this warranty, please contact Hewlett-Packard at one of the following locations.

#### **In the United States.**

Call (503) 757-2002 or write to:

Hewlett-Packard Co.  
Calculator Service Center  
1030 N.E. Circle Blvd.  
Corvallis, OR 97330

### **In Europe.**

Call (022) 83 81 11 or write to:

Hewlett-Packard S.A.  
150, route du Nant-d'Avril  
P.O. Box 1217 Meyrin 2  
Geneva  
Switzerland

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**NOTE** Do *not* send units to this address for repair.

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### **In Other Countries.**

Call (415) 857-1501 in the U.S.A. or write to

Hewlett-Packard Intercontinental  
3495 Deer Creek Rd.  
Palo Alto, California 94304  
U.S.A.

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**NOTE** Do *not* send units to this address for repair.

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### **Service**

Hewlett-Packard maintains service centers in most major countries throughout the world. You may have your unit repaired at a Hewlett-Packard service center any time it needs service, whether the unit is under warranty or not. There is a charge for repairs after the one-year warranty period.

Hewlett-Packard products are normally serviced and reshipped within five (5) working days of receipt at any service center. This is an average time and could vary depending upon the time of year and the work load at the service center. The total time you are without your unit will depend largely on the shipping time.

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**NOTE** Before sending in your unit for service, be sure to save any data you have in memory that you do not wish to lose; all memory is lost during the repair procedures.  
(Transfer the data to your system computer or to another HP-94.)

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### **Obtaining Repair Service in the United States**

For service in the United States, ship your unit to:

Hewlett-Packard Company  
Calculator Service Center  
1030 N.E. Circle Blvd.  
Corvallis, Oregon 97330, U.S.A.

or mail it to:

Hewlett-Packard Company  
Calculator Service Center  
P.O. Box 999  
Corvallis, Oregon 97339, U.S.A.

The telephone number for the Calculator Service Center is (503) 757-2002

### **Obtaining Repair Service in Europe**

Service centers are maintained at the following locations. For information on service in these countries, contact the service center. In countries not listed, contact the sales representative from whom you purchased your unit.

#### **AUSTRIA**

HEWLETT-PACKARD Ges.m.b.H.  
Kleinrechner-Service  
Wagramerstrasse-Lieblgasse 1  
A-1220 Wien (Vienna)

Telephone: (0222) 23 65 11

#### **BELGIUM**

HEWLETT-PACKARD BELGIUM SA/NV  
Woluwedal 100  
B-1200 Brussels

Telephone: (02) 762 32 00

#### **DENMARK**

HEWLETT-PACKARD A/S  
Datavej 52  
DK-3460 Birkerod (Copenhagen)

Telephone: (02) 81 66 40

#### **EASTERN EUROPE**

Refer to the address listed under Austria.

#### **FINLAND**

HEWLETT-PACKARD OY  
Revontulentie 7  
SF-02100 Espoo 10 (Helsinki)

Telephone: (90) 455 02 11

**FRANCE**

HEWLETT-PACKARD FRANCE  
Division Informatique Personnelle  
S.A.V. Calculateurs de Poche  
F-91947 Les Ulis Cedex

Telephone: (6) 907 78 25

**GERMANY**

HEWLETT-PACKARD GmbH  
Kleinrechner-Service  
Vertriebszentrale  
Berner Strasse 117  
Postfach 560 140  
D-6000 Frankfurt 56

Telephone: (611) 50041

**ITALY**

HEWLETT-PACKARD ITALIANA S.P.A.  
Casella postale 3645 (Milano)  
Via G. Di Vittorio, 9  
I-20063 Cernusco Sul Naviglio (Milan)

Telephone: (2) 90 36 91

**NETHERLANDS**

HEWLETT-PACKARD NEDERLAND B.V.  
Van Heuven Goedhartlaan 121  
NL-1181 KK Amstelveen (Amsterdam)  
P.O. Box 667

Telephone: (020) 472021

**NORWAY**

HEWLETT-PACKARD NORGE A/S  
P.O. Box 34  
Oesterndalen 18  
N-1345 Oesteraas (Oslo)

Telephone: (2) 17 11 80

**SPAIN**

HEWLETT-PACKARD ESPANOLA S.A.  
Calle Jerez 3  
E-Madrid 16

Telephone: (1) 458 2600

**SWEDEN**

HEWLETT-PACKARD SVERIGE AB  
Skalholtsgatan 9, Kista  
Box 19  
S-163 93 Spanga (Stockholm)

Telephone: (08) 750 2000

**SWITZERLAND**

HEWLETT-PACKARD (SCHWEIZ) AG  
Kleinrechner-Service  
Allmend 2  
CH-8967 Widen

Telephone: (057) 31 21 11

**UNITED KINGDOM**

HEWLETT-PACKARD Ltd  
King Street Lane  
GB-Winnersh, Wokingham  
Berkshire RG11 5AR

Telephone: (0734) 784 774

**International Service Information**

If you happen to be outside of the country where you bought your unit, you can contact the local Hewlett-Packard service center to see if service is available for it. If service is unavailable, please ship the unit to the address listed above under Obtaining Repair Service in the United States. A list of service centers for other countries can be obtained by writing to that address.

All shipping, reimportation arrangements, and customs costs are your responsibility.

**Service Charge** There is a standard service charge for out-of-warranty service. The charge includes all labor and materials. In the United States, the full charge is subject to the customer's local sales tax. In European countries, the full charge is subject to Value Added Tax (VAT) and similar taxes wherever applicable. All such taxes will appear as separate items on invoiced amounts.

HP-94s damaged by accident or misuse are not covered by the fixed service charges. In these situations, service charges will be individually determined based on time and materials.

## **Service Warranty**

Any out-of-warranty service is warranted against defects in materials and workmanship for a period of 90 days from date of service.

## **Shipping Instructions**

Should your unit require service, return it with the following items:

- A description of the problem.
- A sales receipt or other proof of purchase date if the one-year warranty has not expired.

The product, the description of the problem, and (if required) the proof of purchase date should be packaged in adequate protective packaging to prevent in-transit damage. Such damage is not covered by the one-year limited warranty; Hewlett-Packard suggests that you insure the shipment to the service center. The packaged unit should be shipped to the nearest Hewlett-Packard designated collection point or service center. Contact your dealer for assistance. (If you are not in the country where you originally purchased the unit, refer to "International Service Information" above.)

Whether the unit is under warranty or not, it is your responsibility to pay shipping charges for delivery to the Hewlett-Packard service center.

After warranty service is completed, the service center returns the unit with postage prepaid. On out-of-warranty service in the United States and some other countries, the unit is returned C.O.D. (covering shipping costs and the service charge).

## **Further Information**

Service contracts for many Hewlett Packard calculator and computer products are available. For information about service contracts, please contact the Calculator Service Center in Corvallis, Oregon, USA.

Circuitry and designs are proprietary to Hewlett-Packard, and service manuals are not available to customers. Should other problems or questions arise regarding repairs, please call your nearest Hewlett-Packard service center.



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