HEWLETT-PACKARD

# 82104A CARD READER owner's handbook



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# HP 82104A Card Reader Owner's Handbook

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#### Section 1

# Using the HP 82104A Card Reader

The HP 82104A Card Reader is a very powerful system addition for the HP-41C or HP-41CV calculators. The card reader was specifically designed to complement the calculator system, adding virtually unlimited data and program storage capacity using small magnetic cards.

**Note:** The HP-41C and HP-41CV differ only in their initial Continuous Memory capacities. The term "HP-41C" is used throughout the rest of this handbook, unless otherwise specified, to refer to both calculators.

Even though there are significant differences between the HP-67/HP-97 calculators and the newer HP-41C, the HP 82104A Card Reader enables you to use nearly all current HP-67/HP-97 Application Pac Programs, as well as most of the programs in the vast HP-67/HP-97 Hewlett-Packard User's Library.

So that you can take advantage of the advanced capabilities of the card reader and make full use of the HP-41C system, take a few minutes to work through this handbook. You will find using the card reader simple and intuitive, but with substantial power.

### **Battery Power**

The alkaline batteries in your HP-41C supply power to the HP 82104A Card Reader. An automatic power checking system has been built into the card reader to prevent it from operating when battery power is low. If the *LOW BAT* display appears while you are operating the calculator/card reader system, remove the card from the card reader and replace the batteries in the HP-41C with fresh size N alkaline batteries. Refer to Batteries in appendix B of the *HP-41C Owner's Handbook and Programming Guide*.

An AC adapter and rechargeable battery pack are available as optional accessories for the HP-41C that can be used in combination to operate the system from line power.

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# Plugging in the Card Reader

1. Make sure the calculator is turned off.



 Remove the plug-in module or port cap that is in port 4. (If you remove a memory module, make sure the HP-41C has enough memory allocated to data storage registers—executing <u>SiZE</u> 064 will ensure this.) Refer to section 5 or 7 in the HP-41C Owner's Handbook and Programming Guide for more information about <u>SiZE</u>.



3. Insert the card reader connector into port number 4 as shown. Press the card reader straight into the calculator until it snaps firmly into place.



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### **Removing the Card Reader**

1. Turn the HP-41C off!



- 2. Grasp the body of the card reader.
- 3. Press the tabs on either side of the card reader as shown.



4. Pull the card reader straight back until the connector is free from port 4.



5. Replace the port cap on port 4.



#### Section 2

# **Card Reader Operations**

Most of the capabilities of the card reader are available through the use of small magnetic cards that store information in a greatly condensed form. Information stored in the calculator can be magnetically recorded on the small cards and then read back into the calculator again at a later time. This gives you almost limitless capacity for storing programs and data that you use in you HP-41C\* system.

The remaining card reader capabilities involve expanded software compatibility. With a few exceptions, all software that can be executed and recorded on an HP-67 or HP-97 can be read into the HP-41C system through the HP 82104A Card Reader, and then executed by the HP-41C. The HP 82104A Card Reader actually contains a sophisticated translator that changes operations on HP-67/HP-97 cards to special HP-41Ccompatible functions. All of the capabilities of the card reader are available only when the card reader is plugged into the HP-41C.

### **Magnetic Cards**

Depending upon the kind of information magnetically stored on cards, they are placed in one of four categories: program cards, data cards, status cards, and "write all" cards.

Each magnetic card has two sides or tracks. Each track on a card can belong to one of these four categories. A card can hold up to 32 registers of information, 16 registers on each track.



\* The HP-41C and HP-41CV model calculators differ only in their initial Continuous Memory capacities. The term "HP-41C" is used throughout the rest of this manual to refer to both calculators.

**Program Cards.** A program card is one that has program instructions stored on it. Each side of a card (track) can store up to 16 registers of program instructions. So, if you had program memory of the basic HP-41C completely full with program instructions, you could write all of that information onto just two cards (four tracks). Each additional memory module (64 registers) is equivalent to two more magnetic cards.

**Data Cards.** Data cards are simply cards that have data from the HP-41C data storage registers written on them. As with program cards, each card holds up to 32 registers (16 on each track).

**Status Cards.** Status cards have special status information written on them. The information includes the status of flags 0 through 43 (which includes display format and trigonometric mode); statistics register locations; number of data storage registers; key reassignments of standard HP-41C functions and plug-in application module functions; and contents of X, Y, Z, T, LAST X, and ALPHA registers. The **wsts** function is used to write the status information on cards.

"Write-All" Cards. "Write-All" cards are special cards that hold the entire contents of the calculator. [WALL] is used to write all information in the calculator onto cards.

# Protecting (Clipping) Cards

Information on any of the types of cards can be "protected" from inadvertent clearing or re-recording. To protect a track of a *recorded* card, clip the notched corner of the card at the beginning of the track you wish to protect.



When you have clipped a track of a card, you can read the information on that card into the HP-41C any number of times, but you will not be able to write any information onto that card unless you specifically instruct the HP-41C to do so. You will learn more about this later.

# **Marking Cards**

So that you will not mix up your program and data cards, it is a good idea to identify the contents of a card by marking the card. As you read on in this handbook, you will see how marking cards is important and how the different cards can be marked so they may be easily used and cataloged.

Program Cards:	Program name, subroutine names, version number or date.
Data Cards:	"Data," program name, version number or
Status Cards:	"Status," program name, version number
"Write-All" Cards:	or date, track number. "WALL." program name, version number
	or date.

You can write on the face of a card using any writing implement that does not emboss the card. Permanent ink marking pens (such as Schwan Stabilo, Pilot Fine Point Permanent, Sanford Sharpie, and others), pencils (0.5 mm lead for "film" using a 0.5 mm mechanical pencil works well), and capillary pens using permanent ink for film (pens such as Castell, or Koh-I-Noor) will work for marking on cards. Most of the inks must be allowed to dry for a few seconds and pencil may smear. Pencil, however, is erasable from the cards.

### **Program Card Operations**

Even though programs that you key into the HP-41C are preserved by the calculator's Continuous Memory (even while the HP-41C is turned off), you can conserve program memory and save a program permanently by writing it onto a magnetic card using the card reader.

#### Writing a Program Onto a Card

Following is the procedure for writing a program onto a card.

- 1. Set the HP-41C to PRGM mode (press [PRGM]).
- 2. Select a blank, unprotected (unclipped) magnetic card from the packet of blank cards included with your HP 82104A Card Reader.

- 3. Set the HP-41C to the program you wish to write onto the card. (Press GTO • (ALPHA) name (ALPHA), supplying the name of the desired program.)
- 4. Hold the card face up and firmly insert track 1 of the card as shown.
  - a. If the program is longer than 16 registers (each track on a card holds a maximum of 16 registers), the HP-41C prompts you for the next track with

#### RDY kk OF nn

where **kk** is the number of the next track to be written and **nn** is the total number of tracks required to write the entire program to cards. (Notice that when you begin writing a program to cards, the HP-41C knows the total number of tracks required for that program.) Simply turn the card over and insert track 2 into the card reader as shown.





Pressing  $\overline{R/S}$ ,  $\overline{}$ , or turning the HP-41C off at this point will terminate the operation. Pressing any other keys will only cause the display to blink and the pressed function will not be executed. The *RDY* kk OF nn and *CARD* prompts will remain active for 10 minutes, at which time the operation is terminated.

5. The entire program, including current key assignments of labels in that program, is now written on the magnetic card and also remains loaded in the program memory of the calculator. The contents of all data storage registers, the stack, and ALPHA registers are unchanged. When you pass an unprotected but previously recorded card through the card reader with the HP-41C set to PRGM mode, the previous contents of the track are lost and are replaced by the new program instructions.

Any card-writing session may be terminated by pressing  $\square$  or  $\blacksquare$ .

#### Writing Programs on Clipped (Protected) Cards

Clipping the corners off of program cards normally prevents them from being used again for writing operations. Clipped cards can, however, be read any number of times.

Attempting to write on a protected track (one with the corner clipped) will result in a special message:

#### PROTECTED

The card will pass through the card reader and is *not* written. The display will prompt for another card with *RDY kk OF nn*.

To write a program onto a protected track, simply set flag 14, the card reader Overwrite Flag, before you begin the writing operation. The Overwrite Flag remains set and allows you to write on protected tracks until the program writing operation is completed or terminated.

Flag 14 is automatically cleared each time you turn the HP-41C on and when any reading or writing operation is completed or terminated.

This procedure prevents you from accidentally destroying the information on a card, but allows you to re-use cards after they have been protected.

#### Writing a Private Program Card

The HP-41C and card reader can work together to provide a security system that will prevent accidental alteration and reproduction of important programs. Once a program is made "private" on a card, it cannot be viewed, altered, or re-recorded onto another card through normal operations.

To write a private program card:

- 1. Select a blank, unprotected (unclipped) card.
- Position the HP-41C to the program you wish to make private. (Press GTO • ALPHA name ALPHA, supplying the program name.)

3. Execute the WPRV (write private program) function (XEQ ALPHA WPRV ALPHA). The HP-41C will prompt you with

#### RDY kk OF nn

where **kk** is the next track number and **nn** is the total number of tracks required to write the complete program to cards.

- Insert track 1 as shown. If the program is longer than 16 registers, the HP-41C will prompt you for subsequent tracks with RDY kk OF nn.
- 5. The entire program, including program key reassignments, is now written on the magnetic cards *and* is made a private card.



The private card may be read and executed any number of times, but cannot be viewed or altered. In addition, you cannot write an already private program to a new card. Any attempt to view (e.g., <u>SST</u>), <u>ast</u>), alter or record this program will result in the display of the *PRIVATE* message. The <u>WPRV</u> function is not programmable, that is, cannot be keyed in as part of a program.

#### **Reading a Program From a Card**

Once a program is written onto a card, it is a simple matter to read that program back into the HP-41C's program memory.

Here is one procedure for reading programs from magnetic cards:

- 1. Ensure that the HP-41C is not in PRGM mode.
- 2. Press **GTO** •. This positions the HP-41C after the last program in program memory. The program that is read in will be placed *after* the last program in program memory. If you do not do this step, the program you read in will *replace* the last program in program memory.

Here is one procedure for reading programs from magnetic cards:

- 1. Ensure that the HP-41C is not in PRGM mode.
- 2. Press GTO • This ensures that your last program has an *END* instruction and causes the program that is read to be placed after your last program. (If the last program does not have an *END* instruction, it will be replaced by the new program.)
- 3. a. Insert track one of the program card. If the program is on more than one track of a card, the HP-41C will prompt you for each track with the standard prompt.

RDY kk OF nn

Insert the cards for the program until all of the tracks have been read.

You can insert the cards for a program in any order you wish. The HP-41C knows which tracks have been read and prompts you for the lowest-numbered track not yet read. Regardless of the order the cards are read, the program is placed in the proper order in program memory.

- b. If you wish to use key assignments (of labels in the program) that were written on the card, set the HP-41C to USER mode before reading in the program. Key reassignments recorded with the program are only active when the program on the card is read and executed in USER mode. Only the key reassignments of labels contained in the card program are written onto and read from the card.
- 4. The program is now recorded into program memory and the calculator is set to the top of the new program. The reassigned keys can be used only when the program is read and executed in USER mode.

**Note:** Programs that contain specific card reader functions (e.g., <u>wDTAX</u>, **RSUE**) must be executed with the card reader plugged into the HP-41C. Those functions are contained in the card reader, not the HP-41C. For all other programs, the card reader need not be in place for proper program execution.

In the event that there is not enough room in program memory to hold the entire program you are reading, the HP-41C displays the following:

- **NO ROOM** (to let you know there was not enough room for the entire program),
- **PACKING** (to let you know it is packing program memory in an attempt to find enough room),
- **TRY AGAIN** (to let you know that you should try reading the card again).

If you repeatedly get these messages after trying to read the card, you will have to make room in program memory for the program by reallocating registers, adding memory modules, or deleting instructions or programs already in program memory.

Any program card-reading session may be terminated before all of the tracks of a program have been read. Press  $\mathbb{R}/\mathbb{S}$  or  $\longrightarrow$  to terminate the session. Program memory is left with the partially loaded program in place.

#### **Reading Subroutines**

The **FSUE** (read subroutine) function is a programmable function that causes the program on the card that is read to replace the last program in program memory—all instructions between your last END instruction and the permanent .END. instruction. However, if the last program in memory contains the executing **FSUE** function (as an instruction in an executing program) or the calculator is currently positioned to the last program (when **FSUE** is executed from the display), the program that is read in is added after the last program in program memory.



When you execute the **FSUB** function, either in a program or from the keyboard, the HP-41C prompts you for the card with

#### CARD

If more than a single track is required to read the complete program, the HP-41C prompts for each subsequent track with the standard prompt.

#### RDY kk OF nn

Again, you can insert the tracks in any order and the HP-41C will always prompt you for the lowest numbered track not yet read.

**Program Operation.** When executed by a program, the **RSUB** simply halts program execution, prompts for the cards, and when the read session is complete, execution resumes with the line following the **RSUB**. You can construct ALPHA prompts in your programs that appear in the display instead of the initial **CARD** prompt. Here is an example:

The display will show **INSERT CARD** instead of the standard prompt when the **INSUE** is executed. After the first track of the card is read, all subsequent tracks read are prompted by the **RDY kk OF nn** message.

#### **Reading Private Program Cards**

The procedure for writing private program cards is given on page 13. Once a program is written to a card using **WPRV**, that program cannot be viewed, altered or re-recorded onto another card through normal operations.

To read a private program card, simply set the HP-41C to normal or USER mode, press **GTO** • • and insert the card. The HP-41C prompts you for additional tracks when required just like with non-private program cards.

You can also read a private program card using the procedures described for reading subroutines (page 16) and merging programs (page 19).

Private program cards are just like any other program cards except that the program on that card cannot be viewed, altered, or rerecorded onto another card through normal operations. Any attempt to do so will result in this display:

#### PRIVATE

#### **Merging Programs**

The **MRG** (merge program) function is a programmable function that enables you to read a program from cards into program memory. **MRG** is similar to **RSUB** except that the location of the calculator in program memory or the location of the **MRG** function in a program determines where the card program is placed when it is read.

In a program,  $\ensuremath{\mbox{MRG}}$  causes the calculator to first prompt for the program card with

#### CARD

If additional tracks are required to read in the entire program, the HP-41C prompts you for each additional track with the standard *RDY* kk *OF* nn message.

The complete program, when read, replaces all of the program lines after the **MMRG** function (or after the current location of the calculator in the program) to the end of the program (or beyond the end if the merged program is longer).

The current program or the program containing the MRG function *must* be the last program in program memory. That is, it must end with the permanent *.END*. instruction. If it is not, the HP-41C will show

#### MRG ERR

and no instructions will be read from the card.

When a programmed **MRG** is completed (that is, when the **MRG** is executed by a running program), execution continues with the first instruction in the merged program. When executed from the keyboard, the calculator is left positioned at the current line in program memory.



The [MRG] function cannot be used to merge card programs with programs contained in an application module. Any attempt to do so will result in this display:

#### **MRG ERR**

#### **Automatic Execution**

One exciting feature of the card reader is that you can read certain kinds of program cards and the HP-41C will automatically begin executing the card program.

Here are the details of how automatic card program execution is used.

- 1. Before you write the program to a card, simply set flag 11 (the automatic execution flag).
- 2. Follow the normal procedure for writing a program card (refer to pages 11 through 14).

3. Each time you read that program card, execution will automatically begin at line 1 of the program on the card. To remind you that the program is an automatic execution type, the HP-41C sounds the beeper when execution begins. (The status of flag 11 is ignored when the program card is read using **FSUB** or **MRG**.)

Here are some ways that you can use automatic program card execution.

- 1. Use the first portion of the program on the card to initialize the main program on that card and then halt execution so that you can enter data or execute the main program. You can set the desired flags and modes to prepare the calculator to execute the main program.
- 2. For repetitive use of a card program, automatic program execution makes it so you can execute the program without pressing any keys.
- 3. A program can be structured so that it immediately prompts you when the card is read.

# **Data Card Operations**

Data cards enable you to expand the data storage space in your HP-41C to nearly limitless capacity (you are only limited by the number of cards you have). There are two read and two write functions for data cards, as well as a procedure for reading data cards.

#### Writing Data Onto a Card

The card reader has two functions for writing data cards: (wDTA) and (wDTAX). Both of these functions are programmable (can be instructions in a program) and can also be executed from the display.

Using [wDTAX]. The [wDTAX] (write data as directed by X) function provides you with complete control of which data storage registers are to be written onto cards. This function uses a number in the X-register to control the data write operation.

Here is the procedure for using **WDTAX**:

- 1. Ensure that the HP-41C is not in PRGM mode.
- 2. Using the following format, place a data control number into the X-register.

#### bbb.eee

where: **bbb** is the beginning data storage register address; **eee** is the ending data storage register address.

The calculator uses the absolute value of this number to control which data storage registers are to be written to the data cards. (The sign of the number in X is not altered, it is ignored.) The **bbb** portion instructs the HP-41C to begin at that data storage register address and the **eee** portion is the last data storage register to be written. The **bbb** portion can be one to three digits and the **eee** portion must be three digits.

For example, when using worax, 10.020 would instruct the calculator to write registers  $R_{10}$  through  $R_{20}$  to the card. If the **eee** portion of the number is less than or equal to **bbb**, the calculator writes only the registers specified by **bbb**. So, the number 10.000 would write just  $R_{10}$ .

If **eee** is larger than the number of currently existing registers, the calculator writes from **bbb** to the last existing register (inclusive).

- 3. With the control number in the X-register, execute (WDTAX). In a program, simply key the control number into the X-register (as a line in the program), and follow it with the (WDTAX) function.
- 4. The HP-41C will prompt you to insert a card with

#### RDY kk OF nn

where  $\mathbf{k}\mathbf{k}$  is the next track to be written and  $\mathbf{n}\mathbf{n}$  is the total number of tracks required.

5. Select a blank, unclipped card and insert track 1 into the card reader. The calculator now uses the control number to determine which data storage registers are to be written onto the card.

The **NONEXISTENT** display indicates that the first register specified by the control number does not currently exist (is not allocated).

You can terminate any data read or write session at any time by pressing  $\mathbb{R}/\mathbb{S}$  or  $\frown$ .

Using (wota). The (wota) (write data) function is a simplified version of (wotax). You have little control over the registers written using (wota). When (wota) is executed, the calculator prompts for cards until all of the data registers in the calculator have been written to cards, or until you terminate the write session.

**WDTA** begins writing with data storage register  $R_{00}$ .

Labeling Data Cards. It is a good idea to label your data cards so that you don't lose track of the information. Write "DATA" on the card, and if the data is associated with a specific program, write the program name as well as the version number or date.

#### Writing Data Onto Clipped (Protected) Cards

After a data card has been written using  $w_{DTAX}$  or  $w_{DTA}$ , you can protect the information by clipping the corner off of the card (refer to page 10).

In the event that you decide to use the protected card again, you can simply set the Overwrite Flag (flag 14), execute **WDTAX** or **WDTA**, and insert the card.

Attempting to write on a protected track (one with the corner clipped) will result in a special message:

#### PROTECTED

The card will pass through the card reader and is *not* written. The display will prompt for another card with *RDY kk OF nn*.

Flag 14 is automatically cleared each time you turn the HP-41C on and when any read or write operation is completed or terminated.

#### **Reading Data From Cards**

There are two data reading functions that are similar to the write functions:  $\overline{\text{RDTAX}}$  (read data as directed by X) and  $\overline{\text{RDTA}}$  (read data). In addition, there is a third procedure used to read data cards without using either  $\overline{\text{RDTAX}}$  or  $\overline{\text{RDTA}}$ .

Using  $\overline{\text{RDTAX}}$ . Like  $\overline{\text{WDTAX}}$ , this function uses a number in the X-register to control the card operation.  $\overline{\text{RDTAX}}$  uses the number in X to determine where to place the information read from the data cards.

Here is the procedure for using **RDTAX**.

- 1. Ensure that the calculator is not in PRGM mode.
- 2. Using the following format, key a data read control number into the X-register.

#### bbb.eee

where: **bbb** is the beginning data register address; **eee** is the ending data register address.

Refer to **WDTAX** for more information about **bbb.eee** (page 22).

- 3. With the control number in the X-register, execute **RDTAX**. In a program, simply key the control number into the X-register (as a line in the program) and follow it with the **RDTAX** function.
- 4. The HP-41C will prompt you to insert a card with the standard prompt.

#### RDY kk OF nn

You can construct ALPHA prompts in your programs that appear in the display instead of the standard prompt. Here is an example:

> 01 LBL<sup>†</sup>DGF 02<sup>†</sup>DATA CARD 03 AVIEW 04 RDTAX

The display will show **DATA CARD** instead of the standard prompt when the **RDTAX** is executed. After the first track of the card is read, all subsequent tracks are prompted with the standard prompt.

5. Insert the data card into the card reader. The calculator now uses the control number to determine where to place the information on the cards. Remember that during a multi-track read session, you can insert the cards in any order. The HP-41C automatically keeps track of the relative order of the tracks and the data on them. Regardless of the reading order, the calculator always prompts you for the lowest numbered track not yet read. The **NONEXISTENT** display indicates that the first register specified by the control number does not currently exist (is not currently allocated).

The **CARD ERR** message indicates that there are not enough data storage registers currently allocated to store all of the data on that track.

As with all data and program read operations, you can terminate the read session by pressing **R/S** or **\_\_**. The memory of the HP-41C will contain whatever data has been read up to that time.

Using [RDTA]. This function is used to read all data on the inserted card or cards. [RDTA] instructs the calculator to begin placing the data from the cards in  $R_{00}$  and continues until all data has been read or all currently allocated registers have been filled.

The CARD ERR message indicates that there are not enough data storage registers currently allocated to store any of the data on that track.

**Normal Mode Data Card Read.** With the calculator set to normal or USER mode, you can read a data card by simply inserting it into the card reader. Data on the card will be loaded into the calculator automatically beginning with  $R_{00}$ .

Since the HP-41C and the card reader know how much data was originally written during a data write session (it knows how many tracks were written), the calculator will prompt you for that number of tracks with the standard prompt.

#### RDY kk OF nn

If you wish to read only a portion of the data, you can insert the desired card and terminate after any track is read.

Again, if the card data is contained on more than a single track, you can insert the tracks in any order. The HP-41C automatically places the data into the correct relative positions and prompts you for the lowest numbered track not yet read.

## **Status Card Operations**

You can initialize the calculator for a special program, retain the USER mode keyboard reassignments, or prepare the calculator for a special operation, all by using the status card read and write operations.

#### Writing Status Cards

Status cards can be written using the <u>wsrs</u> (*write status*) function. This function writes the following information to cards:

- Status of flags 0 through 43 (refer to the *HP-41C Owner's Handbook and Programming Guide*, section 14 for information about flags),
- Location of the statistics registers,
- Number of data storage registers currently allocated,
- Key reassignments of any standard HP-41C functions or reassignments of any functions contained in any plug-in application module or other system extension. This does not include reassignments of programs you have written and stored in program memory (they are stored with the program), and
- Contents of registers X, Y, Z, T, LAST X, and ALPHA.

The procedure for writing status cards is:

- 1. Set the HP-41C to normal or USER mode.
- 2. Execute the <u>wsrs</u> function. The HP-41C will prompt you for the cards with the standard card track prompt

#### RDY kk OF nn

where  $\mathbf{k}\mathbf{k}$  is the next track to be written and  $\mathbf{n}\mathbf{n}$  is the total number of tracks required to write all of the status information to cards.

3. Select a blank card and insert it into the card reader. The HP-41C will begin writing the status information to the cards, prompting you for each successive track.

Track one of the status card set holds all of the status information except the standard function key assignments. This remaining information is written on subsequent tracks. You can terminate the status write after writing just track 1. But once you begin writing the remaining tracks, you should not terminate. Partial key-reassignment data on the subsequent tracks cannot be read.

#### **Reading Status Cards**

Once you have the status card set for a particular program or procedure, all you have to do is read in the status cards, and then read in the program and data cards. This ensures that the program will run under the same conditions each time you read in the cards. You can also use the status cards to save a USER mode keyboard that you have customized. (Remember, only standard HP-41C function reassignments and reassignments of functions contained in any plug-in application modules or other extensions are recorded on the status cards. Reassignments of programs that you write are recorded on the program card with the program.)

Here is the status card read procedure:

- 1. Ensure that the HP-41C is not set to PRGM mode.
- 2. Insert the status card into the card reader. The calculator will prompt you with the standard prompt.



During a multiple-track status read, you can insert the status cards in any order. Status sets, however, cannot be intermixed. The HP-41C automatically keeps track of the read operation and prompts you for the lowest numbered track not yet read.

3. When all of the status cards have been read, you can switch to USER mode and use the reassigned keyboard.

If you wish to read just the information on track one (all status information except key reassignments and buffer size), you can interrupt a status read by pressing  $\boxed{\mathbf{R}/\mathbf{S}}$  or  $\boxed{-}$  after reading just track 1. On the other hand, if you wish to read just the key reassignments, you can begin the

read session with track 2 and read all tracks except track 1. If you intend to read track 1, it must be read first. Once you begin reading tracks that contain the key reassignments, you must read all of the tracks containing key reassignments (all status tracks except track 1). Interrupting a read of key reassignments will result in the loss of all key reassignments.

Track 1 of the status cards contains the data register allocation. If the HP-41C does not currently have enough registers to satisfy the allocation on the status cards, the register allocation will remain unchanged and the display will show SIZE ERR. The SIZE ERR message will also be displayed if track 1 is read after any other status track. If you wish to update the register allocation, you should read track 1 first. The NO ROOM and TRY AGAIN messages will be displayed if there is not enough room in memory to store all of the key reassignments.

### "Write-All" Card Operations

Using the [wall (write-all) function, you can write the entire contents of the calculator onto cards. This includes all status information, all data storage registers as well as all of program memory. Using [wall you can completely control and reproduce all conditions required by a program, a customized keyboard, or any other operations.

The **wall** function is non-programmable (cannot be keyed in as an instruction in a program).

#### Writing All Information in the HP-41C to Cards

Here is the procedure for using **WALL**:

- 1. Make sure you have several blank cards ready for writing.
- 2. Execute <u>WALL</u>. The HP-41C will begin prompting you for cards with the standard card prompt.

#### RDY kk OF nn

3. Insert blank cards until the "write-all" operation is completed. Label the cards such that they cannot be mixed with other "writeall" cards. Prematurely terminating a <u>wall</u> session will result in an incomplete "write-all" card set. An incomplete "write-all" card set cannot be properly read and will cause all of memory to be cleared and the display will show <u>MEMORY LOST</u>.

#### Reading the "Write-All" Cards

The "write-all" card set must be maintained as a complete set because the HP-41C will successfully read only a completed <u>WALL</u> card set. The cards from different "write-all" sets cannot be intermixed. When a card set is read, all conditions existing at the time the <u>WALL</u> was executed are duplicated, including all of program memory and the contents of all data storage registers. Because of this, the HP-41C system must be configured (memory modules, printer, etc.) the same as when the <u>WALL</u> card set was written.

Following is the procedure for reading a "write-all" card set.

- 1. Ensure that the HP-41C is not set to PRGM mode.
- 2. Begin inserting the "write-all" card set. The HP-41C will prompt you for each track with the standard prompt.

#### RDY kk OF nn

The cards can be inserted in any order. The HP-41C will keep track of the cards as they are read and will prompt you for the lowest numbered track not yet read.

3. When the operation is complete, the HP-41C is set to the same conditions that existed when the <u>WALL</u> was executed.

Interrupting a read session of the "write-all" card set will result in the clearing of all of memory. The HP-41C will display *MEMORY LOST*.

When there are not enough registers present to read the entire "writeall" card set, none of the "write-all" cards will be accepted and the calculator will show *NO ROOM*.

# **Verifying Cards**

An important feature of the HP-41C and card reader system is the ability to verify the contents of all types of your magnetic cards.

Using the <u>VER</u>(verify) function, you can determine the card type and the track number, or, the fact that the card is bad or is unrecognizable.

The calculator and card reader do this verification by using the information on the card to compute a "checksum." This checksum is written with the information on the card when the card is first written. The verfunction reads the card and recomputes this checksum. It then compares this checksum to the checksum that was originally written on the card. If the checksums are the same, the track is good; if the checksums are not the same, the track is bad. ver is not programmable (cannot be keyed in as an instruction in a program).

The procedure for using **VER** is:

1. Execute VER. The HP-41C will prompt you for the card with

#### CARD

2. Insert any of the cards you wish to verify, one track at a time, into the card reader. If the card is blank or is not a proper HP-41C or HP-67/HP-97 type card, the calculator will display this message:

#### CARD ERR

If the card is bad, that is, the checksums were not equal, the display will show

#### **CHECKSUM ERR**

Good cards will be analyzed by the system to determine their type and track number. The calculator will show the following display:

#### TYPE t TR nn

where t is one of the following card types:

Ρ	Program Card
D	Data Card
S	Status Card
Α	"Write-All" Card
7 <b>P</b>	HP-67/HP-97 Program Card
7 <b>D</b>	HP-67/HP-97 Data Card

and where nn is the track number of the track just read. The track number is relative to the information written on that card. For example, a program that requires two full cards has four tracks numbered 01 through 04. VER tells you which of these tracks has just been read. (Track number is not shown for HP-67/HP-97 cards.)

You can terminate the verify session at any time by pressing R/S or . No information in the HP-41C is altered in any way by the verify operation.

It is a good programming practice to verify cards after each card writing session. If a card is not written properly because of dirty heads or dirty cards (refer to appendix A), or other problems, **VER** lets you know immediately. This enables you to check the card before you clear the written information out of memory.

# Executing Programs Containing Card Reader Functions

Remember from the beginning of this section that the card reader functions only become available while the card reader is plugged in. So, if you have programs stored in program memory that contain specific card reader functions, and the card reader is not attached, those functions are **NONEXISTENT** and that program will not execute properly (when a card reader function is encountered the display will show **NONEXISTENT**). However, when you plug the card reader back in and execute that program, it will execute properly. Here is how the HP-41C keeps track of these card reader functions:

- 1. While the card reader is in place, the function name appears normally in the program like this: 04 RSUB, or 55 RDTAX.
- 2. When the card reader is removed, these functions are replaced with a different function called XROM. An XROM function tells the HP-41C that the function belongs to some plug-in accessory. Next to the XROM function name are two numbers. These numbers indicate which accessory the function belongs to as well as an indicator of the function. So, the program line 04 RSUB (with the card reader plugged in) would change to 04 XROM 30,04 when the card reader was removed. The XROM tells the system that the function belongs to a plug-in accessory, and the 30,04 tells the system that the accessory is number 30 (the card reader) and the function number is 04 (RSUB).

Programs containing these functions have the following XROM numbers when the card reader is removed.

Function	XROM Number	Function	XROM Number
MRG	XROM 30,01	7DSP7	XROM 30,19
RDTA	XROM 30,02	7DSP8	XROM 30,20
RDTAX	XROM 30,03	7DSP9	XROM 30,21
RSUB	XROM 30,04	7DSPI	XROM 30,22
VER	Not programmable	7DSZ	XROM 30,23
WALL	Not programmable	7DSZI	XROM 30,24
WDTA	XROM 30,07	7ENG	XROM 30,25
WDTAX	XROM 30,08	7FIX	XROM 30,26
WPRV	Not programmable	7GSBI	XROM 30,27
WSTS	XROM 30,10	7GTOI	XROM 30,28
7CLREG	XROM 30,11	7ISZ	XROM 30,29
7DSP0	XROM 30,12	7ISZI	XROM 30,30
7DSP1	XROM 30,13	7P<>S	XROM 30,31
7DSP2	XROM 30,14	7PRREG	XROM 30,32
7DSP3	XROM 30,15	7PRSTK	XROM 30,33
7DSP4	XROM 30,16	7PRTX	XROM 30,34
7DSP5	XROM 30,17	TRCLE	XROM 30,35
7DSP6	XROM 30,18	7SCI	XROM 30,36

If a card reader function is entered, using  $\overline{XEQ}$ , into a program line while the card reader is not connected, the function is recorded, displayed, and printed as  $XEQ^{T}$  followed by the function name. Program execution is slowed by lines of this form because the calculator will search for a matching ALPHA label or function name—first in program memory, then in each module plugged in.


#### Section 3

# HP-67/HP-97 Compatibility

The card reader system has been designed so that most prerecorded HP-67/HP-97 programs and programs recorded on cards by HP-67/HP-97 calculators can be read and executed on the HP-41C. All HP-67/HP-97 data cards can be read and used on the HP-41C system.

The card reader actually translates the HP-67/HP-97 program instructions into special compatability functions that execute in the HP-41C. You can also key in and use the compatibility functions while the card reader is plugged into the HP-41C. A complete listing of all HP 82104A functions is given in the function index at the end of this handbook.

**Note:** Some HP-67/HP-97 programs may require an additional HP 82106A Memory Module or an HP 82170A Quad Memory Module before translation and execution can be performed (except for the HP-41CV, which already contains sufficient memory to accommodate all HP-67/HP97 programs).

# Reading HP-67/HP-97 Program Cards

The HP-41C and card reader will read either pre-recorded HP-67/HP-97 program cards or program cards that were written by the HP-67 or HP-97 calculators. There are, however, some important exceptions and considerations that are covered later in this section.

To read a HP-67/HP-97 program card:

- 1. Set the HP-41C to USER mode.
- 2. Execute SIZE 026 to provide 26 registers ( $R_{00}$  through  $R_{25}$ ) for HP-67/HP-97 compatibility. (Skip this step if 26 or more registers are already allocated.)
- 3. Press GTO • . This ensures that your last program has an *END* instruction and causes the program that is read to be placed after your last program. (If the last program does not have an *END* instruction, it will be replaced by the new program.)

4. Insert the program card. The HP-41C begins the translation process as soon as the complete program is read. This generally requires several seconds. During the translation time, the display shows

WORKING and then PACKING

5. The HP-41C will prompt for two-track programs with the standard prompt.

#### RDY kk OF nn

The program card can be inserted either track 1 first, or track 2 first. Translation begins after the entire program has been read.

6. Once the program is read and translated, it is ready for execution.

# Executing HP-67/HP-97 Card Programs

Most translated programs will execute only if the card reader is plugged into the HP-41C. An attempt to execute most translated programs while the HP 82104A Card Reader is not in place will result in the **NONEXIS**-**TENT** display.

While the HP-41C is in USER mode, the top row of keys work just like the A through E keys on the HP-67 and HP-97 Calculator when you are executing translated programs. As long as the calculator is set to the translated program in program memory, you can execute it the same way you would on the HP-67 or HP-97. If you are unsure as to how the HP-67 or HP-97 calculators operate, refer to their respective owner's handbooks. Part Two in each of these books covers programming in detail.

To execute program A, set the HP-41C to USER mode and press the HP-41C  $\land$  key. To execute program a, press  $\land$  (lower case a). The labels A through E and a through e in the HP-67/HP-97 program are translated into HP-41C local labels A through E and a through e. (For more information on local labels, refer to section 12 in the HP-41C Owner's Handbook and Programming Guide.) So when you press A, the program beginning with local label A is where execution begins. If you are unsure of how programming on the HP-41C works, it is a good idea to review part II of the HP-41C Owner's Handbook and Programming Guide. Programming and USER mode operation of local labels are covered in detail in that book.

**Positioning the Calculator.** The HP-41C must be set within the translated program before the local label execution (A through E and a through e) of that program can be accomplished. When the HP-67/HP-97 program card is read and translated, the HP-41C is automatically positioned to the top of that program.

However, if you position the calculator outside of the translated program, you must reposition to execute the translated program. One way this can be accomplished is to execute CATALOG 1. This catalog lists and automatically positions the HP-41C to successive programs in memory. If there are only two or three programs in program memory, you will need to stop the catalog listing immediately after executing CATALOG 1 by pressing [R/S]. You can then use [SST] and [BST] to display and position to specific programs in the catalog. Since the translated program has only local ALPHA and numeric labels, no label appears in the catalog. However, the END associated with that program will appear in the catalog. If you position to the END of the program using the catalog, you can execute it using the local labels in USER mode (simply press A through E, a through e as explained earlier).

Once you have positioned the calculator using catalog 1, you can check to see if the calculator is positioned to the proper program by setting the HP-41C to PRGM mode. The first line of the program will be 01 LBL 67. Using <u>SST</u> and <u>BST</u> in program mode, you can locate that label to verify that the calculator is set to the translated program. You can then switch back to USER mode and execute the program.

## Storage Register Compatibility

When an HP-67/HP-97 program card is translated for execution in the HP-41C, a certain set of data storage registers must be made available for use in the HP-41C. Before you read the HP-67/HP-97 program card, you should execute  $\boxed{\text{SIZE}}$  026 on the HP-41C to ensure that at least 26 data storage registers ( $R_{00}$  through  $R_{25}$ ) are available.

The correspondence between HP-67/HP-97 data storage registers and HP-41C data storage registers is as follows:

HP-67/HP-97 Data Storage Registers	HP-41C Data Storage Registers
Primary Registers (10)	R <sub>00</sub> through R <sub>09</sub>
Secondary Registers (10)	R <sub>10</sub> through R <sub>19</sub>
Α	R <sub>20</sub>
В	R <sub>21</sub>
С	R <sub>22</sub>
D	R <sub>23</sub>
E	R₂₄
I	R <sub>25</sub>

Note that primary HP-41C data storage registers are always identified by a two-number register address, whereas HP-67/HP-97 register addresses are one-number. You must use the two-number HP-41C register addresses.

The **PES** function on the HP-67/HP-97 exchanges the primary and secondary register contents. This same operation can be accomplished by executing the **TPE-S** compatibility function on the HP-41C. It exchanges the contents of  $R_{00}$  through  $R_{09}$  with  $R_{10}$  through  $R_{19}$ .

# **Program Length**

Because of the need to translate HP-67/HP-97 programs, the length of the program once translated will increase slightly over the original length. You can estimate how long an HP-67/HP-97 program will be when translated by multiplying the number of steps in the original program by 0.2. For example, a 100-line HP-67/HP-97 program will require 0.2  $\times$  100 or about 20 registers of program memory in the HP-41C.

Even though the translated programs are slightly longer, they will normally execute significantly faster than on the HP-67/HP-97.

With 26 registers allocated to HP-41C data storage registers (<u>SIZE</u> 026), the basic 63-register HP-41C is left with 37 registers in program memory—that's about 120 to 220 lines of program instructions. Reading an HP-67/HP-97 program card that requires more HP-41C program space than is available will result in these messages:

PACKING and then TRY AGAIN

Try reinserting the card. If the message is again displayed, an additional memory module will need to be inserted before the program can be successfully translated.

# Reading HP-67/HP-97 Data Cards

To read an HP-67/HP-97 data card, simply follow this procedure:

- 1. Ensure that the calculator is not in PRGM mode.
- 2. Execute <u>size</u> 026 to ensure that there are enough HP-41C registers available for the data.
- 3. Insert the HP-67/HP-97 data card into the card reader. The data on the card will be inserted into the corresponding HP-41C data storage registers. Refer to the register correspondence table on page 38 to see the location of the data.
- 4. The data on the cards is now ready for use. Remember that the HP-41C data storage register addresses are two numbers (00 through 99).

# **Compatibility Details**

Most operations in the HP-67 and HP-97 calculators can be translated by the card reader for execution by the HP-41C. However, there are several areas of incompatibility, and therefore programs that use these features cannot be executed properly by the HP-41C.

Specifically, there are only three prerecorded HP-67/HP-97 Applications Pac programs that must be changed slightly after being translated by the card reader for execution on the HP-41C. These programs are:

Navigation Pac I	Fix From Two Lines of Position (NAV-11A) (NAV-11B translates properly with no changes.)
Math Pac I	Base Conversions (MA1-03A)
Clinical Lab and Nuclear Medicine Pac	Basic Statistics (CL1-16A)

Instructions for modifying these programs for the HP-41C are given in appendix C.

There are also changes in the user instructions for execution of other applications pac programs. These changes are detailed in appendix C.

Following is a list of the specific operations that cannot be translated or that will not operate the same on the HP-41C as they do on the HP-67/HP-97.

- 1. Any program attempting rapid reverse branching will result in the *NONEXISTENT* display when execution is attempted.
- 2. Programs that must be initialized manually by storing data into the A, B, C, D, E, or I registers will work properly only if the data values are placed into the corresponding HP-41C data storage registers according to the register correspondence table shown on page 38.
- 3. The HP-67/HP-97 program sequence

$$\begin{array}{c} X = Y? \\ 1 \\ 2 \end{array}$$

normally results (in the HP-67/HP-97) in the number 12 in X if the test is true and the number 2 in X if the test is false. This sequence will not work properly on the HP-41C since it skips the entire number string instead of the individual digits of the number.

- 4. Programs that call more than three subroutine levels on the HP-67/HP-97 will not function the same way on the HP-41C. The HP-41C accepts subroutine calls up to six levels deep.
- 5. When merge is followed by a pause in an HP-67/HP-97 card program, once translated the pause is not useful. The HP-41C always stops and prompts for a card when programmable read functions are executed in programs.
- 6. The pause length on the HP-67/HP-97 is extended by any keystroke. PSE on the HP-41C is continued only if the keys pressed are normally used for data entry (e.g., numbers, ALPHAs, CHS EEX, etc.).
- 7. As the result of the standard deviation function approaches zero, the validity of the result decreases. For standard deviations near zero the HP-67/HP-97 could give meaningless small values. In these cases, the HP-41C displays *OUT OF RANGE* and program execution halts.
- HP-67/HP-97 write data will be translated to a standard HP-41C wDTA. Programs that do not do standard sequential writes of the primary and secondary storage registers will not execute prop-erly.
- 9. Programs that merge data using the HP-67 I-register will not operate properly. The HP-41C uses (RDTAX) and the X-register for similar purposes.
- 10. HP-67/HP-97 data or program cards cannot be merged.
- 11. When the HP-41C automatically switches from fixed notation to scientific notation for the display of small or large numbers, the number of digits displayed is determined by the current fix format (FIX 0 through FIX 9). The HP-67/HP-97 uses SCI 9 for this purpose.
- 12. The HP-41C compatibility function (PRTX) reformats justkeyed-in numbers before printing them on the optional system printer. The HP-97 function (PRINTX) prints the number just as it was keyed in.

- 13. Data and program information cannot be mixed on the same card. Attempts to read one track of data and then one track of program will result in the DATA ERROR display.
- 14. Programs that use unsupported HP-67/HP-97 features or capabilities may not operate properly.
- 15. The HP-41C ADV (advance) enables the stack lift. The HP-67/HP-97 space function leaves the stack lift unchanged.

# **Compatibility Function List**

Following is a list of all programmable HP-67/HP-97 keystroke sequences and the corresponding HP-41C compatibility functions or keystrokes.

HP-67	HP-97	HP-41C	Notes	HP-41C
Keystrokes	Keystrokes	Function		Display
0	0	0		0
1	1	1		1
2	2	2		2
3	3	3		3
4	4	4		4
5	5	5		5
6	6	6		6
7	7	7		7
8	8	8		8
9	9	9		9
•	•	·		
h 1/x	$V_{\mathbf{x}}$	1/x or 1/X	1	1/X
9 10 <sup>x</sup>	1 10 <sup>x</sup>	10* or 10+X	1	10†X
h ABS	1 (ABS)	ABS	2	ABS
hCF 0	CLF 0	CF 00	1	CF 00
hCF 1	CLF 1	CF 01	1	CF 01
hCF 2	CLF 2	CF 02	1	CF 02
hCF 3	CLF 3	CF 22	1	CF 22
CHS	CHS	CHS	1	CHS
CL REG	CL REG	7CLREG	2	7CLREG
CL X	CL X	CLX	1	CLX
1 COS	cos	COS	1	cos
9 COS-1	Cos-1	COS <sup>-1</sup> Or ACOS	1	ACOS
h DEG	f DEG	DEG	1	DEG
8	8	•	1	/
9 • R	/ D→R	D-R	2	D-R
DSP ()	DSP 0	7DSPO	2	7DSP0
DSP	DSP 1	7DSP1	2	7DSP1
DSP 2	DSP 2	7DSP2	2	7DSP2
DSP 3	DSP 3	(7DSP3)	2	7DSP3
DSP 4	DSP 4	[7DSP4]	2	7DSP4
DSP 5	DSP 5	[7DSP5]	2	7DSP5
DSP 6	DSP 6	7DSP6	2	7DSP6
DSP 7	DSP 7	7DSP7	2	7DSP7
DSP 8	DSP 8	7DSP8	2	7DSP8
DSP 9	DSP 9	[7DSP9]	2	7DSP9
DSP (i)	DSP (1)	(7DSPI)	2	7DSPI
f DSZ	f DSZ 1	7DSZ	2	7DSZ
9 DSZ(i)	( DSZ (i)	7DSZI	2	7DSZI
EEX	EEX	EEX	1	EEX
h ENG	ENG	TENG	2	7ENG
ENTER +	ENTER+	ENTER+	1	ENTER

HP-67	HP-97	HP-41C	Notes	HP-41C
Keystrokes	Keystrokes	Function		Display
9 @*	e*	ex or E+X	1	E↑X
h F? () h F? 1	1 F2 0	FS? 00	1	FS? 00
h F? 2	<b>1</b> F? 2	FS7C 02	2	FS? 01 FS?C 02
h F? 3	1 F? 3	FS?C 22	2	FS?C 22
9 FRAC	FRAC	FRC	2	FRC
h GRD	GRD	GRAD	2	7FIX GRAD
GSB ()	GSB 0	XEQ 00	1	XEQ 00
I GSB 1	GSB 1	XEQ 01	1	XEQ 01
GSB 2	GSB 2	XEQ 02	1	XEQ 02
	GSB 4	XEQ 04	1	XEQ 03
GSB 5	GSB 5	XEQ 05	1	XEQ 05
I GSB 6	GSB 6	XEO 06	1	XEQ 06
GSB 7	GSB 7	XEO 07	1	XEQ 07
	GSB 9	XEQ 08	1	XEQ 08
1 GSB A	GSB A	XEQ 10	1	XEQ 10
1 GSB B	GSB B	XEQ 11	1	XEQ 11
I GSB C	GSB C	XEQ 12	1	XEQ 12
GSB D	GSB D	XEO 13	1	XEQ 13
9 GSB f a	GSB 1 a	XEQ 15	1	XEQ 14 XEO 15
9 GSB f b	GSB / b	XEQ 16	1	XEQ 16
9 GSB f C	GSB / C	XEQ 17	1	XEQ 17
9 GSB 1 d		XEQ 18	1	XEQ 18
	GSB (II)	7GSBI	1	XEQ 19 ZGSRI
GTO 0	GTO 0	GTO 00	1	GTO 00
<u>GTO</u> 1	GTO 1	GTO 01	1	GTO 01
GTO 2		GTO 02	1	GTO 02
GTO 4	GTO 4		1	GTO 03
GT0 5	GT0 5	GTO 05	1	GTO 05
GTO 6	GTO 6	GTO 06	1	GTO 06
GTO 7		GTO 07	1	GTO 07
GTO 9	GTO 9		1	GTO 08
GTO A	GTO A	GTO 10	1	GTO 10
G10 B	GTO B	GTO 11	1	GTO 11
GTO C	GTO C	GTO 12	1	GTO 12
GTOE	GTOF		1	GTO 13
GTO # a	GTO 1 a	GTO 15	1	GTO 15
610 F b	G10 f b	GTO 16	1	GTO 16
GTO C	GTO TC	GTO 17	1	GTO 17
			1	GTO 18
GTO (ii)	GTO (i)	7GTOI	2	7GTOI
9 + H.MS	+ HMS	HMS	2	HMS
	HMS+	HR	2	HR
		HMS+	2	HMS +
( ISZ	ISZ 1	[7]SZ	2	7157
9 (ISZ (i)	f ISZ (i)	7ISZI	2	7ISZI
	LBL ()	LBL 00	1	LBL 00
			1	LBL 01
LBL 3	LBL 3	LBL 03	1	LBL 02
( LBL 4	LBL 4	LBL 04	1	LBL 04
LBL 5	LBL 5	LBL 05	1	LBL 05
	LBL 7		1	LBL 06
LBL 8	LBL 8	LBL 08	1	LBL 08

HP-67	HP-97	HP-41C	Notes	HP-41C	
Keystrokes	Keystrokes	Function		Display	
LBL 9	LBL 9	LBL 09	1	LBL 09	
	LBL	LBL 10, LBLA	1, 3	LBL 10, LBL A	ı
			1, 3	LBL 11, LBL B	1
	LBL	LBL 13, LBL D	1, 3	LBL 12, LBL C	;
I LBL E	LBLE	LBL 14, LBL E	1, 3	LBL 14, LBL E	ł.
LBL ( a	LBL 1 a	LBL 15, LBL a	1, 3	LBL 15, LBL a	
		LBL 17 LBL C	1, 3	LBL 16, LBL b	1
LBL 1 d	LBL 1 d	LBL 18, LBL d	1, 3	LBL 17, LBL C	,
ILBLI C	LBL / C	LBL 19, LBL •	1, 3	LBL 19, LBL e	
			1	LN	
LST X	LAST X	LASTX OF LASTX	1	LOG	
8	8	•	1	-	
MERGE	MERGE	MRG	2	MRG	
		R-P	2	FACT	
	22	*	1	н-р %	
9 <b>% CH</b>	1 % CH	жен	2	%CH	
		T or P	1	PI	
₽ REG	+ 1 REG	+ 70005C	1	+	
9 STK	STACK	7PRSTK	2	7PRSTK	
1 -x-	PRINTX	7PRT X	2	7PRTX	
Pas	Pis Pis	795	2	7 <b>P</b> < →S	
		P-R	2	PSE P.P	
h R+	R+	R+ Or RDN	1	RDN	
h R+		Rt	2	Rţ	
		RAD	2	RAD	
	RCU 0	RCL 00	2	RCL 00	
RCL 1	RCL 1	RCL 01	1	RCL 01	
RCL 2	RCL 2	RCL 02	1	RCL 02	
RCL 3	RCL 3	RCL 03	1	RCL 03	
RCL 5	RCL 5	RCL 05	1	RCL 05	
RCL 6	RCL 6	RCL 06	1	RCL 06	
RCL 7	RCL 7	RCL 07	1	RCL 07	
RCL 8	RCL 8	RCL 08	1	RCL 08	
RCL A	RCLA	RCL 20	1	RCL 20	
RCLB	RCL B	RCL 21	1	RCL 21	
RCLC	RCL C	RCL 22	1	RCL 22	
RCL	RCL E	RCL 24	1	RCL 23 RCL 24	
h RCI	RCL I	RCL 25	1	RCL 25	
RCL (I)	RCL (i)	RCL 25	1	RCL IND 25	
RCU ST		7RCLE	2	7RCLS	
R/S	R/S	STOP (R/S)	1	STOP	
h RTN	RTN	RTN	1	RTN	
96		EREG 14, SDEV	2, 4	ΣREG14, SDE	V
	SCI	SF 00	2	/SCI SE 00	
ISF 1	STF 1	SF 01	1	SF 01	
hSF 2	STF 2	SF 02	1	SF 02	
ISF 3	STF 3	SF 22	1	SF 22	
	80 11 (2 - 1	EREG 14, $\Sigma$ +	1,4	2REG14, Σ+ ΣREG14 Σ-	
	SIN	SIN	1	SIN	
9 SIN-1	I SIN-1	SIN-1 OF ASIN	1	ASIN	
h SPACE	SPACE		2	ADV	
Maria X I		ITA LUL ISORTI		auni	

HP-67	HP-97	HP-41C	Notes	HP-41C
Keystrokes	Keystrokes	Function		Display
510 - 0	STO - 0	5TO + 00 or 5T+ 00	1	ST/ 00
STO - 1		STO + 01 or ST+ 01	1	ST/ 01
		STO + 03 or ST+ 03	1	ST/ 03
STO - 4	STO - 4	STO + 04 or ST+ 04	1	ST/ 04
<b>STO -</b> 5	sto = 5	STO + 05 or ST+ 05	1	ST/ 05
<b>STO</b> - 6	STO - 6	STO + 06 or ST+ 06	1	ST/06 ST/07
STO - 8	STO - 8	STO + 08 or ST+ 08	1	ST/ 08
510 - 9	STO - 9	STO + 09 or ST+ 09	1	ST/ 09
STO - 0	STO = 0	STO - 00 or ST- 00	1	ST- 00
	STO = 1	STO - 02 or ST- 02	1	ST- 02
<u>\$10</u> - 3	STO - 3	STO - 03 or ST- 03	1	ST- 03
STO - 4	sto - 4	STO - 04 or ST- 04	1	ST- 04
510 - 5	STO - 5	STO - 05 or ST- 05	1	ST- 05 ST- 06
		STO - 07 or ST- 07	1	ST- 07
510 - 8	STO - 8	STO - 08 or ST- 08	1	ST- 08
sto - 9	sto - 9	STO - 09 or ST- 09	1	ST- 09
STO + 0	STO • 0	STO + 00 or ST+ 00	1	ST + 00
STO + 1	STO + 1		1	ST + 01 ST + 02
STO + 3	STO • 3	STO + 03 or ST+ 03	1	ST+ 03
STO + 4	STO + 4	STO + 04 or ST+ 04	1	ST+ 04
STO + 5	STO + 5	STO + 05 or ST+ 05	1	ST + 05
STO + 6	STO + 6	STO + 06 or ST+ 06 STO + 07 or ST+ 07	1	ST + 06 ST + 07
STO - 8	STO • 8	STO + 08 or ST+ 08	1	ST+ 08
STO + 9	STO • 9	STO + 09 or ST+ 09	1	ST+ 09
S10 × 0	STO × 0	STO × 00 or ST× 00	1	ST* 00
	SIO × 1		1	ST* 02
STO X 3	STO X 3	STO × 03 or ST× 03	1	ST* 03
STO 🗶 4	STO × 4	STO × 04 or ST× 04	1	ST* 04
<u>sto</u> × 5	<u>STO</u> × 5	STO × 05 or ST× 05	1	ST* 05
STO ► 6	S10 × 6		1	ST* 07
510 × 8	STO X 8	STO × 08 or ST× 08	1	ST* 08
STO × 9	S10 × 9	STO × 09 or ST× 09	1	ST* 09
STO - (i)	STO - (i)	STO + 25		
		or ST+ 25	1	ST/ IND 25
510 - 10		or ST- 25	1	ST- IND 25
STO 🕈 (II)	STO + (i)	STO + 25		
-	673 A A	or ST+ 25	1	ST+ IND 25
	للتانية الت		1	ST* IND 25
STO 0	STO 0	STO 00	1	STO 00
STO 1	STO 1	STO 01	1	STO 01
STO 2	510 2	STO 02	1	STO 02
STO 3	STO 3	STO 03	1	STO 03
510 5	<b>STO</b> 5	STO 05	1	STO 05
ST0 6	STO 6	STO 06	1	STO 06
STO 7	STO 7	STO 07	1	STO 07
ST0 8	STO 8		1	STO 08
STO A	STO A	STO 20	1	STO 20
STO B	STO B	STO 21	1	STO 21
510 C	STO C	STO 22	1	STO 22
510 D	STOP	STO 24	1	STO 23
h STI	STO I	(STO) 25	1	STO 24
STO (i)	STO (ii)	STO 25	1	STO IND 25

HP-67	HP-97	HP-41C	Notes	HP-41C
Keystrokes	Keystrokes	Function		Display
9 TAN-1	TAN-1	TAN" OF ATAN	1	ATAN
f TAN	TAN	TAN	1	TAN
×		×	1	•
( W/DATA	W/DATA	WDTA	2	WDTA
1 X×0	f [X≠0?]	X=0?	2	X≠0?
1 x = 0	( x = 0?	x=0? Or x=0?	1	X=0?
1 x>0	1 x>0?	X>0?	2	X>0?
1 X<0	(x < 0?)	X < 0?	2	X<0?
9 X # Y	1 X # Y ?	X#Y?	2	X≠Y?
9 <b>x</b> = y	f (x = y ?)	x=y? Or x=y?	1	X = Y?
9 X>Y	1 x > y ?	x>y? or x>y?	1	X>Y?
9 X≤Y	f x ≤ y ?	X & Y? Or X <= Y?	1	X<=Y?
1 🕱	t x	EREG 14, MEAN	2, 4	ΣREG14. MEAN
9 🔀	X <sup>2</sup>	x <sup>2</sup> or X+2	1	X†2
h XH	1 X21	X<>> 25	2	X<> 25
h Xty	X5.9	X: Y Or X<>Y	1	X<>Y
h y*	3 <sup>12</sup>	y <sup>x</sup> or ¥+X	1	Y†X

- Notes: 1. This function can be executed by pressing a key on the normal mode keyboard. It is the first form of the function shown in the "HP-41C Function" column. In addition, this function can be executed by pressing <u>XEO</u> <u>ALPHA</u> name <u>ALPHA</u> when you supply the function name. The function name is the second form of the function shown in the "HP-41C Function" column. This function can also be assigned to a key location for execution in USER mode using <u>ASN</u> <u>ALPHA</u> name <u>ALPHA</u> key, when you supply the function name and press the key to which the function is to be assigned. When only one function name is shown in the "HP-41C Function" column, both the keyboard form and the display execution form are the same.
  - 2. This function can be executed by pressing <u>XEO</u> <u>ALPHA</u> name <u>ALPHA</u> when you supply the function name. The function is not on the normal mode keyboard. This function can also be assigned to a key location using <u>ASN</u> <u>ALPHA</u> name <u>ALPHA</u> key when you supply the function name and then press the key to which the function is to be assigned. The function can then be executed by pressing the reassigned key in USER mode.
  - The HP-67/HP-97 labels are translated into two labels on the HP-41C, one numeric label followed by one local ALPHA label.
  - The HP-41C translates mean, standard deviation, Σ+, and Σ- into two functions each. The first, ΣREG 14, automatically assigns the statistics registers to begin at R<sub>14</sub>. The second function is the normal translated statistics function.



PRGM ALPHA

ON USER

## Appendix A

# Accessories, Maintenance and Service

# Accessories

# **Standard Accessories**

HP 82104A Card Reader HP 82104A Card Reader Owner's Handbook Head Cleaning Card 20 Blank Magnetic Cards Card Holder for Magnetic Cards

# **Optional Accessories for the HP 82104A Card Reader**

Blank Magnetic Cards Multiple Card Packs Program Card Holder

# Maintenance

The HP 82104A Card Reader is a powerful addition to the HP-41C calculator system. It has been designed with the utmost attention to detail and quality.

After construction, each card reader is thoroughly inspected for electrical, mechanical, and cosmetic flaws.

# Card Reader Maintenance

## **Temperature Specifications**

Operating	10 to 45° C	50 to 113° F
Storage	-40 to 75° C	-40 to 167° F

#### CAUTION

Always turn the HP-41C off before inserting or removing any plug-in extensions or accessories. Failure to turn the HP-41C off could damage both the calculator and the accessory.

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- 1. Keep the contact area on the card reader plug free of obstructions. Should the contacts become dirty, carefully blow the dirt out of the contact area. Do not use any liquid to clean the contacts or the card reader.
- 2. Store the card reader in a clean dry place. Static electricity could damage the card reader.
- 3. Always turn the HP-41C off before inserting or removing any plug-in extension. Failure to do so could damage both the calculator and the extension.

#### CAUTION

Do not insert your fingers or any other objects other than an HP module or plug-in accessory into any port. To do so could alter the Continuous Memory or could even damage the port or the calculator. Always keep the port caps in place over any HP-41C ports that are not in use.

**Magnetic Card Maintenance.** Try to keep your cards as clean and free of oil, grease, and dirt as possible. If a read operation results in the *CHECKSUM ERROR* display, the card may be dirty. Clean the card and try the operation again. Dirty cards can only degrade the performance of your card reader. Extremely dirty cards may be cleaned with alcohol and a soft cloth.

Minimize the exposure of your calculator and card reader to dusty, dirty environments by storing them in the soft carrying case when not in use. Each card pack contains one head cleaning card.



The magnetic recording head is similar to other magnetic recording equipment. Any collection of dirt or other foreign matter on the head can prevent contact between the head and the card, with consequent failure. The head cleaning card consists of an abrasive underlayer designed to remove such foreign matter. However, the use of the card without the presence of a foreign substance will remove a minute amount of the head itself; thus extensive use of the cleaning card can reduce the life of the card reader. If you suspect that the head is dirty, or if you have trouble reading or recording cards (the display shows *MALFUNCTION* when you insert the card), by all means use the cleaning card; that's what it is for.

# **Improper Card Reader Operation**

If your HP-41C system appears to be operating properly except for the reading or writing of magnetic cards, check the following:

- 1. Make sure that the calculator is in the proper operating mode. Read the specific procedure for reading or writing magnetic cards.
- 2. If the display shows LOW BAT when you insert a card, the batteries do not have sufficient power to operate the card reader. Remove the card and insert new size N alkaline batteries in the HP-41C. Refer to Batteries in appendix B of the HP-41C Owner's Handbook and Programming Guide.
- 3. If the display repeatedly shows *MALFUNCTION* when you insert a card, the card reader head may be dirty. Use the cleaning card as directed. If the *MALFUNCTION* display still shows when you insert a card, try another card. If the difficulty persists, your HP 82104A Card Reader should be taken or sent to an authorized Hewlett-Packard repair facility.
- 4. Cards must move freely past the card reader heads. Holding a card back or bumping a card after the drive mechanism engages could cause a card to be misread. Always insert the card firmly into the card reader.

## CAUTION

Cards can be accidentally erased if subjected to strong magnetic fields. Magnetometers and X-ray equipment at airports are in the safe range.

- 5. Check the condition of your magnetic cards. Dirty or deeply scratched cards may not read properly.
- 6. The *MALFUNCTION* display may also show if you operate the card reader outside the temperature specifications.
- 7. If you are unsure as to the source of the problems, you may wish to take your HP-41C and the HP 82104A Card Reader to your nearest authorized HP retail outlet prior to sending the unit in for service. By temporarily exchanging card readers or calculators, you and the dealer may be able to determine which device is not functioning properly. Only the device that has been determined to be malfunctioning should be sent to HP for service. If you and the

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dealer are unable to determine the source of the malfunction, send both the HP-41C and HP 82104A to HP for service. Refer to Repair Policy.

## **AC Line Operation**

If you do not wish to operate your HP-41C system on battery power, an AC adapter and rechargeable battery pack are available as optional accessories for the HP-41C that can be used in combination to operate the system from line power.

#### WARNING

Do not attempt to recharge the alkaline batteries. Do not store batteries near a source of high heat or dispose of them in fire. Doing so may cause them to leak or explode.

# Limited One-Year Warranty

## What We Will Do

The HP 82104A Card Reader is warranted by Hewlett-Packard against defects in materials and workmanship for one year from the date of original purchase. If you sell your unit or give it as a gift, 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 that 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.

## Warranty Information

If you have any questions concerning this warranty, please contact an authorized Hewlett-Packard dealer or a Hewlett-Packard sales and service office. Should you be unable to contact them, please contact:

• In the United States:

Hewlett-Packard Corvallis Division 1000 N.E. Circle Blvd. Corvallis, OR 97330 Telephone: (503) 758-1010 Toll-Free Number: (800) 547-3400 (except in Oregon, Hawaii, and Alaska) • In Europe:

Hewlett-Packard S.A. 150, route du Nant-d'Avril P.O. Box CH-1217 Meyrin 2 Geneva Switzerland Telephone: (022) 83 81 11

Note: Do not send units to this address for repair.

• In other countries:

Hewlett-Packard Intercontinental 3495 Deer Creek Rd. Palo Alto, California 94304 U.S.A. Telephone: (415) 857-1501

Note: Do not send units to this address for repair.

# 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 repaired 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.

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

The Hewlett-Packard United States Service Center for batterypowered computational products is located in Corvallis, Oregon:

> Hewlett-Packard Company Corvallis Division Service Department P.O. Box 999 Corvallis, Oregon 97339, U.S.A.

1030 N.E. Circle Blvd. Corvallis, Oregon 97330, U.S.A. Telephone: (503) 757-2000

## **Obtaining Repair Service in Europe**

Service centers are maintained at the following locations. For countries not listed, contact the dealer where you purchased your unit.

GERMANY

Vertriebszentrale Berner Strasse 117

Postfach 560 140 D-6000 Frankfurt 56 Telephone: (611) 50041

HEWLETT-PACKARD GmbH Kleinrechner-Service

#### AUSTRIA

HEWLETT-PACKARD Ges.m.b.H. Kleinrechner-Service Wagramerstrasse-Lieblgasse 1 A-1220 Wien (Vienna) Telephone: (0222) 23 65 11

#### BELGIUM

DENMARK

Datavei 52

HEWLETT-PACKARD BELGIUM SA/NV Woluwedal 100 B-1200 Brussels Telephone: (02) 762 32 00

# 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

# Telephone: (02) 81 66 40

Refer to the address listed under Austria.

HEWLETT-PACKARD A/S

DK-3460 Birkerod (Copenhagen)

#### 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

#### NETHERLANDS

HEWLETT-PACKARD NEDERLAND B.V. Van Heuven Goedhartlaan 121 N-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

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#### 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 20 00

#### 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

Not all Hewlett-Packard service centers offer service for all models of HP products. However, if you bought your product from an authorized Hewlett-Packard dealer, you can be sure that service is available in the country where you bought it.

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 Repair Charge

There is a standard repair charge for out-of-warranty repairs. The repair charges include 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.

Products damaged by accident or misuse are not covered by the fixed repair charges. In these situations, repair charges will be individually determined based on time and materials.

# Service Warranty

Any out-of-warranty repairs are 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 completed Service Card, including 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 Service Card, a brief 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 repairs are completed, the service center returns the unit with postage prepaid. On out-of-warranty repairs 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 are not available. 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.

# Potential for Radio/Television Interference (for U.S.A. Only)

The HP 82104A Card Reader generates and uses radio frequency energy and, if not installed and used properly—that is, in strict accordance with the instructions in this manual—may cause interference to radio and television reception. It 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. However, there is no guarantee that interference will not occur in a particular installation. In the unlikely event that your card reader does cause interference to radio or television reception (which can be determined by halting card reader operation) you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the HP-41 and the card reader with respect to the receiver.
- Move the HP-41 and the card reader away from the receiver.
- If the HP-41 is being used with a rechargeable battery pack that is plugged in, move the HP-41 and the card reader to a different ac outlet so that the calculator and the receiver are on different branch circuits.

If necessary, you should consult your dealer 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.

# **Technical Assistance**

The keystroke procedures and program material in this manual are supplied with the assumption that the user has a working knowledge of the concepts and terminology used. Hewlett-Packard's technical support is limited to explanations of operating proce-

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dures used in the manual and verification of results obtained in the examples. If you have technical problems involving this manual, first consult the owner's manual for the HP-41. Should you need further assistance, you may write to:

> Hewlett-Packard Corvallis Division Customer Support 1000 N.E. Circle Blvd. Corvallis, OR 97330

# **Dealer and Product Information**

For dealer locations, product information, and prices, please call (800) 547-3400. In Oregon, Alaska, and Hawaii, call (503) 758-1010.

## Appendix B

# **Messages and Errors**

Following is a listing of all card reader messages and errors that you might see in the HP-41C display. For a list of all standard HP-41C messages and errors, refer to appendix E of the HP-41C Owner's Handbook and Programming Guide.

Display	Meaning
CARD	The system is prompting for a card.
CARD ERR	Unrecognizable card type (card was not recog- nizable as a standard HP-41C, HP-67, or HP-97 card).
	Card type not consistent during multiple-track input. (Card types were mixed during a multiple track read.)
	Wrong card type for $\ensuremath{RDTA}$ , $\ensuremath{RSUB}$ or $\ensuremath{MRG}$ .
	During multiple-track input of program or status cards, different sets of data were mixed.
CHECKSUM ERR	The card just read by $ver (verify)$ is dirty or bad.
LOW BAT	Battery power is not sufficient to read or write a card. When this message is displayed during a multi-track read or write session, the session is terminated.
MALFUNCTION	Inoperative hardware detected. Use the head cleaning card and try again.
MRG ERR	An attempt was made to merge a card program while the calculator was positioned to a pro- gram contained in an application module.
	An attempt was made to merge a card program to a program other than the last program in memory.
	60

	An attempt was made to merge a card program to a program contained in a plug-in application module.
NO ROOM	There was not enough space in program mem- ory to read the program, status, or "write all" card set.
PACKING and TRY AGAIN	There was not enough room in memory to store key reassignments of standard functions when a status card set was read.
	Memory is being packed. You should try the operation again.
	Repeated displays indicate that you must make room by deleting programs or by adding memory modules.
PRIVATE	An attempt was made to alter or view a private program.
RDY kk OF nn	Ready to read or write a card. <b>kk</b> is the next track to be written or read and <b>nn</b> is the total number of tracks required. The <b>kk</b> portion is always the lowest numbered track not yet read.
ROM	An attempt was made to record a program contained in an application module. The program must first be downloaded into program memory using <b>COPY</b> . Refer to the <i>HP-41C Owner's Handbook and Programming Guide</i> .
SIZE ERR	After reading track 1 of a status set, the size specified by the card was greater than the number of existing data storage registers.
	Track 1 of a status set was not read first.
TYPE t TR nn	After executing $vert$ , the verified track was found to be good. The <b>t</b> is one of the following:
	<ul> <li>P Program Card</li> <li>D Data Card</li> <li>S Status Card</li> </ul>

# 62 Messages and Errors

4	"Write-All" Card
7 <b>P</b>	HP-67/HP-97 Program Card
7 <b>D</b>	HP-67/HP-97 Program Card

and **nn** is the track number of the track just verified.

**WORKING** A time-consuming system task is being performed. (Such as translation of a HP-67/HP-97 program card.)

#### Appendix C

# HP-67/HP-97 Applications Pac Compatibility

Following is a list of changes to programs and user instructions in HP-67/HP-97 Applications Pacs. These changes and comments will help when you are executing translated Applications Pac programs in the HP-41C.

#### **Business Decisions Pac**

Page 6-02:

In the instructions, change [RCL] [C] to [RCL] 22.

Page 12-03:

In the instructions, change GSB 8 to xEQ 08.

Pages 13-03, 13-04:

In the instructions, change STO A to STO 20, STO B to STO 21, STO C to STO 22, STO D to STO 23, and STO E to STO 24.

Page 15-02:

In the instructions, change **RCL** 8 to **RCL** 08.

Programs 21 and 22 are not recorded on magnetic cards and therefore are not readily available for translation.

#### **Clinical Lab and Nuclear Medicine Pac**

Page 05-03: In the instructions, change **STO A** to **STO** 20.

Page 06-02:

In the instructions, change **STO A** to **STO** 20.

Program 16:

This program must be modified with the following procedure to run properly on the HP-41C:

#### 64 HP-67/HP-97 Applications Pac Compatibility

- 1. Use the HP 82104A Card Reader to read CL-16 into the HP-41C.
- 2. In normal mode (not USER, ALPHA, or PRGM), press GTO (ALPHA) A (ALPHA).
- 3. In PRGM mode, press <u>sst</u> twice. You will see 0. Now press <u>sto</u> 03.
- 4. Switch out of PRGM mode and press de GTO 17.
- Switch to PRGM mode and press I BST three times. You will see RCL 06. Press 
   twice. You will now see 1. Press
   STO + 03, RCL 03.
- 6. Switch out of PRGM mode. Press Store 00.
- Switch to PRGM mode and press <u>sst</u> once. You will see ADV. Press .
- 8. Switch out of PRGM mode and press 💹 GTO 13.
- 9. Switch to PRGM mode, press 
   BST three times. You will see RCL 06. Press 
   twice. You will now see 1. Press 
   STO 03, RCL 03. Switch out of PRGM mode.
- 10. Try the example problems on pages 16-03 and 16-04 of the Clinical Lab and Nuclear Medicine book.
- 11. If either example does not work, start over at step 1 of this procedure.
- 12. Record the revised program on a card for future use. Mark the card appropriately so that you will be able to find it easily.

```
Page 18-04:
```

In the instructions, change **STO** 7 to **STO** 07.

#### Games Pac I

Page 5-03:

Change **RCL** I in line eight of user instructions to **RCL** 25.

Page 12-03:

Add to step 9 of the instructions:

For HP-41C

Page 12-04:

Add to step 15 of the instructions:

For HP-41C



SF 00

Page 15-05: In step 2 of instructions, use [XEQ] [ALPHA] CLRG [ALPHA]. Change STO 7 to STO 07, STO A to STO 20. Pages 15-06, 15-07, 15-08: In the instructions, substitute [XEQ] ALPHA 7P<>S for all [f] [P3S] commands. Pages 15-06, 15-07: In the instructions, substitute **XEQ ALPHA** ADV **ALPHA** for **SPACE**. In the instructions, substitute [XEQ] [ALPHA] 7PRTX [ALPHA] for PRINTX. Change STO 7 to STO 07. Pages 15-09, 15-010: In the instructions, change **STO** + 1 to **STO** + 01; **STO** 2 through STO 5 to STO 02 through STO 05; RCL 1 to RCL 01; RCL 9 to RCL 09. Page 17-02: Change DSP 6 to FIX 6.

# Math Pac I

Program 3:

This program must be modified with the following procedure to run properly on the HP-41C:

- 1. Use the HP 82104A Card Reader to read MA1-03 into the HP-41C.
- 2. In normal mode (not USER, ALPHA, or PRGM), press
- 3. Switch to PRGM mode. You should see LBL 19.
- 4. Press 📕 BST .
- 5. Press  $\frown$  until you see the line with X <> Y.
- 6. Press the following keys in order.

1.	<b>x</b> ≤y?	5.	飅 lbl 06
2.	鬬 бто 06	6.	RCL 07
3.	EEX 1	7.	RTN
4.	STO X 07		

7. Switch out of PRGM mode and back into USER mode.

#### 66 HP-67/HP-97 Applications Pac Compatibility

8. Try the first example problem on page 3-03 of the Math Pac book. If the example does not work, start over with step 1 of this procedure.

9. Record the revised program on a card for future use. Mark the card appropriately so that you will be able to find it easily.

Pages 04-02, 04-03, 04-05:

All references to step 128 and 132 in the instructions should be changed to line 139.

Page 04-02:

MERGE in the user instructions is replaced by XEQ ALPHA MRG ALPHA.

Page 06-02:

Change **STO** 0 through **STO** 4 to **STO** 00 through **STO** 04. Page 07-04:

Change SF 0 to SF 00.

Page 08-02:

In the instructions, change GTO E to 📒 GTO ALPHA E ALPHA .

In the instructions, change all references to step 138 to line 142.

#### Pages 09-02, 09-03:

In the instructions, change all references to step 112 to line 124.

```
Page 10-02:
```

In the instructions, change GTO E to STO ALPHA E ALPHA .

In the instructions, change all references to step 177 to line 123.

Page 11-02:

In the instructions, change GTO E to GTO ALPHA E ALPHA.

In the instructions, change all references to step 148 to line 157.

## M.E. Pac I

Page 10-03:

In the instructions, change GTO C to GTO ALPHA C ALPHA. Page 16-03:

Change STO 6 to STO 06.

Program 23:

Always load side 1 of card 1, then the appropriate configuration card.

## **Navigation Pac I**

Page 02-01:

In the instructions, change  $\mathbb{RCL}$   $\mathbb{E}$  to  $\mathbb{RCL}$  24.

In the instructions, change •H.MS to XEQ ALPHA HMS ALPHA.

Page 02-02:

Change RCL 0 to RCL 00, RCL 5 to RCL 05.

Page 07-02:

In the instructions, change all references of Prs to xeo (ALPHA) 7P<>S (ALPHA).

Page 10-02:

In the instructions, change Pis to IEQ ALPHA 7P <> S ALPHA.

#### Page 11-01:

In the instructions, change PS to XEQ[ALPHA] 7P<>S [ALPHA]. Program 11:

Program 11:

This program must be modified with the following procedure:

- 1. Using the HP 82104A Card Reader, load NAV-11A.
- 2. In normal mode (not USER, ALPHA, or PRGM) press
- 3. Switch to PRGM mode.
- 4. Press **SST**. You should see **LBL D**.
- 5. Press 0 (zero).
- 6. Switch out of PRGM mode and back to USER mode.
- 7. Record the revised program on a card for future use. Mark the card appropriately so you can find it easily.

## Standard Pac

Page 05-03:

In the instructions, change  $\overline{\text{sto}} = 1$  to  $\overline{\text{sto}} = 20$ ,  $\overline{\text{sto}} = 1$ ,  $\overline{\text{sto}} = 1$ ,  $\overline{\text{sto}} = 21$ ,  $\overline{\text{sto}} = 22$ ,  $\overline{\text{sto}} = 1$  to  $\overline{\text{sto}} = 22$ ,  $\overline{\text{sto}} = 23$ , and  $\overline{\text{sto}} = 1$  to  $\overline{\text{sto}} = 24$ .

Pages 11-01, 11-04:

Changes references in the instructions to step 112 to line 118.

Program 11:

It is not possible to merge HP-67/HP-97 program cards using the HP-41C. If you wish to use a function recorded by an HP-67 or HP-97, read it into the HP-41C then write it back out as an HP-41C program card. Now you may read program 11 into the HP-41C. Press GTO • 118 XEO (ALPHA) MRG (ALPHA) and read in your translated function card.

## 68 HP-67/HP-97 Applications Pac Compatibility

Page 15-01:

The HP-41C will pause displaying **57.0**. The information at the end of the program will appear like this:

In display:		On printer:	
-888.9	- <b>90</b>	-888.9-90	***
-8.889	-88	-8.889-88	***
-8.9	-88	-8.9-88	***

# Stat Pac I

Many user instructions in Stat Pac I instruct you to clear PRINT mode using CF 0. On the HP-41C, use EF 00.

Page 09-03:

In the instructions, change (STO | A) to (STO | 20 and (STO | B) to (STO | 21.

Page 19-03:

In the instructions, change STO E to STO 24.

# Surveying Pac I

Page 02-05:

In the instructions, change **STO** 6 to **STO** 06.

Page 03-04:

In the instructions, revision D of the handbook, change line 17 from D to D.

Page 06-07:

In the instructions, change RCL 3 to RCL 03, RCL A to RCL 20, RCL B to RCL 21, and  $\bullet$ HMS to XEQ [ALPHA] HMS [ALPHA].

## Page 11-02:

In the instructions, change **STO** 5 to **STO** 05, **STO** 6 to **STO** 06.

Page 11-05:

In the instructions, change **STO** 5 to **STO** 05.

Page 12-02:

In the instructions, change (STO) 0 through (STO) 6 to (STO) 00 through (STO) 06, respectively.

Page 17-03:

In the instructions, change (STO) 0 through (STO) 9 to (STO) 00 through (STO)09, respectively. In the instructions, change "Press (WDTA)" to "Press (XEQ) (ALPHA) WDTA (ALPHA)." Change (STO) A to (STO) 20.

Page 18-03:

In the instructions, change (STO) 0 through (STO) 5 to (STO) 00 through (STO) 05, respectively.

# HP 82104A Card Reader Function Index

When the HP 82104A Card Reader is plugged into the HP-41C, the following functions become active in the system. These functions and programs containing these functions are only executable while the card reader is plugged in. You can list all of these functions by executing CATALOG 2.

7CLREG	Clears registers $R_{00}$ through $R_{09}$ and $R_{20}$ through $R_{25}.$ Compatible with HP-67/HP-97 $\hfill CL \hfill REG$ .
(7DSPO) through (7DSP9)	Display 0 through 9 decimal digits. Same as HP-67/ HP-97 $\fbox{DSP}$ 0 through 9.
(7DSP1)	Display indirect using $R_{25}$ for indirect control. Same as $\fbox{OSP}\textcircled{m}$ on HP-67/HP-97.
7DSZ	Decrement and skip on zero. Same as $\square SZ$ on HP-67 and $\square SZ$ 1 on the HP-97.
[7DSZI]	Decrement and skip on zero indirect using $R_{25}$ for indirect control. Same as $\boxed{DSZ}$ (1) on the HP-97 and $\boxed{DSZ(i)}$ on the HP-67.
7ENG	Engineering notation. Does not change the number of displayed digits. Same as $\fbox{Eng}$ on the HP-67/HP-97.
7FIX	Fixed notation. Does not change the number of displayed digits. Same as $\fbox{rix}$ on the HP-67/HP-97.
[7GSBI]	Go to subroutine indirect using $R_{25}$ for indirect control. Same as $\fbox{GSB}$ on the HP-67/HP-97. Negative values result in NONEXISTENT display.
[7GTOI]	Go to label indirect using $R_{25}$ for indirect control. Same as GTO 10 on the HP-67/HP-97. Negative values result in <b>NONEXISTENT</b> display.
7ISZ	Increment and skip on zero. Same as $\fboxst{sz}$ on the HP-67 and $\vst{sz}$ 1 on the HP-97.
[7 SZI]	Increment and skip on zero indirect using $R_{25}$ for indirect control. Same as (SZ (i)) on the HP-67 and (SZ (ii)) on the HP-97.
7P<>S	Exchange primary and secondary register contents. Exchanges content of $R_{00}$ through $R_{09}$ with $R_{10}$ through $R_{19}$ . Provides HP-67/HP-97 Prs compatibility.
--------	---
7PRREG	Print registers HP-67/HP-97 compatibility function. If printer is attached, prints the contents of registers $R_{00}$ through $R_{09}$ and $R_{20}$ through $R_{25}$ . If no printer, displays the register number and then its contents.
7PRSTK	Print stack HP-67/HP-97 compatibility function. If printer is attached, prints the contents of T, Z, Y, X. If no printer, views the contents. (If printer is not present or disabled, stack lift is enabled.)
7PRTX	Print X HP-67/HP-97 compatibility function. If printer is attached, prints the contents of the X-register. If no printer, displays X.
7RCLS	Recall contents of statistics registers for HP-67/HP-97 compatibility.
7SCI	Scientific notation. Does not alter the number of displayed digits. Same as HP-67/HP-97 [sci].
RDTA	HP-41C read data card (page 23).
RDTAX	HP-41C read data card as directed by X (page 24).
RSUB	HP-41C read subroutine (page 16).
WALL	HP-41C "write all" (not programmable) (page 28).
WDTA	HP-41C write data card (page 21).
WDTAX	HP-41C write data card as directed by X (page 21).
WPRV	HP-41C write private program card (not programmable) (page 13).
WSTS	HP-41C write status card (page 26).
MRG	HP-41C merge program from card (page 19).
VER	HP-41C verify track (not programmable)(page 29).



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