



Panasonic® **Attache Case**
Model: RD-9808

Instruction for Use

① For your convenience and protection, enter the information below and retain for future reference. The model and serial numbers are on the bottom of the unit. A separate warranty registration card is packed with the unit. This should be completed and mailed to Panasonic as soon as possible. If you received no warranty registration card with your purchase, please contact your Panasonic dealer, they may have registered the unit for you.

Notice: In several countries a warranty registration card is not necessary.

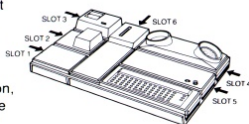
Model No. _____ Dealer Name _____

Serial No. _____ Dealer Address _____ City _____ State _____ Zip _____

Purchase Date _____ Dealer Telephone _____

GENERAL DESCRIPTION The I/O Adaptor allows you to connect up to six peripherals at once. Multiple peripheral attachments are made within a special modular tray—with the HHC Primary Unit at the bottom right.

CONNECTIONS Peripherals connect in only one way; do not force fit an upside down peripheral. All the slots (ports) are similar. The slot numbers for the peripherals begin at the slot (1) immediately across the I/O Adaptor from the HHC—and proceed in clockwise fashion, except for the slot (6) which is located on the top of the I/O Adaptor.

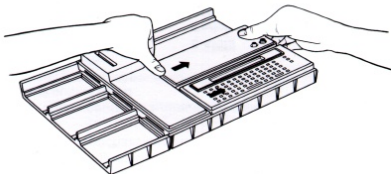


MAIN TRAY A large, three-slot tray comes with the I/O Adaptor for holding the Primary Unit, the I/O Adaptor and two more large peripherals (such as the TV Adaptor or the Modem); it will also hold the smaller peripherals if you wish.

SUB-TRAY A smaller, three-slot tray for holding a Micro Printer, the RS-232C unit, and/or Programmable Memory (RAM) also comes with the I/O Adaptor.

How to take off the Primary Unit and peripherals:

Push the Primary Unit and peripherals away from the I/O Adaptor as shown in the figure.





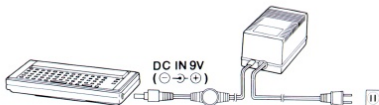
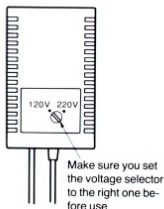
Panasonic® I/O Adaptor
Model: RL-P6001

Instruction for Use

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE.

AC ADAPTOR This AC Adaptor allows you to do two things at the same time. First, you can operate with regular AC current; second, you can recharge the various nickel-cadmium batteries of the HHC system even while operating.

The AC Adaptor plugs into the right-hand side jack of the HHC Primary Unit.



The AC Adaptor has a Voltage Selector Switch, which allows you to choose either 120 volts or 220 volts as line current input.

Recharging times vary from device to device, but approximately 12 hours is required to fully recharge all batteries.

CAUTION: 1) Always check the Voltage Selector Switch before using the AC Adaptor to make sure it matches the line current voltage you are plugging into. If you mistakenly plug into 220 volts while the switch is set to 120 volts, the fuse built into the AC Adaptor will burn



out—protecting the circuitry of the entire HHC system (at which time you should take the AC Adaptor to your nearest Panasonic Servicer).

2) RD-9498 is an exclusive AC Adaptor for HHC system and must not be used with any other devices.

Be sure the AC Adaptor has adequate ventilation for cooling, and you can use it at all times. Do not place objects on top of the AC Adaptor.

SPECIFICATIONS

Primary Side	
Input Voltage:	120 V \pm 10%; 220 V \pm 10% Switchable
Secondary Side	
Output Voltage:	At no load; 9 V
Temperature Rise:	At 1.1 A load; 8.8 V
Operating Temperature:	Max. +55°C over air temperature
Dimensions:	32°F–104°F (0°C–40°C)
	3-1/32" \times 2-17/32" \times 5-3/4"
	(77 \times 64.5 \times 146 mm)
Weight:	2 lb. 6.8 oz (1.1 kg)

CAUTION: WHEN USED WITHIN RATED WATTAGE, THE TEMPERATURE RISE ON THE UNIT SURFACE DOESN'T AFFECT PERFORMANCE.



Panasonic[®] AC Adaptor
Model: RD-9498

Instruction for Use

This model is not included in the Primary Unit.

The model and serial numbers are found inside the Case. You should note the model and serial numbers of this product in the space provided and retain this manual as a permanent record of your purchase to aid in identification in the event of theft.

Model No. _____ Serial No. _____

The vinyl attache case with its distinctive dimensions can hold all of the following: HHC Primary Unit, two large-sized peripherals (eg., TV Adaptor, Modem), three small-sized peripherals (eg., printer, RS-232C), antenna selector box, three connection cables for video, owner's manual, and more. Most of this equipment fits into the slots of the large and small trays provided with the I/O Adaptor. The remaining equipment fits pocket inside the case. Two or three extra RAMs may be held in the pocket as well. (You must select what you want to carry in the pocket due to the limited size of the pocket).

CAUTION: Be careful when carrying the case with your HHC system. Violent falls or blows can damage the HHC system or its connections. **HANDLE WITH CARE!**

③ **WHAT CAN GO WRONG** If you insert a peripheral without the I/O Cable into the slot on the top of the I/O Adaptor, it may physically fit—but you will eventually break the slot. You must use the I/O Cable (optionally available).

The slot only accepts a uni-directional connection. A device should not be forced into a slot upside down.

SPECIFICATIONS	Peripheral Connection Slots:	6 slots Peripherals can be attached to any slot (When the slot on the top of the I/O Adaptor is used, the I/O Cable must be used)
	HHC Primary Unit Connection Slot:	44-terminal edge connector
	Power Source:	Supplied from the HHC Primary Unit or from the AC Adaptor
	Power Consumption:	20 mW
	Operating Temperature:	32°F–104°F (0°C–40°C)
	Dimensions:	16-3/4"×2"×12-7/32" (425.5×51×318 mm)
	Weight:	2 lb. 6.8 oz. (1.1 kg)

(only for USA)

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

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules. Which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient the receiving antenna
- relocate the computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits.

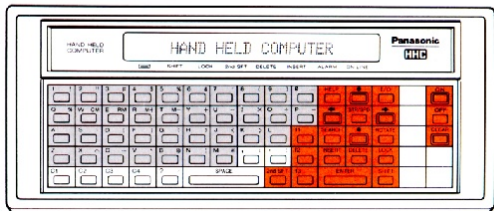
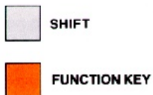
If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the US Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4.

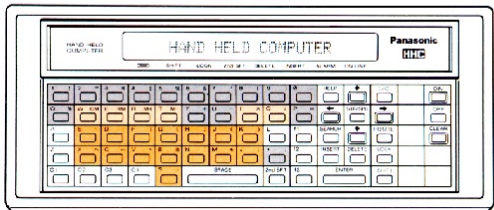
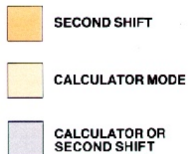
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COLOR-KEYED DIAGRAM (1)



COLOR-KEYED DIAGRAM (2)

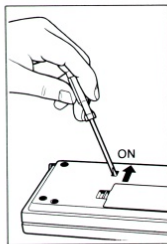


SOME SPECIAL FEATURES OF THE HHC

- ▶ Easy-to-use keyboard with upper and lower case characters.
- ▶ HELP key gives directions for use of function keys, without disturbing any program you may be carrying out.
- ▶ SEARCH key locates information with only a few keystrokes.
- ▶ Information is presented at user-selected speeds.
- ▶ HHC turns itself off after a few minutes of inactivity, but it "remembers" your last action and continues where you left off the next time you use the HHC.
- ▶ Battery life is extended by a group of new hardware techniques that dynamically regulate and conserve power usage.
- ▶ Modular design allows virtually unlimited expandability and any combination of peripheral devices.
- ▶ SNAP—a new programming language and operating system—saves memory space, executes at extremely high speed, and can be added to by any programmer, including you.
- ▶ HHC is designed for both existing and future hardware and software.

BEGINNING FROM "COLD START"

Before using your HHC for the first time, you will have to engage the rechargeable nickel-cadmium batteries, which have been disconnected during storage and shipping. Locate the recessed switch, marked ALL-OFF, on the bottom of the unit; and insert a pencil or screwdriver, as shown in the illustration at left. Flip this two-position switch from OFF to ON. It is highly recommended for you to use the AC Adaptor when you start using your HHC, because the rechargeable batteries might have been discharged for long storage in the warehouses or on the store shelves.



Note that this is not the same as turning the unit off and on with the keys on the keyboard. In the latter case, the HHC retains its Internal Memory, the Clock/ Controller date and any program in progress. When the switch on the bottom is turned off, however, all memory is erased because all power is removed. Therefore, never turn the unit off with the ALL-OFF switch on the back unless you plan to store the HHC for an extended period, or as a trouble-shooting tactic (see the section on WHEN THINGS GO WRONG).

When you press **ON** followed by **SEARCH**, the word RESTART appears in the Display. Press **SEARCH** to begin operation of the HHC. If RESTART appears at any time other than after a cold start, check the time and review alarms in the Clock/ Controller and check File System files in Internal Memory: they may have been inadvertently disturbed.

On the other hand, if **RESTART** does not appear when you first turn on the unit from a cold start, or if the message **BAT LOW** appears with a beep for a few seconds and then goes away, or if there is nothing in the Display—then your batteries need to be recharged by using the AC Adaptor which plugs into the round jack on the right side of the HHC. Take care to see that the AC Adaptor has sufficient ventilation so that it does not overheat.

Be sure to set the AC Adaptor for the correct voltage (120 or 220), to avoid serious battery damage.

Also note that you should use the AC Adaptor whenever possible—keeping the batteries fully charged for portable use of the HHC, even when the **ALL-OFF** switch is in the **OFF** position.

If **BAT LOW** appears in the Display the batteries need to be recharged, or you should use the **ALL-OFF** switch on the back of the unit to turn the HHC off, even though this means that you will lose some data. Otherwise, your batteries could discharge permanently.

USING THE HHC PRIMARY UNIT

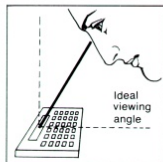
The Instrument Itself

Let's take a look at your HHC. First the back side: behind the removable door are three sockets for HHC capsule programs.

Now, use the page with the color-keyed diagram of the computer to locate features as they are discussed in the remainder of this manual.

At the top of the front of the HHC is the "window" that is the Display area—a liquid crystal display (LCD) that can hold up to 26 characters plus graphic patterns.

The Display has been designed so that it can be read easily when the HHC is lying flat, as on a desk. The illustration at left shows the ideal viewing angle. Experiment until you find the best angle for your own operations.



Immediately below the Display are eight "indicators". Use the table below to find the meaning if a "Blip" (small triangle) is on above one of these indicator words (Note: the leftmost Blip is used to mean different things by different HHC capsule programs; consult your capsule program manuals to learn if this Blip has a significance for the capsule program you are using):

SHIFT—The HHC is in the Shift Mode (refer to the **SHIFT** key described below).

LOCK—Some function has been locked with the **LOCK** key (described below).

2ND SFT—The HHC is in the Second-Shift Mode (described below).

DELETE—The HHC is in the Delete Mode (described below).

INSERT—The HHC is in the Insert Mode (described below).

ALARM—The Clock/Controller has a message for you (described in the section on the Clock/Controller).

ON-LINE—When the HHC is being used with a Modem peripheral as a terminal to another computer, this Blip indicates that you are properly receiving the carrier tone from the remote computer.

The Keyboard The largest feature of the HHC is the KEYBOARD of 65 keys, which is your means for giving instructions to the computer. The keyboard is UNLIKE a typewriter keyboard in that the HHC keys can perform different functions in different programs. The following descriptions are generally applicable, but do not cover every possibility.

A computer can do so many tasks that one keyboard is not sufficient. Therefore, HHC key definitions are changed for some programs, and entirely different keyboards may be substituted (by overlays) for other programs.

Most of the keys are auto-repeat keys; they repeat their actions over and over if held down for more than about one second.

Most of the keys are alphanumeric (character) keys, but we will begin with descriptions of the "function" keys—that is, keys that perform actions.

ON and OFF Keys At the upper-right is the **ON**, just above the **OFF**. In case you forget to turn the HHC off, the unit automatically turns itself off after about ten minutes of inactivity, going into a power-saving mode. If you are in an activity that starts by using **UD**, **HELP**, or **STP:SPR**, be sure to complete that activity because the HHC will not automatically turn itself off in the middle of one of these special functions. In every other case, it will turn itself off.

If there are peripherals connected to the HHC, the **OFF** key turns them off also, eliminating their power consumption.

Nothing is lost or forgotten while the HHC is in the "off" (power-saving) mode; any program that was in progress "freezes" and continues when the **ON** key is pressed.

The CLEAR Key Just below the **ON** and the **OFF** key is the **CLEAR** key.

If you are in the middle of a program, press **CLEAR** once to go back to the beginning of that program. If you are already at the beginning of a program, pressing **CLEAR** once will return you to the PRIMARY MENU (described on page 18). In all cases, pressing **CLEAR** twice returns you to the Primary Menu.

The I/O Key At the top of the next row is the Input-Output key (I/O).

Press **IO** and any current program will be interrupted to present a listing of all presently connected attachments (peripherals), the slot numbers where the peripherals are attached, and their status (**ON** or **OFF**).

Also listed are the locations of attached Programmable Memory peripherals with the number of free characters in each, plus a notation of the free characters in the Internal Memory of the Primary Unit. The memory area which is currently selected will be signified by appearing in negative type (white on black).

We'll learn more about the linkages that can be made with **LOCK** in the section on peripherals (page 48).

RIGHT and LEFT Keys



Below the **END** key is the RIGHT key **→**, and nearby is its mirror-image, the LEFT key **←**.

These are general purpose direction keys and perform in different ways in different programs.

For example, when writing or editing material in the File System, these keys move the flashing indicator (called the CURSOR) right or left without changing the characters across which it passes.

The **→** and **←** keys along with the **↑** and **↓** keys are called ARROW keys; their specific functions will be described in various sections throughout this manual.

UP and DOWN Keys

Locate **↑** and **↓**. Like the **→** and **←**, these are general direction keys and perform in various ways.

For example, the Display is like a "window" on a file or list: pressing **↑** causes the line immediately above the current line to appear—moving the "window" upward, so to speak.

Pressing **↓** reveals the line below the current line.

The ROTATE Key

Usually, when you are typing a line of characters, pressing **ROTATE** causes the line in the Display to rotate continuously from right to left (like the news bulletins at Times Square) until you press any key except **END**, **HELP**, **CAUSE**, **2nd SP**, **11**, **12**, or **13**.

The LOCK Key

Below the **ROTATE** key is **LOCK** which, when pressed before certain keys (**SHIFT**, **2nd SP**, **INSERT**, **DELETE**, and all the ARROW keys), will put those keys in a Lock Mode that affects the keys as though they were held down continuously.

When you press **LOCK** followed by **SHIFT** or **2nd SP**, the Blip appears in the Display above the Attention Indicator, **LOCK**.

The Lock Mode continues until the locked key is pressed a second time.

The SHIFT Key

Moving down, you encounter **SHIFT** which has the same purpose as a shift key on a typewriter. Pressing it produces an upper-case letter when followed by any

alphabet key, and it produces the punctuation and other marks above the first line of numerical keys.

When you press **SHIFT**, the Blip appears in the Display above the Attention Indicator, SHIFT, meaning that the next character typed will be shifted.

The LOCK key may be used with **SHIFT**.

The color-keyed diagram shows the characters accessed by **SHIFT**.

The STP/SPD Key and Display Modes

Locate the STOP/SPEED key **STOP/SPD**. It is used to "freeze" an activity in some applications so that you can study the situation—or devote your attention to matters other than the computer. The action resumes when **STOP/SPD** is pressed a second time.

Instead of resuming your action by pressing **STOP/SPD** a second time, you can select the speed of the Display and auto-repeat keys by pressing a number from **1** (very slow) through **5** (medium) through **9** (very fast). Thereafter, the original activity continues at the chosen speed. The speed choice will prevail until changed by you in the above manner, or unless the ALL-OFF switch is used to turn the HHC completely off. Experiment with various speeds to find which is most comfortable for you.

The DELETE Key Just below the **↵** key you will find the DELETE key **DELETE**.

This key is used to delete characters, lines, and other material. The method of deletion differs in different programs, as described in other parts of this manual.

When you press **DELETE**, the Blip appears in the Display above the Attention Indicator, DELETE, to warn you that you are about to delete material, and the cursor becomes a flashing empty rectangle.

The LOCK key may be used with **DELETE**.

The HELP Key The HELP key has two functions.

First, true to its name, it gives help. Press **HELP** and the message PRESS KEY FOR DEFINITION will appear in the Display. Then if you press one of the function keys excluding **F1**, **F2**, or **F3**, the definition of that key will be shown in the Display briefly. After this, the interrupted activity will resume.

Second, you can assign new definitions to **F1**, **F2** and **F3** as described below.

The SEARCH Key Above **DELETE** is the SEARCH key **SEARCH**—which is used when reviewing File System text to locate a character word, phrase, or other group of characters.

The procedure for searching a file is covered on page 40.

The INSERT Key To the left of **DELETE** is the INSERT key **INSERT**.

This key is used in different ways in different programs, but its general function is to insert characters or lines within other material.

When you press **INSERT**, the Blip appears above the Attention Indicator, **INSERT**. Also, the cursor becomes a flashing checkered rectangle.

The LOCK key may be used with **INSERT**.

The ENTER Key The wider **ENTER** is adjacent to **SHIFT**. If **ENTER** is pressed after a group of characters, it signals the HHC that you are through with your input and causes the program to move forward.

f1, f2, f3 Keys These keys are called USER-DEFINABLE KEYS—that is, they can represent combinations of keystrokes (functional, alphabetical or numerical) that you choose. The only exceptions are **F1**, **F2**, **F3**, **ON**, **OFF**, **CLEAR**, **GO**, **HELP** and **STOP/SPD**—beyond these anything may be included in a function key definition to provide shortcuts.

When you define a user-definable key, the action of that key is the same as if you had typed a group of keys from the keyboard. For example, if you assigned the number "234" to a user-definable key and you were in the Calculator Mode, the number 234 would be entered into the calculator and interpreted as a number. If

you were editing a file in the File System when you pressed the key, then "234" would be entered as text into the file. Thus the user-definable keys form a useful addition to all programs.

To assign a definition to one of these keys: press **HELP**, then the key (**F1** for example), then the desired definition (ignoring the current definition which will disappear when you start typing the new one), and finally press **CLEAR** which returns you to the beginning of your program (not back to the middle in this case).

When you press function keys as a part of a definition, the Display will echo as follows:

LOCK as a superscript M*
 ROTATE as an inverse image G
 INSERT as \hat{M} symbol
 DELETE as \hat{M} symbol
 SEARCH as black rectangle
 ENTER as an inverse image M
 C1 as an "ä" (with umlaut)
 C2 as an "ö" (with umlaut)
 C3 as an "ü" (with umlaut)
 C4 as an "ñ" (with tilde)

*The M for LOCK does not appear until you have typed the function to be locked.

Only 14 characters can be used in a single definition; at the 15th keystroke, the word FULL appears in the Display. If more characters are needed, the definition can be divided between two or three user-definable keys—to activate the full definition, press the user-definable keys in the sequence in which you entered the definition.

The SECOND SHIFT Key While we're on the subject of shifting, locate the SECOND SHIFT key **2nd SFT**.

This key gives you the availability of more characters without adding more keys to the compact HHC. For example, pressing **SHIFT** before typing "y" will produce a capital Y. But pressing **2nd SFT** before typing "y" produces the plus sign (+)—thus giving you three characters with the same key.

You can determine which keys are responsive to the SECOND SHIFT key by studying the color-keyed diagram.

The Blip above the Attention Indicator, 2ND SFT, indicates that the next character typed will be second-shifted. The LOCK key may be used with **2nd SFT**.

C1, C2, C3, C4 Keys The keys **C1**, **C2**, **C3**, and **C4** are PROGRAM DEFINABLE KEYS. In File System programs and when typing in the Clock/Controller schedule, pressing **C1** produces an "a" with an umlaut; **C2** is an "o" with an umlaut; **C3** is a "u" with an umlaut; and **C4** is an "n" with a tilde—commonly accented letters in European languages.

These keys are redefined by HHC capsule programs, and you can find how to use these keys in the specific HHC capsule program manuals.

NUMERIC Keys The first row of the keyboard contains the numerals, which can be used in most programs. Refer to the discussion beginning on page 19 for detailed information on the Calculator Mode.

ALPHABET and PUNCTUATION Keys The alphabet and punctuation keys are arranged on the HHC much the same as on a standard typewriter keyboard, and they have the same functions, except where **2nd SFT** is used, as discussed above.

Note that the most commonly used punctuation marks—period, comma and question mark—are available in both shifted and unshifted modes to facilitate typing.

MENUS

Definition and Explanation

MENUS list your available options. Menu choices are numbered 1–9, and in case more items are needed, A–Z —for a maximum of 35 possible selections.

The Menu items are presented in the Display one at a time—at a speed determined by your choice of DISPLAY SPEED settings (see the discussion of the STOP/SPEED key in the section on the HHC Keyboard.)

All menus cycle, so that after the last item has appeared, the first item is shown again, and so on.

To choose a specific menu item, just type its number or letter AT ANY TIME during the menu presentation (**ENTER** is not required).

There are often "menu within menus," so that when you type the menu number for a particular program, you may be presented a menu of options available for that program. A selection here can lead to yet a third menu, and so on.

To get quickly from the Primary Menu to a remote menu choice, passing through a number of menus, you can type several digits immediately at the Primary Menu and you will end up quickly at the chosen activity. For example, typing the number "24" at the Primary Menu leads instantly to the time activity of the Clock/Controller.

If you type a number or letter that doesn't represent a menu item, the HHC will beep politely to inform you to try again.

The Primary Menu

This is where you begin when you use your HHC. The Primary Menu lists the intrinsic programs available with the HHC Primary Unit, plus any currently accessible HHC capsule programs and programs for certain peripherals (Telecomputing with the Modem, for instance).

If only programs intrinsic to the HHC Primary Unit are accessible, here is what you will see in the Display when the Primary Menu is being shown:

- 1= CALCULATOR
- 2= CLOCK/CONTROLLER
- 3= FILE SYSTEM
- 4= RUN SNAP PROGRAMS

This list will be lengthened to include the name of programs contained in attached HHC capsules. Also listed are any programs for peripherals which are attached and selected by the I/O key (see the section on Beyond the Primary Unit with the I/O key, page 48).

Instructions for programs not intrinsic to the Primary Unit of the HHC are given in manuals for the specific peripherals or HHC capsules.

To access the Primary Menu at any time, just press **ENTER** twice.

CALCULATOR

Definition and Explanation

To enter the Calculator Mode of the HHC, press **2** while in the Primary Menu.

Look at the color-keyed diagram, and you will see that the two top rows of keys and the period key (which is the decimal point) become Calculator keys, performing only the indicated calculator functions—SHIFT or 2ND SHIFT are not necessary when using the Calculator Mode.

Arithmetic problems are entered into the Calculator in the same order as they are written on paper. First a number—then plus, minus, times, or divide by—then the second number—and finally the equals sign. Thus, “two plus three equals five” occurs as follows:

KEY	DISPLAY
CLEAR	0 with cursor
2	2
+	2+
3	2+3
=	5

You can use **←** and **→** to move the cursor and make changes; when you are satisfied, type the equals sign, and the answer will appear no matter where the

cursor is located. In the above example, when the Display read 2+3, you could move the cursor to change the plus to a minus, then immediately press the **=** and receive the answer (-1).

In a string of arithmetic procedures, each function is completed (as though the equals sign had been used) before going into the next procedure. For example, take the problem:

$$(37+16.9-11)\times 3=$$

The Calculator handles it as follows:

KEY	DISPLAY
CLEAR	0 with cursor
3 7	37
+	37+
1 6 . 9	37+16.9
-	53.9-
1 1	53.9-11
×	42.9×
3	42.9×3
=	128.7

Numbers longer than ten digits are not accepted; the HHC will beep for each

excess keystroke. If the answer cannot be expressed in, or rounded off to, ten digits (e.g., 9999999999×5), the Display shows the message:

RANGE ERROR

And the problem must be stated in a manner that will lead to an answer of ten digits or less.

The Percent Key The Percent Key for the Calculator is the key used in other programs for the letter "Q".

The most useful feature of the Percent Key is that you can use it to figure discount, add-on, and similar problems. Examples:

- \oplus 5 % = adds 5 percent to the original number.
- \ominus 8 % = subtracts 8 percent from the original number.
- \times 4 % = multiplies the original number by 0.04.
- \div 5 % = divides the original number by 0.05.

Calculator Memory The four Memory Keys—**CM**, **RM**, **M+**, and **M-**—allow numbers to be stored and retrieved for further use. Thus, you can put the result of a calculation into memory, add to it or subtract from it as the result of other calculations, and retrieve the summed result when you need it.

CM —the Clear Memory key stores a zero in memory, clearing any previous value.

M+ —the Add-to Memory key is used to add on the most recently displayed number to the number currently in the memory.

Note that this key is NOT an equals key; thus, pressing $2 \oplus 3 \text{ M+}$ will add 3 to the memory, not 5.

M- —the Subtract-from Memory key subtracts the most recently displayed number from the current number in the memory.

RM —the Recall Memory key displays the number currently in the memory, entering that number into the calculations just as if you had typed the number itself (the number remains in memory until you change it).

CE —this key is like the CLEAR ENTRY (CE) key of other calculators; it deletes the entire, most-recent number—then plus, minus, times or divide by—, so you can retype it. (You can use f1, f2, f3 keys to store the numbers or combinations of keystrokes in the Calculator Mode).

When you add to or subtract from memory, the number in the Display and the calculation in progress are not disturbed. Therefore, memory operations can be used whenever needed.

You are not limited to the Primary Unit when using the Calculator program. If you have a TV Adaptor, you can see your calculations on a television. And you can have a hard copy of your calculations if you have a printer attached.

CLOCK/CONTROLLER

Definition and Explanation

The CLOCK/CONTROLLER is a useful feature of the Primary Unit of the HHC. First, it is an accurate Quartz Clock that displays the current time and date.

Second, it is an electronic appointments calendar that allows you to schedule personal and business events—hours, days, months or even years ahead.

You can set the times that you wish to be reminded, and include messages to yourself that describe each appointment. (This information is stored in only internal RAM, and Programmable Memory (RAM) can't be used for this function).

When the time of the appointment arrives, the HHC sounds off pleasantly—and when you acknowledge the tune, the pertinent message appears in the Display.

Thus, you can schedule all your business appointments, review them at any time, add, delete or reschedule items. Or you can remind yourself of recurring events, such as wedding anniversaries, birthdays, etc.—literally for the rest of your life! With appropriate peripherals, you can see your schedule on a TV or have a printed copy.

Moreover, the CLOCK/CONTROLLER keeps working and “remembering” even when the HHC is turned off. And on or off, or even if you are in the middle of another program, the tune sounds at each alarm setting—and continues to sound every 10 minutes until you acknowledge it.

The Clock/Controller Menu

From the Primary Menu, type **2** for the CLOCK/CONTROLLER function. This will display the following menu:

- 1=SET ALARM
- 2=REVIEW
- 3=ACKNOWLEDGE
- 4=TIME
- 5=SET TIME

The Time Pressing **4** gives you the time and date, with the seconds counting—like this:

WED 11:31:59  MAR 23 1983

To return to the Clock/Controller Menu, press **2** once—twice to return to the Primary Menu.

Setting the Time To make time corrections, for time zone changes, etc., press **F5** in the Clock/Controller Menu. This causes the time and date to be “frozen” and the clock to stop while you readjust, and places a cursor in the Display for changing characters. The manner of display is slightly different from the regular time display:

WED 11:31:59 AM 03/23/83

Use **←** and **→** to move the cursor to the characters that need changing, and then type in the new characters—using **A** for AM and **P** for PM (**SHIFT** is not necessary to produce the capital A or P). Notice that the cursor skips character positions over which you have no control—that is, the day of the week which depends on the date, and all spaces, slashes, and colons.

It is a good idea to set the seconds some 15 to 20 seconds in advance of the watch or other standard you are using. Then, when you complete your resetting, you can synchronize with the standard by pressing **ENTER** at the exact second. This starts the clock running at the new time and returns the HHC to the Clock/Controller Menu. Note that you don't have to be at the end of the line to press **ENTER**; you can make a change only in the hour, for example, and then press **ENTER**.

When changing the hour for time zone adjustments, you must also reset the minutes and seconds. This is because the clock is “frozen” for the amount of time it takes to make the changes and press **ENTER**.

If you somehow set an impossible date or time—e.g., 03/33/83 or 11:65:59—it will be converted to an acceptable time which may not be the correct time. Therefore, it is a good idea to check the time at least once after setting to see if you have entered it correctly.

Setting the Alarm From the Clock/Controller Menu, press **F3**. This causes the following message to appear in the Display:

SET ALARM, TYPE ENTER

The current time then appears, but with a flashing cursor. In the same manner as setting time, change the characters to represent the time in the future when you wish to be reminded of an appointment. Then press **ENTER**. (Note: Any appointments must not be set with in ten minutes from the present time, otherwise it won't give you the tune while the Primary Unit is turned off).

The Display will prompt you with:

MESSAGE:

The cursor appears, and you can now type a message in the length of the Display or shorter. In case you make typing errors, you can correct them by using the editing features described in the File System—page 33.

Last, press **ENTER** and the alarm and message will be entered in the schedule file. The HHC returns to the Clock/Controller Menu.

(Note: if you press **DELETE** instead of **ENTER** after the message, the HHC also returns to the Clock/Controller Menu, but your alarm and message are lost. Be sure to press **ENTER**.)

Reviewing the Schedule From the Clock/Controller Menu, press **2** to review your schedule.

The Display presents the message for the most recently entered item. Press **▶**, and the time and date for that message appear. (Conversely, when the time and date are in the Display, pressing **▶** will move the message into the Display.)

To review other items of the schedule, in reverse order of their entry, press **▶**. The message of the second newest item appears each time **▶** is pressed, until the first alarm entered is reached and the beeper sounds.

You can move in the opposite direction by pressing **◀**—until that end of the file is reached and the beeper gives its signal. Any past-due alarms that have not been deleted will appear in the schedule as it is reviewed.

As you move through the schedule, you may remove whole items (alarm and message) by pressing **DELETE** when the specific items are in the Display. The Display will then say:

DELETED

This message remains until you press **▶** or **◀** (or **DELETE** which, of course, takes you to the Clock/Controller Menu).

Acknowledging Alarms When the time for one of your schedule items arrives, the HHC will sound its pleasant alarm—and will continue to do so every ten minutes until you acknowledge and delete the item. Also, a Blip appears in the Display immediately above the Attention Indicator, "ALARM." If you begin using your HHC and notice that the alarm Blip is on, it means that an alarm has expired; acknowledge this alarm even if you haven't heard the tune.

From the Primary Menu, press **2** **3** to reach the Acknowledge program. The Display will show the message. Press **▶** to see the corresponding time and date. Then press **DELETE** to remove the item from your schedule, and **DELETE** once to return you to the Clock/Controller Menu—twice for the Primary Menu.

What if there have been more than one alarm since you last checked your schedule? In that case, after you press **DELETE**, your HHC beeper will sound again—and again and again until every past-due alarm has been deleted (at which time the Blip over Alarm will go off).

You may find and delete these past-due alarms by using **▶** and **◀**, in the same manner you review your schedule. However, only past-due alarms are shown in the Acknowledge mode, whereas all alarms (past and future) are shown in the Review mode.

FILE SYSTEM

Definition and Explanation

The File System provides a means for storing, reviewing, and editing text, which can be divided into separate files (files can be copied, renamed, or deleted whether they contain text or other material). These files are stored in the Random Access Memory (RAM) within the HHC itself or in Programmable Memory Peripherals.

In the HHC, a file is a variable-sized area within the memory. SNAP files and other nonprogrammable files are stored in the File System and can be copied or deleted but NOT edited, except to change the name. The Clock/Controller schedule also occupies the same storage space (although it is not listed in the File System Menu), and thereby effects the total amount of memory storage available. The use of certain peripherals also can reduce the amount of available memory.

Current Memory

An HHC system with peripherals can contain several memory areas: the Internal Memory is one of them; each Programmable Memory Peripheral is another memory area. Only one of these memory areas is active at a time in the File System. The listing of files in the File System Menu represents those files in the currently selected area.

To find the Current Memory, press **☐**, and you will enter the I/O Menu. It lists all the available memory areas—the HHC Primary Unit's Internal Memory and all attached Programmable Memory peripherals—plus the number of characters available for additional data in each memory area.

The Current Memory will be displayed as an inverse image; the others normally.

You can change the Current Memory by typing the number from the I/O Menu of the memory area that you wish to become the Current Memory. Note that only one memory area can be activated at a time, although other peripherals in the I/O Menu can be in a variety of on and off conditions.

This procedure not only gives access to text files for reviewing, editing, copying, etc., but it also locates nonprogrammable files—such as files needed to run capsule programs—and makes them accessible in the Current Memory.

File System Menu

To choose the File System from the Primary Menu, press **☐**. The Display shows:

FILE SYSTEM

to confirm your choice. Let us assume the HHC Internal Memory is the Current Memory and it contains no files. The Display then presents the following menu:

1=NEW FILE
2=COPY FILE
NO FILES

An example of a menu with files could look like this:

```

1 = NEW FILE
2 = COPY FILE
3 = BANK
4 = CREDIT CARDS
5 = AUTO RECORDS
6 = DEFINITIONS
7 = HOME INVENTORY
8 = CHEMICAL ELEMENTS
9 = RECIPES
A = CALORIE COUNTER
B = INCOME TAX

```

When a file has been deleted, its name no longer appears in the menu. As files are created and deleted, the file numbers change, so that only the lowest consecutive numbers are in the menu.

Creating a File You're ready to create a file—a name and address file, for example. Enter the Primary Menu (by pressing **CLEAR** twice if necessary).

First press **F3** to enter the File System program. Then press **F1** to select NEW FILE, and a message (called a "prompt" because it prompts you to do something) appears in the Display:

```
TYPE FILE NAME, THEN ENTER
```

and you do just that: choose a name for the file and press **ENTER**

The Display becomes blank, the flashing cursor appears at the left, and you start typing the text of your address file. Type as you normally would on a typewriter, using **SHIFT** for upper-case letters and for the symbols above the numerals, etc. (**DEL** operates as shown on the color-keyed diagram.)

When you type the file name, you can use any characters or punctuation that you want—characters can be upper or lower case, spaces can be included in file names, and you can have two files with the same name (you can tell them apart by their different menu numbers). If a file name is longer than the Display it will shift from right to left, showing the entire name before going to the next item. File names, like file lines, can be 80 characters long.

Terminate each file line with **ENTER** to save the material. If you type more than 80 characters, each additional keystroke will change the last character and cause a beep, signifying that the line is full.

Pressing **CLEAR** once returns you to the File System Menu; twice, to the Primary Menu.

Be sure not to create more than 33 files. Nothing will prevent you from creating a 34th file, but you may have trouble accessing it. When you reach 33, you can delete files that you don't need any more or copy the files into another memory area and then delete the original.

Making Corrections Unless you yourself are a computer (and a well-programmed one), you will make mistakes as you type your files. They are easy to correct.

You can think of the Display as a "window" into a file—a window 26 characters wide and one line high. Using the four arrow keys **←**, **→**, **↑**, and **↓**, you can "drive" the window anywhere within any file for reviewing, making corrections or additions, etc.

If you want to replace any character, move the cursor with the arrow keys to the unwanted character. Then type the correct character. When you press **ENTER** the entire line will be saved, regardless of the cursor position.

Insertions How about inserting missing characters? That's just as easy.

Position the cursor adjacent to where you wish to make a character insertion. Press **INSERT**, followed by **→** or **←**, which opens up a space to the right or left of the cursor, which you can fill by typing a character.

If you need to insert multiple characters—e.g., an entire word or more—again position the cursor adjacent to where you want the insertion. Press:

```

LOCK
INSERT
now type new characters
INSERT
ENTER
  
```

Pressing **INSERT** a second time takes you out of the locked Insert Mode.

Note that when you use the space key to create a space, this represents a character in the computer, and any spaces that you type in will be retained when you press **ENTER** to end a line.

When you are making insertions in a line, if you try to insert enough characters to cause the line to be longer than 80 characters, the HHC will beep, and the new characters will not be accepted.

A new line also can be inserted—either above or below the current line. Press:

```

INSERT
↑ or ↓
then the new line
ENTER
  
```

Multiple lines can be inserted by the following procedure:

```

LOCK
INSERT
↑ or ↓
the first new line
ENTER
the second new line
ENTER
etc.

```

After all lines have been inserted, pressing **INSERT** a second time terminates the locked Insert Mode.

Deletions Deletions are made with equal ease. Position the cursor over the unwanted character. Then press:

```

DELETE
→ or ←

```

DELETE RIGHT and DELETE LEFT close up the word by "pulling" from the end of the word.

To delete several adjacent characters, press:

```

LOCK
DELETE
→ or ←

```

Each stroke of the Right or Left arrow key deletes the character under the cursor and closes up the text by "pulling". To terminate the Delete Mode, press **DELETE** again.

Whole lines can be deleted. To delete the current line and put the line below into the Display, press:

```

DELETE
↓

```

And to delete the current line and put the line above into the Display, press:

```

DELETE
↑

```

To delete all the lines from a point in the file to the end, press:

```

LOCK
DELETE
LOCK
↓

```

Conversely, to delete all the lines from a point in the file to the beginning, press:

LOCK
DELETE
LOCK
↓

Neither of these procedures will delete the file name. You can delete an entire file only when the file name is in the Display (you may remember it will appear in negative (white on black)).

To cause a file to disappear, type its number from the File System Menu. When its name is in the Display, press:

DELETE
↓

A summary of editing commands can be found beginning on page 42.

Memory Capacity As you continue to create or enlarge files, your available memory storage area will be used. When less than 80 characters are left free after completing the last line, with more keystrokes, the Display will show its normal contents and this message (The *** will be a number):

ONLY *** BYTES LEFT!

You can enter a few more characters, but then you must either stop entering material, delete material, or move files to other memory areas.

If you persist until all memory space is used, the Display will present a menu of files in the Current Memory so that you can choose one or more for deletion. Pick a file that you can afford to lose and type its number; that file will be deleted, and the HHC returns to the line you were working on before the overflow.

One last situation. If you are about to transfer a file copy to a memory area that doesn't have room to encompass it all, the transfer will be rejected, and you will receive the message:

NO ROOM

Reviewing a File When you want to look at a particular file, choose the File System from the Primary Menu by pressing **3**, then the file's number.

The file name appears in negative (white on black) in the Display. Press **2**, and the first line of the body of the file appears—in Fill-and-Rotate Mode if longer than 26 characters (if the file you have selected is not a text file, then instead of the first line you will get the message: CAN'T EDIT).

You can stop the moving line at any time by pressing any key: no character will appear, but the Display will "freeze". When the Display is frozen and there are more characters remaining in the line, a stack of dashes appears in the right-most position of the Display.

Pressing **ROTATE** will cause the line to move through the Display in Times Square fashion.

To mark the limits of a file, the **END** key causes a beep when the last line is in the Display; the **HOME** key causes a beep when the first line is in the Display. Similarly, the **HOME** key and the **END** key cause a beep when the cursor reaches the beginning or the end of a line.

To read an entire file in sequence, press:

LOCK
END

Alternatively, you can hold down the **END** key. In both cases, the file will appear line by line in Fill-and-Rotate Mode, and a beep will be heard when the last line is reached. Remember, you can adjust the speed of this and all other Display presentations by pressing **STP/SPD** plus a number key.

You can reach the bottom of a file faster by pressing **END** twice when each line appears. The first keystroke causes the Display to freeze, so that you don't have to wait for the Fill-and-Rotate action; the second keystroke presents the next line, and so on. The fastest way to get to the top of a file is simply to press **CLEAR** and then select the file again from the File System Menu.

Searching a File You can search through one of your files to find occurrences of words, phrases, characters, or other groupings. When you utilize this feature, you do not have to go to the beginning of a file. The entire file is searched from the point of the cursor to the bottom of the file—then from the top to the point where the search began—stopping only if the characters are found.

Press **SEARCH** and the Display prompts you with:

SEARCH FOR?

You then type the characters for which you are seeking—a last name, in an address file, for instance—then press **ENTER**.

If the HHC cannot locate your desired characters, the Display briefly says:

NOT FOUND

If the characters are found, the line in which they occur is displayed, with the cursor located over the first character in the group. To search further and find the next occurrence of the characters, move the cursor at least one space to the right, then repeat the above procedure.

If you want to find the characters several times, you can use a user-definable key to help:

HELP
 (F)
 SEARCH
 the desired characters
 ENTER
 CLEAR

Thereafter, you can continue to search by pressing (F) after each find.

Copying a File From time to time, you may wish to duplicate a file: to have a back-up original while making editing changes or to transfer a file from one memory area to another.

You can copy any file in the File System Menu. Press (C) for COPY FILE; This prompt appears:

SELECT FILE

A menu of all of the file names in the Current Memory will be presented. From these, type the number of the file to be duplicated; this prompt appears:

SELECT DESTINATION RAM
 1 = INTRAM, 1884 FREE

This is followed by a numbered list of available memory areas, including the Current Memory. Type the number of the destination area for the new copy. Your selection will be echoed in the Display in normal lettering—and then the message COPY DONE appears in the Display.

The copying procedure does not change the Current Memory; it only selects the memory destination for the new copy. Therefore, when the procedure is completed, the File System Menu of the original Current Memory returns to the Display—and you now have two copies of the file: one in the Current Memory area and one in the assigned memory area. If you now wish, you can call up the original copy of the duplicated file and delete it from the Current Memory.

Summary of Editing Commands

	Moves cursor left; moves window left with cursor at far left
	Moves cursor right; moves window right with cursor at far right
	Displays previous line
	Displays next line
	Cursor to beginning of line
	Cursor to end of line
	Displays all lines to end of file
	Displays all lines to beginning of file

INSERT

Inserts next keystroke left of cursor

INSERT 

Inserts space for next keystroke left of cursor

INSERT 

Inserts space for next keystroke right of cursor

INSERT 

Inserts single line above current line

INSERT 

Inserts single line below current line

DELETE 

Deletes character cursor is over and pulls word together from the right

DELETE 

Deletes character cursor is over and pulls word together from the right

DELETE 

Deletes line in Display and displays previous line

DELETE 

Deletes line in Display and displays next line

LOCK INSERT

Inserts following keystrokes to left of cursor; exits by INSERT

LOCK INSERT 

Inserts spaces to right of cursor; exits by INSERT

LOCK INSERT 

Inserts spaces to left of cursor; exits by INSERT

LOCK DELETE 

Each RIGHT deletes character and pulls right characters; exits by DELETE

LOCK DELETE 

Each LEFT deletes character and moves cursor left with characters right of cursor; exits by DELETE

LOCK DELETE 

Each DOWN deletes current line and displays next line (except the first line); exits by DELETE

LOCK DELETE 

Each UP deletes current line and displays previous line; exits by DELETE

LOCK INSERT LOCK 

Inserts multiple spaces left of cursor; exits by INSERT twice

LOCK INSERT LOCK 

Inserts multiple spaces right of cursor; exits by INSERT twice

LOCK INSERT 

Each DOWN inserts empty line below the current line; exits by INSERT

LOCK INSERT 

Each UP inserts empty lines above the current line; exits by INSERT

LOCK DELETE LOCK 

Deletes lines to beginning of file, (except the first line); exits by DELETE twice


LOCK DELETE LOCK 

Deletes lines to end of file; exits by DELETE twice

RUN SNAP PROGRAMS

The RUN SNAP PROGRAMS allows the running of programs written in the SNAP language, that are stored in the HHC's File System. Programs may be written in SNAP using various computers and then be "downloaded" (sent into the HHC) by various means, including the HHC Modem and RS-232C peripherals, using special capsules designed for this purpose. It is expected that the SNAP capsule for the HHC will be able to develop SNAP language programs accessible through the RUN SNAP PROGRAMS menu entry also. Since this item is available in every HHC, it means that you can use SNAP programs in the RAM of your HHC, without having to own the development tools that are necessary to create the programs.

When you select the RUN SNAP PROGRAMS menu item, the HHC displays a menu of the SNAP programs contained in the memory area selected with the I/O key. Pressing the key for one of these programs starts the program running, in the same way that selecting a capsule program from the Primary Menu begins that capsule program. If you press **CLEAR** while you are running a SNAP program, you will return to the RUN SNAP PROGRAMS menu. If there are no SNAP programs in the Current Memory area, you will see "NO FILES" instead. Press **CLEAR** twice to return to the Primary Menu.

Note that only SNAP programs are shown in this special menu. The names of these programs also appear in the File System menu, where they may be copied, renamed, and deleted. However, if you press  while the name is visible you will see the CAN'T EDIT message, since SNAP files are programs, not text.

BEYOND THE PRIMARY UNIT WITH THE I/O KEY

Let's take a brief look at some of the ways you can extend the power of the HHC.

Capsules

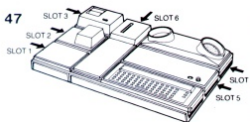
The back of your HHC has a removable door behind which are sockets for three HHC capsules. These capsules are the ultimate in size reduction for program cartridges using ROM (Read Only Memory).

Capsules can also contain data for use by other peripherals—voice synthesizing, for example. And some peripherals contain their own capsules—e.g., the Acoustic Modem and the RS-232C. Instructions are in the manuals for the individual peripherals and HHC capsules.

A continuing supply of new programs will be offered as they are developed.

Peripherals and the I/O Adaptor

At the left side of your HHC Primary Unit is the area for the connection of peripherals. Any one peripheral can be connected directly to the side of the HHC. That peripheral would be shown as connected to slot 0 in the I/O Menu.



When connecting or disconnecting any peripheral, be sure to turn the HHC Primary Unit off first.

If you wish to attach more than one peripheral at a time, you will need the I/O Adaptor, which allows you to connect up to six peripherals at one time (full instructions for use come with the I/O Adaptor).

TV Adaptor

A TV Adaptor connects your HHC to any TV set, so that you can view the HHC output on the larger screen as you type and edit, rather than one line at a time on the HHC Display. It also allows the use of color graphics.

With appropriate capsules, the TV interface also can be used to display accounting, teaching, and other programs, as well as to play video games.

Acoustic Modem

An Acoustic Modem connects your HHC to a telephone receiver. With the Telecomputing capsule, the Modem converts your HHC into a "computer terminal," which allows you to connect with such information networks as Source, Micronet, and Tymnet.

Micro Printer

A Micro Printer can print selected files from your File System or the schedule in your Clock/Controller. It also can give you a "hard copy" of your Calculator operations. Indeed, it can provide a permanent record of any program performed by the HHC.

Programmable Memory

A Programmable Memory adds extra random access memory (RAM), thus amplifying the File System storage capacity.

The I/O Key and Menu

Any or all of these present and future peripherals that are attached to the HHC are accessed by the I/O key (Input/Output key), which calls up the I/O Menu at any time without disturbing any program in progress. (I/O Menu is displayed only on the LCD of the Primary Unit, and not on peripherals. e.g. TV Adaptor)

In addition, while you are in the I/O Menu, the STP/SPD key and the HELP key are not functional. The three keys **STOP**, **HELP**, and **STOP** cannot be used at the same time. Also, don't try to make selections from the I/O Menu with a user-definable key **F1**, **F2**, or **F3**.

The peripheral selections that you make with the I/O key remain in effect throughout your use of the HHC. If you turn a peripheral on while you are in the File System, for example, when you press **ENTER** and then enter another program, that same peripheral will keep working as it did in the previous program.

However, peripherals all temporarily stop working while you are in the Primary Menu. Thus if you need to stop all peripheral activity quickly—for example, if a printer has run out of paper—press **STOP** twice.

Generally, when you make one or more peripheral selections in the I/O Menu and press **ESC** again, you return to the previous activity at the point when you pressed **ESC**. However, if you use the I/O key to select a new RAM area, then when you leave the I/O Menu, it will be as if you had pressed **ESC** twice—you will return to the Primary Menu rather than to the point of interruption.

Using the I/O key you manually make all the peripheral selections required by your program; the program does not do this for you. For example, when you enter a telecomputing program that normally expects to use the Modem, you must use the I/O key to turn on the Modem input and output as well as any other peripherals you intend to use while you are in that program.

It is highly recommended to make all necessary peripheral selections before you enter a program, otherwise you can not make selections when the internal RAM is occupied full. In this case you have to delete the some files or copy the files to the external RAM, in order to make the peripheral selection possible.

One use of the I/O key is to make peripheral selections before entering program. The other—main—use of the I/O key is to change peripheral selections while you are in a program. For example, you can do a lot of editing in a File System file, directly on the LCD Display. Then if you want a printed copy of several lines within the file, you can just position the first line you want printed in the Display, use the I/O key to turn on the printer and then use **F5** to print several lines. When the lines you want are printed, you can then turn off the printer with the I/O key and continue editing the file.

To use a peripheral properly, you have to press **F5** on the HHC before connecting or disconnecting the peripheral. When you press **F5** after changing peripheral connections, the HHC examines all of the bus slots to determine what peripherals are present at the moment. When the HHC detects the different peripherals in slots from before, the HHC returns to the Primary Menu and all peripherals are turned off.

As you physically plug or unplug peripherals into the HHC itself or into the I/O Adaptor, the HHC will beep as the connection is made. When the peripheral is fully inserted, the beeping will stop. The beep indicates that the connection is incomplete, and if a peripheral should become partially disconnected from the HHC or the I/O Adaptor, the beeping will warn you to push the peripherals in firmly.

The bus connectors on the HHC and the peripherals are keyed in such a way that the peripheral must be inserted with its front up; you should not try, and will not be able to, insert a peripheral in an upside-down position.

When no peripherals are attached, pressing **F5** causes the status of the Internal Memory storage to be displayed.

When peripherals are attached, pressing **ESC** will present a menu such as this:

```

1 = VIDEO OUT, ON, SLOT=5
2 = MODEM IN, ON, SLOT=4
3 = MODEM OUT, ON, SLOT=4
4 = PRINTER OUT, OFF, SLOT=3
5 = INTRAM, 551 FREE
6 = EXT RAM, 3215 FREE, SLOT=1

```

The ON-OFF status of a given peripheral can be changed by typing its respective menu number. Thus, in the above menu, pressing **1** causes the VIDEO OUT to go OFF.

The ON or OFF status, as in the above I/O Menu, really indicates, when a peripheral is ON, that it is available to the current program. The program however, may or may not be designed to use that particular peripheral. For example, a program designed to create graphic patterns in the LCD Display does not send output to any other peripheral because no other peripheral is designed to display identical graphic patterns; so even if you were to turn on the TV Adaptor or Modem, nothing would be sent.

You can make as many selections from the I/O Menu as you want and you will remain within the I/O Menu (unlike the Primary Menu and the menus for the File System and Clock/Controller, which leave the menu as soon as a selection is

made). To return from the I/O Menu to the interrupted activity, press **ESC** again. The CLEAR key can also be used to leave the I/O Menu.

In the case of Programmable Memory areas, the Current Memory appears in the Display in negative lettering (white on black); the others, in normal lettering. The number of free characters available is also noted. Pressing the number of a memory area causes that area to become the Current Memory and deactivates any area that was the Current Memory.

With the exception of the TV Adaptor, all of the above peripherals—like the HHC itself—can operate without the AC Adaptor.

WHEN THINGS GO WRONG

As with all computers, hand-held to main-frame, things sometimes do not go as you planned: displays go blank or strange words like RESET and RESTART appear.

Usually in these occasional instances, the most that you can lose with the HHC and have to re-do is the current line or current calculation. Just press **CLR** and be resigned to doing that small part again.

Example: if the word, RESET appears in the Display, it implies that there has been a momentary problem within the HHC or attached capsule or peripheral. Press **CLR**, and pick up again with the interrupted program one step before the difficulty.

RESTART can be a trifle more serious. If RESTART should appear other than when you first turn on the HHC with the switch in back, press **RESTART** twice. This should produce the Primary Menu, meaning that the problem was in the capsule or other peripheral program: your HHC is fine.

However, if you are unable to reach the Primary Menu in this manner, turn the HHC off by means of the ALL-OFF switch in back of the unit. Detach all capsules and peripherals. Wait about two minutes. Then using as a power source the AC Adaptor (which you also should check), turn the HHC on again with the switch in back. When you press **ON** followed by **RESTART**, the word RESTART appears in the Display, and pressing **CLEAR** should bring you the Primary Menu. Otherwise, the HHC needs servicing.

If the above procedures were successful in restoring normal operation, immediately re-enter the time and the Clock/Controller schedule, and all material in the Internal Memory—as these are lost when the ALL-OFF switch is turned off.

One way to minimize any such memory loss is frequently to make copies of files into Programmable Memory peripherals.

Finally, when things don't happen as you expect them to, refer once again to the appropriate section of this manual. Although extremely unlikely, the fault could lie with you—so check it out.

OPERATING PRECAUTIONS Charge the batteries every six months, if the unit is not used for a long time with the ALL-OFF switch set to "OFF".

Do not subject the unit to a temperature of over 60°C (120°F), because characteristics of the internal parts may be adversely affected by heat. Especially, never leave the unit in a car exposed to the direct sunlight for a long time. The cabinet may become deformed and deterioration of the performance may result.

The HHC can be cleaned with a soft cloth moistened with a mild soap-and-water solution.

SPECIFICATIONS	Microprocessor: 6502 running at 1 MHz
	ROM Capacity: Internal ROM 16K bytes plus sockets for 3 capsules each containing up to 16K bytes
	RAM Capacity: RL-H1000; 2K bytes (expandable to 4K bytes) RL-H1400; 4K bytes RL-H1800; 8K bytes
	Keyboard: 65 positive-action keys, redefinable with overlays, interrupt driven, with 2-key rollover
	Display: Continuous liquid crystal display (LCD) with an 8 by 159 dot matrix, plus 8 "Blip" dots above corresponding Attention Indicators

Power Source:	Built-in nickel-cadmium "AA" rechargeable battery pack (6 V/5 Batteries) with external AC Adaptor/Recharger (Charging time: 12 Hours)
Bus:	44-pin edge connector with address and data busses, control lines plus interrupt, clock, power control and bank select lines
Dimensions:	8-15/16" × 1-3/16" × 3-3/4" (227 × 30.5 × 95 mm)
Weight:	1 lb. 5.87 oz (620 g)

GLOSSARY ALPHANUMERIC KEYS—Those keys which produce a letter or a number.

ATTENTION INDICATORS—Those words that appear on the face of the HHC just below the Display which signal certain modes of the HHC or its current program.

AUTO-REPEAT KEYS—Keys which when held down will repeat over and over at a speed determined by the user-selected speed setting on the HHC.

BASIC—Acronym for "Beginners All-purpose Symbolic Instruction Code"—a high level computer language that can be learned easily by beginning programmers for giving instructions to the computer.

BLIP—A triangle-shaped dot that appears in the Display above the Attention Indicators.

BUS—A standard collection of signals within a computer which allows the connection of peripheral devices—the bus is the main path of information transfer, thus including all address signals, data signals, and control signs.

CALCULATOR—Four function calculator with memory.

CURRENT MEMORY—The memory storage area which is currently accessible for programming, creating files, etc.

CURSOR—The flashing indicator that shows where the next character will be typed, changed, deleted, etc.

DISPLAY—The rectangular screen where the current data of the HHC is visible. It is a Liquid Crystal Display (LCD).

DISPLAY SPEED—The rate at which information is presented or moves across the HHC Display.

FILE SYSTEM—Data storage wherein text and non-text files can be created edited, reviewed, searched, etc.

FILL-AND-ROTATE MODE—The method by which lines over 26 characters are seen in the Display; the first 26 characters appear at once, and the remainder of the line moves in from the right side of the Display, eliminating the original characters off the left side of the Display.

FUNCTION KEYS—Those keys that cause some action, as distinguished from character keys which generate alphabetical, numerical, or other characters.

INTERNAL MEMORY—Those memory files that are stored within the HHC Primary Unit.

INTERRUPT DRIVEN—The phrase describing the fast, power-saving system by which the HHC processes input and output data. In essence, the HHC doesn't use power while "waiting" for data, rather it interrupts any current program for a tiny fraction of a second in order to receive or respond to data, but only as needed.

MENU—A list of available programs or activities within programs.

MODEM—A device that adapts a computer to an ordinary telephone; the HHC Modem must contain a capsule program for telecommunications.

PERIPHERAL—An attachment to the bus of a computer that extends the computer's capabilities; peripherals are usually input or output devices.

PRIMARY MENU—The menu which lists the programs currently available to use with the HHC.

PRIMARY UNIT—The HHC without any attachments; the Primary Unit.

PROGRAM—A sequence of instructions for the solution of a problem by a computer.

PROGRAMMABLE MEMORY—Storage that can be read or changed; same as Random Access Memory (RAM).

PROMPT—A message in the Display which tells (prompts) you to do something.

RANDOM ACCESS MEMORY (RAM)—Data or program storage that can be read or changed; called RAM for short.

READ ONLY MEMORY (ROM)—Data or program storage that can be read but not changed or deleted; called ROM for short.

ROTATE MODE—A method by which lines are seen in the Display; they move in continuously from the right side of the Display and exit the left side, much like the news bulletins at Times Square.

SNAP—A computer language and operating system used by the HHC; it is characterized by high flexibility, rapid execution, and compact program storage.

USER-DEFINABLE KEYS—Keys whose functions are assigned and can be changed by the user; on the HHC, these are the keys labeled f1, f2 and f3.

(only for USA)

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- reorient the receiving antenna
- relocate the computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

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Panasonic[®]

Programmable Memory (RAM)
Model: RL-P9001/RL-P9002

Instruction for Use

For your convenience and protection, enter the information below and retain for future reference. The model number is on the bottom of the unit and serial number is inside the battery compartment. A separate warranty registration card is packed with the unit. This should be completed and mailed to Panasonic as soon as possible. If you received no warranty registration card with your purchase, please contact your Panasonic dealer, they may have registered the unit for you.

Notice: In several countries a warranty registration card is not necessary.

Model No. _____ Dealer Name _____
 Serial No. _____ Dealer Address _____ City _____ State _____ Zip _____
 Purchase Date _____ Dealer Telephone _____

GENERAL DESCRIPTION The basic unit of Programmable Memory (RAM), RL-P9001, has a storage capacity of 4K bytes. Each such unit can be up-graded in 2K increments to 8K.

CONNECTION First, make sure the HHC Primary Unit is off before either connecting or disconnecting Programmable Memory (RAM) units.

The left-hand side slot of the HHC Primary Unit can receive a RAM unit. Also any slot of the I/O Adaptor can accept a RAM unit, giving you the possibility of a total of six RAM units connected at one time.

Simply insert the bus connector on the RAM unit into the slot. The RAM unit must be right side up when inserted (do not force fit an upside down RAM unit).

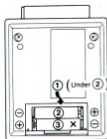
BACK-UP BATTERY FOR MEMORY (OPTION) There is a battery door on the bottom of each RAM unit; inside are three manganese batteries with a life of about 12 months. It is essential that these batteries be replaced in time, so a sticker is provided which is attached on the bottom of the RAM unit. You can use the sticker to indicate the date when the batteries need replacing. These batteries maintain your information in the RAM unit when it is disconnected from the Primary Unit.

POWER SOURCE The RAM unit has two power supplies. One is for access and control of information and comes from the Primary Unit or the I/O Adaptor. The other, the back-up power supply, comes from the three AAA manganese batteries located inside the RAM unit.

HOW TO CHANGE BATTERIES First, turn the Primary Unit off by pressing the OFF key. Second, remove the Primary Unit from the I/O Adaptor tray, freeing the left slot. Third, attach the RAM unit to the Primary Unit. Fourth, turn the Primary Unit and RAM unit over. Fifth, open the battery compartment door on the RAM unit and insert the new batteries in the direction indicated by the compartment diagram.

Following procedure is recommended to change the batteries:

- Remove the ③ battery by depressing the battery at the spot indicated by the × in the illustration.
- Grasp the ② battery and remove.
- Using a fingernail or screwdriver, press the end of the ① battery towards the spring (←) and lift.
- Insert the new batteries. To insert the batteries easily, push the battery towards the spring.



WHAT CAN GO WRONG

As mentioned above, if the back-up batteries are not replaced in time, you may lose all the information in the RAM unit.

If the RAM unit is not securely connected, you will not be able to control it. If the RAM unit is not connected to the Primary Unit when you change the batteries, you will lose all information (you don't need to turn on the Primary Unit, it will automatically supply power to an attached RAM unit).

When the RAM unit will be stored alone, make sure the bus connector has a cap on it to prevent electro-static damage.

HOW TO EXPAND MEMORY CAPACITY

If you want to expand the memory capacity, take the RAM unit to the nearest Panasonic Servicer in your area (for RL-P9001).

SPECIFICATIONS

Memory Capacity:	RL-P9001; 4K bytes (two 2K bytes CMOS RAM) expandable to 8K bytes RL-P9002; 8K bytes (four 2K bytes CMOS RAM)
Memory Protection	
Back-up Battery:	3 "AAA" manganese batteries as back-up
Life Time:	About 1 year
Power Source:	Supplied from the HHC Primary Unit
Power Consumption:	20 mW
Operating Temperature:	32°F–104°F (0°C–40°C)
Dimensions:	4-1/2" × 1-3/16" × 3-3/4" (113.5 × 30.5 × 95 mm)
Weight:	8.1 oz. (230 g) without batteries 9.2 oz. (260 g) with batteries

(only for USA)

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

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- reorient the receiving antenna
- relocate the computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

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Panasonic®

RS-232C Serial Interface
Model: RL-P3001

Instruction for Use

1 For your convenience and protection, enter the information below and retain for future reference. The model and serial numbers are on the bottom of the unit. A separate warranty registration card is packed with the unit. This should be completed and mailed to Panasonic as soon as possible. If you received no warranty registration card with your purchase, please contact your Panasonic dealer, they may have registered the unit for you.

Notice: In several countries a warranty registration card is not necessary.

Model No. _____ Dealer Name _____

Serial No. _____ Dealer Address _____ City _____ State _____ Zip _____

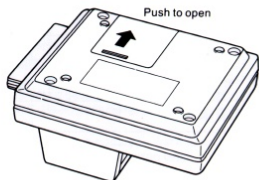
Purchase Date _____ Dealer Telephone _____

GENERAL DESCRIPTION The RS-232C along with its connecting cable joins you to other computers and their peripherals (modems, high speed printers, and so on). It allows the HHC to receive data and programs from data networks. The RS-232C has optional capsule programs which give you menu options to facilitate this connection.

CONNECTION The RS-232C, like other HHC peripherals, has a connector which fits into any I/O Adaptor slot or into the left-hand side slot of the HHC Primary Unit.

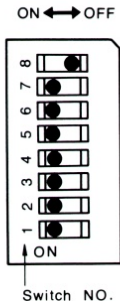
THE RS-232C CABLE (OPTION) The RS-232C cable, 1.5 meters long, connects either end first to the RS-232C input/output port on the top, and the other end connects to a matching port on the device to be connected to. Those two connections are uni-directional: they can only be made one way. Do not force fit a wrong connection. Every device needs its own cable. The cables are not necessary interchangeable.

PROGRAM CAPSULES (OPTION) As developed, new capsule programs will be released which will expand the capability of the RS-232C—for instance, by allowing you to connect with other or newer devices. They can be mounted where the present RS-232C capsule program is, under the door on the bottom of the unit. Instructions will be provided with the capsule programs themselves.



3 HOW TO SELECT BAUD RATE

To select the baud rate, open the door at the bottom of the unit; you will see the dip switch for this purpose. The switch has numbers from 1 to 8 and an indicator for ON. Use the following chart to choose the baud rate:



Baud Rate	Switch No.							
	1	2	3	4	5	6	7	8
9600 bps	ON	ON	ON	ON	ON	ON	ON	OFF
4800 bps	ON	ON	ON	ON	ON	ON	OFF	ON
2400 bps	ON	ON	ON	ON	ON	OFF	ON	ON
1200 bps	ON	ON	ON	ON	OFF	ON	ON	ON
600 bps	ON	ON	ON	OFF	ON	ON	ON	ON
300 bps	ON	ON	OFF	ON	ON	ON	ON	ON
150 bps	ON	OFF	ON	ON	ON	ON	ON	ON
75 bps	OFF	ON	ON	ON	ON	ON	ON	ON

200 bps	ON	ON	OFF	OFF	ON	ON	ON	ON
110 bps	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
50 bps	OFF	OFF	ON	ON	ON	ON	ON	ON

WHAT CAN GO WRONG

You can transmit unintelligible signals by selecting the wrong mode of transmission for the particular device you are connecting to.

PRIMARY UNIT KEYS AFFECTING YOUR RS-232C

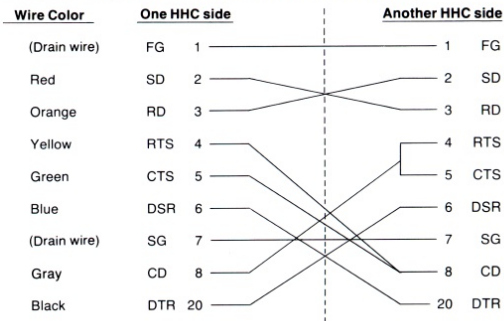
The I/O key when pressed gives you the I/O menu from which you type the number corresponding to "RS 232C IN", and "RS 232C OUT". You can exit the I/O menu with either ENTER or the I/O key.

THE CONNECTION OF RS-232C WIRES

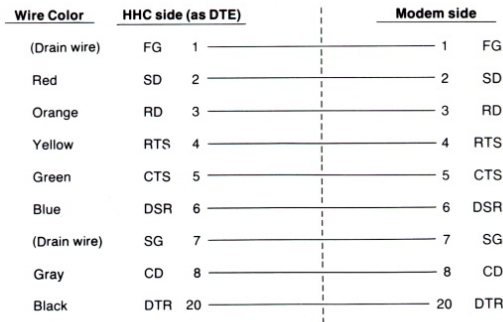
In order for RS-232C peripherals to be connected to any desired terminals, one side of RS-232C cable is not connected to the pins of DB25 type connector. For your reference, examples of wiring are shown in figure 1 and figure 2. Figure 1 is applicable in case you'd like to connect the devices whose assignment of pins are as same as the RS-232C peripheral (in case you have communication between another HHC system). Also, this wiring is applicable in case you want to connect with EPSON printer which has RS-232C interface card.

For more information, please refer to the manual for your equipment or contact the nearest servicenter.

Example of wiring for communication between HHCs (Figure 1)



Example of wiring for the connection to the MODEM (Figure 2)



Signal Description and Pin Assignment

Pin No.	Signal Name	Direction	Description	Wire Color
1	FG	—	Frame Ground	(Drain wire)
2	SD	Out	Transmitted Data	Red
3	RD	In	Received Data	Orange
4	RTS	Out	Request to Send (This is the signal to request sending the signal for the connected terminal.)	Yellow
5	CTS	In	Clear to Send (This signal is used for withholding timing of the transmitted data.)	Green
6	DSR	In	Data Set Ready (This signal is showing the timing of setting data from the terminal.)	Blue
7	SG	—	Signal Ground	(Drain wire)

8	CD	In	Received Line Signal Detector (In case the modem is connected, this signal is used for the carrier detect.)	Gray
20	DTR	Out	Data Terminal Ready (This signal is showing the connected terminal is ready or not.)	Black

Note: "Direction"; This is the direction of signal flow as viewed from RS-232C peripheral. All signals are compatible with EIA RS-232C Standard.

SPECIFICATIONS

Transmission System:	Asynchronous serial transmission
Transmission Speed:	50, 75, 110, 150, 200, 300, 600, 1200, 2400, 4800, 9600 bps selectable; accuracy 0.5% or less
Transmission Code:	5, 6, 7 or data bits 1 or 2 stop bits
How to Set Transmission Speed:	Set manually by dip switches in the bottom of the unit
Output Level of Line Driver:	±10 V

Allowable Input Level of Line Receiver:	Within ± 20 V
Line Driver:	Output termination current within ± 12 mA Output impedance 300Ω or more (measured by applying ± 12 V at output terminal when power off)
Input/Output Connector for Transmission:	DB 25 type connector (CCITT-V24)
Control/Application Capsule Socket:	1 slot (in the bottom of the unit)
Power Source:	Supplied from the HHC Primary Unit or from the AC Adaptor
Power Consumption:	650 mW
Operating Temperature:	$32^{\circ}\text{F}-104^{\circ}\text{F}$ ($0^{\circ}\text{C}-40^{\circ}\text{C}$)
Dimensions:	$4-1/2'' \times 2-13/32'' \times 3-3/4''$ ($113.5 \times 61 \times 95$ mm)
Weight:	12.35 oz. (350 g)

Please refer to your capsule manual for more information.

(only for USA)

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