82104A
CARD READER

OWNER'S HANDBOOK

APR 20, 1983

"The success and prosperity of our company will be assured only if we offer our customers superior products that fill real needs and provide lasting value, and that are supported by a wide variety of useful services, both before and after sale."

Statement of Corporate Objectives
Hewlett-Packard

When Messrs. Hewlett and Packard founded our company in 1939, we offered one superior product, an audio oscillator. Today, we offer over 3500 quality products, designed and built for some of the world's most discerning customers.

Since we introduced our first scientific calculator in 1967, we've sold millions worldwide, both pocket and desktop models. Their owners include Nobel laureates, astronauts, mountain climbers, businessmen, doctors, students, and homemakers.

Each of our calculators is precision crafted and designed to solve the problems its owner can expect to encounter throughout a working lifetime.

HP calculators fill real needs. And they provide lasting value.

HEWLETT PACKARD

HP 82104A Card Reader
Owner's Handbook

March 1982

82104-90001 Rev. D

Contents

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.

Plugging in the Card Reader

1. Make sure the calculator is turned off.

2. 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 SIZE 064 will ensure this.) Refer to section 5 or 7 in the *HP-41C Owner's Handbook and Programming Guide* for more information about SIZE.
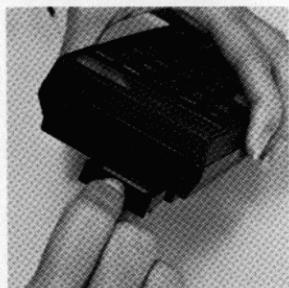
3. Insert the card reader connector into port number 4 as shown. Press the card reader straight into the calculator until it snaps firmly into place.

Your HP-41C calculator and card reader system is now ready to use!

Removing the Card Reader

1. Turn the HP-41C off!
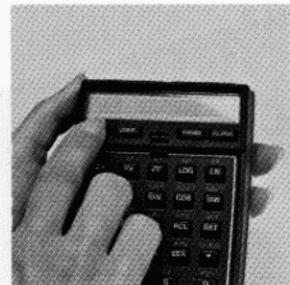
2. Grasp the body of the card reader.

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.
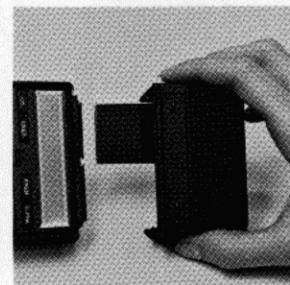
5. Replace the port cap on port 4.

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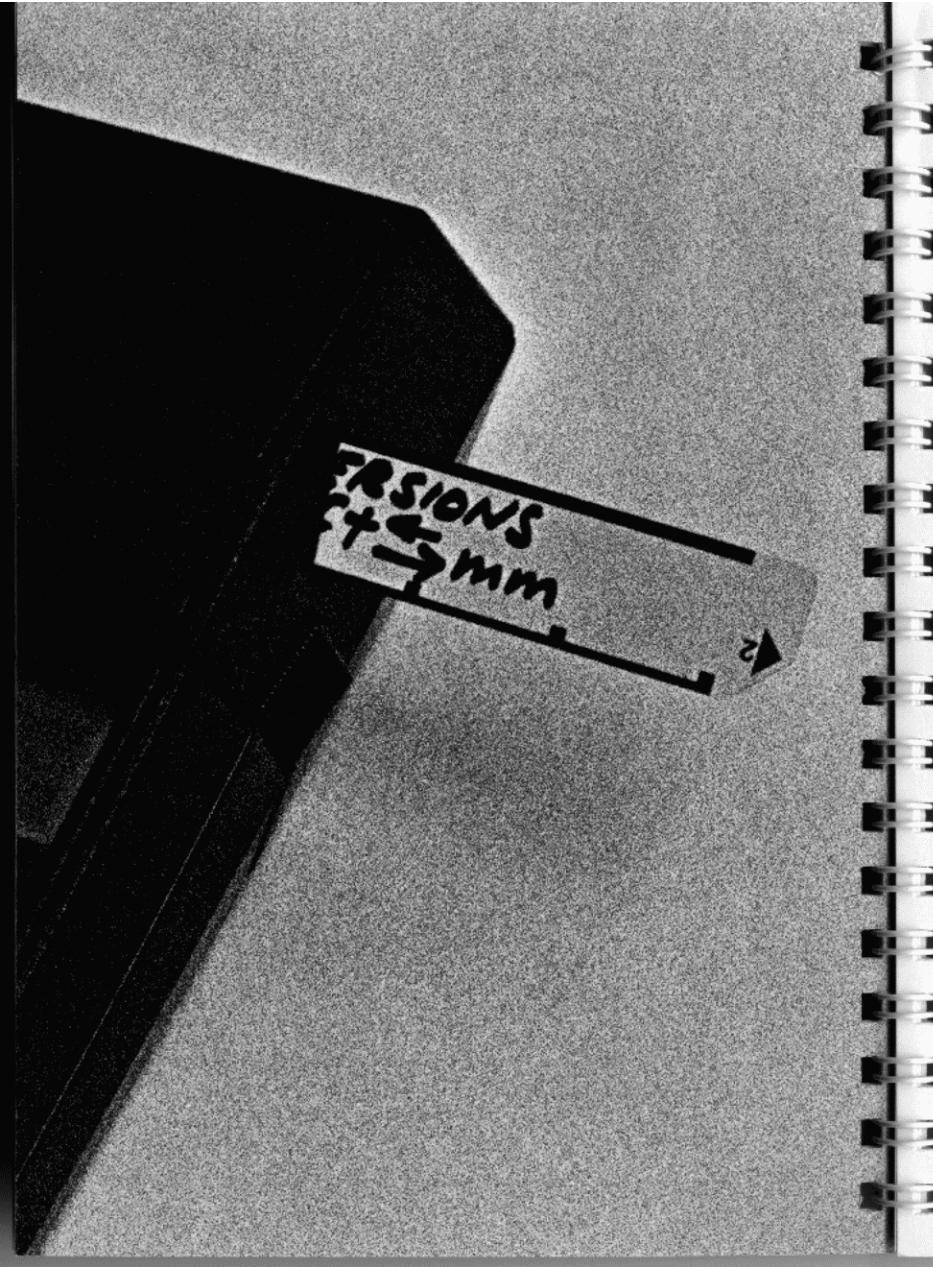
Most of the capabilities of the card reader are available through the use of small magnetic cards that store information in a greatly condensed form. Information stored in the calculator can be magnetically recorded on the small cards and then read back into the calculator again at a later time. This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

Magnetic Card

Track 1 ⟶ ◄————————————————► ◄——— Track 2

View showing how information
is stored on a card (not normally visible).

Up to
16 registers ⟶ ◄——— Up to
16 registers
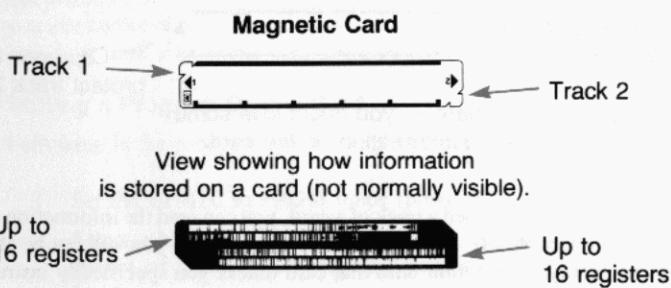
Program Cards. A program card is one that has program instructions stored on it. Each side of a card (track) can store up to 16 registers of program instructions. So, if you had program memory of the basic HP-41C completely full with program instructions, you could write all of that information onto 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.

Clip here to → protect track 1.

← Clip here to protect track 2.

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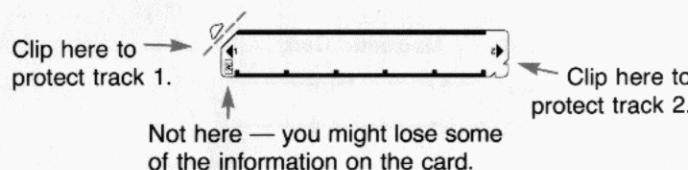
When you have clipped a track of a card, you can read the information on that card into the HP-41C any number of times, but you will not be able to write any information onto that card unless you specifically instruct the HP-41C to do so. You will learn more about this later.

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 date.
Status Cards:	"Status," program name, version number or date, track number.
"Write-All" Cards:	"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 [R/S], [←], 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.
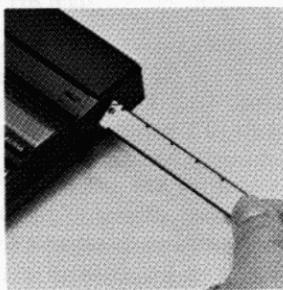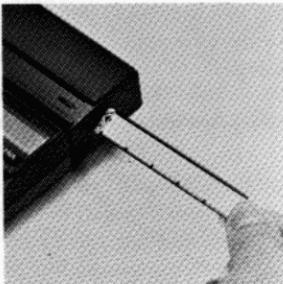
When you pass an unprotected but previously recorded card through the card reader with the HP-41C set to PRGM mode, the previous contents of the track are lost and are replaced by the new program instructions.

Any card-writing session may be terminated by pressing [R/S] or [←].

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.

2. 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.

4. 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.
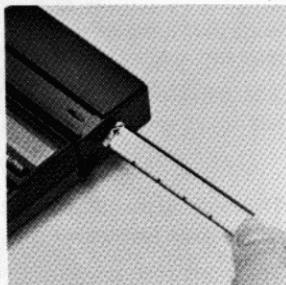
The private card may be read and executed any number of times, but cannot be viewed or altered through normal operations. In addition, you cannot write an already private program to a new card. Any attempt to view (e.g., [SST], [BST]), alter or record this program will result in the display of the **PRIVATE** message or be ignored. The [WPRV] 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.

When you read a program into program memory, that program replaces the last program in memory—all instructions between your last *END* instruction and the permanent *.END.* instruction. If your last program ends with the permanent *.END.* instruction, it will be *replaced* by the new program. If your last program has an *END* instruction, or if you execute ■ [GTO] [·] [·] (which places an *END* at the end of the last program), the new program will be stored after the *END* instruction—preserving your last program.

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., [WDTAX], [RSUB]) 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 [R/S] or [←] to terminate the session. Program memory is left with the partially loaded program in place.

Reading Subroutines

The [RSUB] *(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 [RSUB] function (as an instruction in an executing program) or the calculator is currently positioned to the last program (when [RSUB] is executed from the display), the program that is read in is added after the last program in program memory.

[RSUB] Executed From the Keyboard
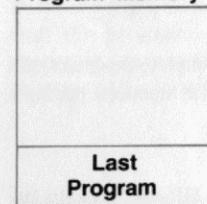
Program Memory

Program Card

The card program normally replaces the last program in memory...

Last Program
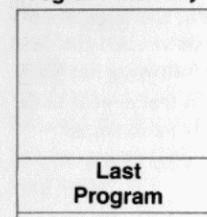
Program Memory
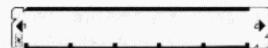
Program Card

...but when the HP-41C is currently positioned to the last program in program memory, the card program is added after the last program.

Last Program

[RSUB] Executed in a Program
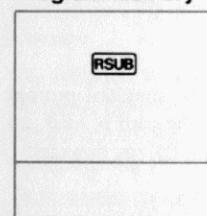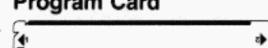
Program Memory

Program Card

The card program normally replaces the last program in memory...

[RSUB]
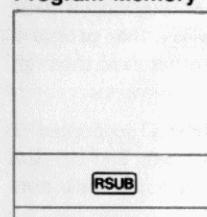
Program Memory
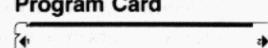
Program Card

...but when the [RSUB] is in the last program in memory, the card program is added after the last program.

[RSUB]

When you execute the RSUB 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:

```
01 LBL ABC
02TINSERT CARD
03 AVIEW
04 RSUB
        ⋮
```

The display will show **INSERT CARD** instead of the standard prompt when the RSUB 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 re-recorded 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, 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 MRG 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.

▬▬▬ [MRG] Executed From the Keyboard ▬▬▬

Program Memory   **Program Card**

```
┌─────────────────┐
│  LBL TEST       │
│  RCL 02         │
│  CHS            │
│    •            │
│    •            │
│    •            │
└─────────────────┘
```
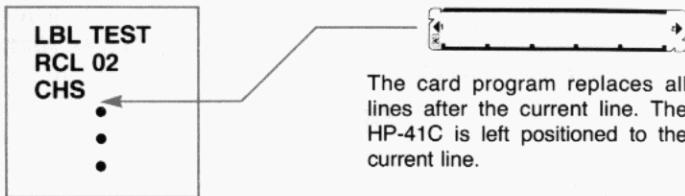
The card program replaces all lines after the current line. The HP-41C is left positioned to the current line.

▬▬▬ [MRG] Executed in a Program ▬▬▬

Program Memory   **Program Card**

```
┌─────────────────┐
│  LBL ABC        │
│  PROMPT         │
│  MRG            │
│    •            │
│    •            │
│    •            │
└─────────────────┘
```
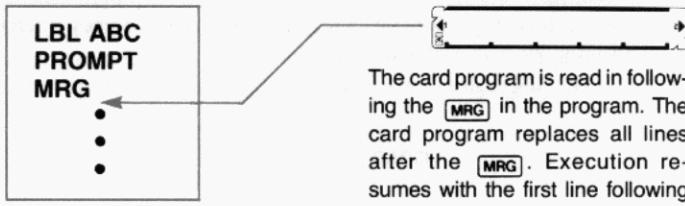
The card program is read in following the [MRG] in the program. The card program replaces all lines after the [MRG]. Execution resumes with the first line following the [MRG] instruction.

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 [RSUB] 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 [WDTAX], 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 **kk** is the next track to be written and **nn** 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 [R/S] or [←].

Using [WDTA]. The [WDTA] *(write data)* function is a simplified version of [WDTAX]. You have little control over the registers written using [WDTA]. When [WDTA] 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 [WDTAX] or [WDTA], 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: [RDTAX] *(read data as directed by X)* and [RDTA] *(read data)*. In addition, there is a third procedure used to read data cards without using either [RDTAX] or [RDTA].

Using [RDTAX]. Like [WDTAX], this function uses a number in the X-register to control the card operation. [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*ᵀ*DGF*
*02*ᵀ*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 [WSTS] *(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 [WSTS] function. The HP-41C will prompt you for the cards with the standard card track prompt

RDY kk *OF* nn

    where **kk** is the next track to be written and **nn** 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.

RDY kk *OF* nn

    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 [R/S] or [←] 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 [WALL]. 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 "write-all" cards.

Prematurely terminating a [WALL] 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 *MEMORY LOST*.

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 [WALL] 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 [WALL] 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 [WALL] 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 [WALL] 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 "write-all" 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 [VER] *(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 [VER] function 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:

P	Program Card
D	Data Card
S	Status Card
A	"Write-All" Card
7P	HP-67/HP-97 Program Card
7D	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.)

3. You can terminate the [VER] 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	7RCLΣ	XROM 30,35
7DSP6	XROM 30,18	7SCI	XROM 30,36

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.)

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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 [A] key. To execute program a, press ■ [A] (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 [SST] and [BST] 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 [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_{00} through R_{09}
Secondary Registers (10)	R_{10} through R_{19}
A	R_{20}
B	R_{21}
C	R_{22}
D	R_{23}
E	R_{24}
I	R_{25}

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 [P⇄S] function on the HP-67/HP-97 exchanges the primary and secondary register contents. This same operation can be accomplished by executing the [7P<>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 0.2×100 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 ([SIZE] 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 [SIZE] 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

   X=Y?
   1
   2

   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.

8. 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 properly.

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 [7PRTX] reformats just-keyed-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 Keystrokes	HP-97 Keystrokes	HP-41C Function	Notes	HP-41C 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
.	.	.		.
1/x	1/x	1/x or 1/X	1	1/X
10^x	10^x	10^x or 10↑X	1	10↑X
ABS	ABS	ABS	2	ABS
CF 0	CLF 0	CF 00	1	CF 00
CF 1	CLF 1	CF 01	1	CF 01
CF 2	CLF 2	CF 02	1	CF 02
CF 3	CLF 3	CF 22	1	CF 22
CHS	CHS	CHS	1	CHS
CL REG	CL REG	7CLREG	2	7CLREG
CLX	CLX	CLX	1	CLX
COS	COS	COS	1	COS
COS⁻¹	COS⁻¹	COS⁻¹ or ACOS	1	ACOS
DEG	DEG	DEG	1	DEG
÷	÷	÷	1	/
→R	D→R	D-R	2	D-R
DSP 0	DSP 0	7DSP0	2	7DSP0
DSP 1	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 (i)	7DSPI	2	7DSPI
DSZ i	DSZ i	7DSZ	2	7DSZ
DSZ (i)	DSZ (i)	7DSZI	2	7DSZI
EEX	EEX	EEX	1	EEX
ENG	ENG	7ENG	2	7ENG
ENTER↑	ENTER↑	ENTER	1	ENTER

HP-67 Keystrokes	HP-97 Keystrokes	HP-41C Function	Notes	HP-41C Display
e^x	e^x	e^x or E↑X	1	E↑X
F? 0	F? 0	FS? 00	1	FS? 00
F? 1	F? 1	FS? 01	1	FS? 01
F? 2	F? 2	FS?C 02	2	FS?C 02
F? 3	F? 3	FS?C 22	2	FS?C 22
FRAC	FRAC	FRC	2	FRC
FIX	FIX	7FIX	2	7FIX
GRD	GRD	GRAD	2	GRAD
GSB 0	GSB 0	XEQ 00	1	XEQ 00
GSB 1	GSB 1	XEQ 01	1	XEQ 01
GSB 2	GSB 2	XEQ 02	1	XEQ 02
GSB 3	GSB 3	XEQ 03	1	XEQ 03
GSB 4	GSB 4	XEQ 04	1	XEQ 04
GSB 5	GSB 5	XEQ 05	1	XEQ 05
GSB 6	GSB 6	XEQ 06	1	XEQ 06
GSB 7	GSB 7	XEQ 07	1	XEQ 07
GSB 8	GSB 8	XEQ 08	1	XEQ 08
GSB 9	GSB 9	XEQ 09	1	XEQ 09
GSB A	GSB A	XEQ 10	1	XEQ 10
GSB B	GSB B	XEQ 11	1	XEQ 11
GSB C	GSB C	XEQ 12	1	XEQ 12
GSB D	GSB D	XEQ 13	1	XEQ 13
GSB E	GSB E	XEQ 14	1	XEQ 14
GSB f a	GSB f a	XEQ 15	1	XEQ 15
GSB f b	GSB f b	XEQ 16	1	XEQ 16
GSB f c	GSB f c	XEQ 17	1	XEQ 17
GSB f d	GSB f d	XEQ 18	1	XEQ 18
GSB f e	GSB f e	XEQ 19	1	XEQ 19
GSB (i)	GSB (i)	7GSBI	2	7GSBI
GTO 0	GTO 0	GTO 00	1	GTO 00
GTO 1	GTO 1	GTO 01	1	GTO 01
GTO 2	GTO 2	GTO 02	1	GTO 02
GTO 3	GTO 3	GTO 03	1	GTO 03
GTO 4	GTO 4	GTO 04	1	GTO 04
GTO 5	GTO 5	GTO 05	1	GTO 05
GTO 6	GTO 6	GTO 06	1	GTO 06
GTO 7	GTO 7	GTO 07	1	GTO 07
GTO 8	GTO 8	GTO 08	1	GTO 08
GTO 9	GTO 9	GTO 09	1	GTO 09
GTO A	GTO A	GTO 10	1	GTO 10
GTO B	GTO B	GTO 11	1	GTO 11
GTO C	GTO C	GTO 12	1	GTO 12
GTO D	GTO D	GTO 13	1	GTO 13
GTO E	GTO E	GTO 14	1	GTO 14
GTO f a	GTO f a	GTO 15	1	GTO 15
GTO f b	GTO f b	GTO 16	1	GTO 16
GTO f c	GTO f c	GTO 17	1	GTO 17
GTO f d	GTO f d	GTO 18	1	GTO 18
GTO f e	GTO f e	GTO 19	1	GTO 19
GTO (i)	GTO (i)	7GTOI	2	7GTOI
→H.MS	→H.MS	HMS	2	HMS
H→	H→	HR	2	HR
H.MS+	H.MS+	HMS+	2	HMS+
INT	INT	INT	2	INT
ISZ i	ISZ i	7ISZ	2	7ISZ
ISZ (i)	ISZ (i)	7ISZI	2	7ISZI
LBL 0	LBL 0	LBL 00	1	LBL 00
LBL 1	LBL 1	LBL 01	1	LBL 01
LBL 2	LBL 2	LBL 02	1	LBL 02
LBL 3	LBL 3	LBL 03	1	LBL 03
LBL 4	LBL 4	LBL 04	1	LBL 04
LBL 5	LBL 5	LBL 05	1	LBL 05
LBL 6	LBL 6	LBL 06	1	LBL 06
LBL 7	LBL 7	LBL 07	1	LBL 07
LBL 8	LBL 8	LBL 08	1	LBL 08

HP-67 Keystrokes	HP-97 Keystrokes	HP-41C Function	Notes	HP-41C Display
f LBL 9	LBL 9	LBL 09	1	LBL 09
f LBL A	LBL A	LBL 10, LBL A	1, 3	LBL 10, LBL A
f LBL B	LBL B	LBL 11, LBL B	1, 3	LBL 11, LBL B
f LBL C	LBL C	LBL 12, LBL C	1, 3	LBL 12, LBL C
f LBL D	LBL D	LBL 13, LBL D	1, 3	LBL 13, LBL D
f LBL E	LBL E	LBL 14, LBL E	1, 3	LBL 14, LBL E
f LBL f a	LBL f a	LBL 15, LBL a	1, 3	LBL 15, LBL a
f LBL f b	LBL f b	LBL 16, LBL b	1, 3	LBL 16, LBL b
f LBL f c	LBL f c	LBL 17, LBL c	1, 3	LBL 17, LBL c
f LBL f d	LBL f d	LBL 18, LBL d	1, 3	LBL 18, LBL d
f LBL f e	LBL f e	LBL 19, LBL e	1, 3	LBL 19, LBL e
f LN	LN	LN	1	LN
f LOG	f LOG	LOG	1	LOG
f LST X	f LAST X	LASTX or LASTx	1	LASTX
−	−	−	1	−
g MERGE	f MERGE	MRG	2	MRG
h N!	f N!	FACT	2	FACT
g →P	→P	R-P	1	R-P
f %	%	%	1	%
g %CH	f %CH	%CH	2	%CH
h π	f π	π or PI	1	PI
+	+	+	1	+
h REG	f REG	7PRREG	2	7PRREG
g STK	f STACK	7PRSTK	2	7PRSTK
f -x-	PRINT x	7PRTX	2	7PRTX
f P≷S	f P≷S	7P≷·S	2	7P≷·S
h PAUSE	f PAUSE	PSE	2	PSE
f R→	←R	P-R	1	P-R
h R↓	R↓	R↓ or RDN	1	RDN
h R↑	f R↑	R↑	2	R↑
h RAD	f RAD	RAD	2	RAD
f D→	f R→D	R-D	2	R-D
RCL 0	RCL 0	RCL 00	1	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 4	RCL 4	RCL 04	1	RCL 04
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 9	RCL 9	RCL 09	1	RCL 09
RCL A	RCL A	RCL 20	1	RCL 20
RCL B	RCL B	RCL 21	1	RCL 21
RCL C	RCL C	RCL 22	1	RCL 22
RCL D	RCL D	RCL 23	1	RCL 23
RCL E	RCL E	RCL 24	1	RCL 24
h RCL I	RCL I	RCL 25	1	RCL 25
RCL (i)	RCL (i)	RCL ■ 25	1	RCL IND 25
RCL Σ+	RCL Σ+	7RCLΣ	2	7RCLΣ
f RND	f RND	RND	2	RND
R/S	R/S	STOP (R/S)	1	STOP
h RTN	RTN	RTN	1	RTN
g S	f S	ΣREG 14, SDEV	2, 4	ΣREG14, SDEV
f SCI	SCI	7SCI	2	7SCI
h SF 0	f STF 0	SF 00	1	SF 00
h SF 1	f STF 1	SF 01	1	SF 01
h SF 2	f STF 2	SF 02	1	SF 02
h SF 3	f STF 3	SF 22	1	SF 22
Σ+	Σ+	ΣREG 14, Σ+	1, 4	ΣREG14, Σ+
h Σ−	f Σ−	ΣREG 14, Σ−	1, 4	ΣREG14, Σ−
f SIN	f SIN	SIN	1	SIN
g SIN⁻¹	f SIN⁻¹	SIN⁻¹ or ASIN	1	ASIN
h SPACE	f SPACE	ADV	2	ADV
f √x	√x	√x or SQRT	1	SQRT

HP-67 Keystrokes	HP-97 Keystrokes	HP-41C Function	Notes	HP-41C Display
STO ÷ 0	STO ÷ 0	STO ÷ 00 or ST÷ 00	1	ST/ 00
STO ÷ 1	STO ÷ 1	STO ÷ 01 or ST÷ 01	1	ST/ 01
STO ÷ 2	STO ÷ 2	STO ÷ 02 or ST÷ 02	1	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	1	ST/ 06
STO ÷ 7	STO ÷ 7	STO ÷ 07 or ST÷ 07	1	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
STO − 0	STO − 0	STO − 00 or ST− 00	1	ST− 00
STO − 1	STO − 1	STO − 01 or ST− 01	1	ST− 01
STO − 2	STO − 2	STO − 02 or ST− 02	1	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	1	ST− 06
STO − 7	STO − 7	STO − 07 or ST− 07	1	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
STO + 0	STO + 0	STO + 00 or ST+ 00	1	ST+ 00
STO + 1	STO + 1	STO + 01 or ST+ 01	1	ST+ 01
STO + 2	STO + 2	STO + 02 or ST+ 02	1	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	1	ST+ 06
STO + 7	STO + 7	STO + 07 or ST+ 07	1	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
STO × 0	STO × 0	STO × 00 or ST× 00	1	ST* 00
STO × 1	STO × 1	STO × 01 or ST× 01	1	ST* 01
STO × 2	STO × 2	STO × 02 or ST× 02	1	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	1	ST* 06
STO × 7	STO × 7	STO × 07 or ST× 07	1	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
STO ÷ (i)	STO ÷ (i)	STO ÷ ■ 25 or ST÷ ■ 25	1	ST/ IND 25
STO − (i)	STO − (i)	STO − ■ 25 or ST− ■ 25	1	ST− IND 25
STO + (i)	STO + (i)	STO + ■ 25 or ST+ ■ 25	1	ST+ IND 25
STO × (i)	STO × (i)	STO × ■ 25 or ST× ■ 25	1	ST* IND 25
STO 0	STO 0	STO 00	1	STO 00
STO 1	STO 1	STO 01	1	STO 01
STO 2	STO 2	STO 02	1	STO 02
STO 3	STO 3	STO 03	1	STO 03
STO 4	STO 4	STO 04	1	STO 04
STO 5	STO 5	STO 05	1	STO 05
STO 6	STO 6	STO 06	1	STO 06
STO 7	STO 7	STO 07	1	STO 07
STO 8	STO 8	STO 08	1	STO 08
STO 9	STO 9	STO 09	1	STO 09
STO A	STO A	STO 20	1	STO 20
STO B	STO B	STO 21	1	STO 21
STO C	STO C	STO 22	1	STO 22
STO D	STO D	STO 23	1	STO 23
STO E	STO E	STO 24	1	STO 24
h STO I	STO I	STO 25	1	STO 25
STO (i)	STO (i)	STO ■ 25	1	STO IND 25

HP-67 Keystrokes	HP-97 Keystrokes	HP-41C Function	Notes	HP-41C Display
g [TAN⁻¹]	f [TAN⁻¹]	[TAN⁻¹] or [ATAN]	1	*ATAN*
f [TAN]	[TAN]	[TAN]	1	*TAN*
[×]	[×]	[×]	1	***
f [W/DATA]	f [W/DATA]	[WDTA]	2	*WDTA*
f [x≠0]	f [x≠0?]	[X≠0?]	2	*X≠0?*
f [x=0]	f [x=0?]	[X=0?] or [X=0?]	1	*X=0?*
f [x>0]	f [x>0?]	[X>0?]	2	*X>0?*
f [x<0]	f [x<0?]	[X<0?]	2	*X<0?*
g [x≠y]	f [x≠y?]	[X≠Y?]	2	*X≠Y?*
g [x=y]	f [x=y?]	[x=y?] or [X=Y?]	1	*X=Y?*
g [x>y]	f [x>y?]	[X>Y?] or [X>Y?]	1	*X>Y?*
g [x≤y]	f [x≤y?]	[x≤y?] or [X≤Y?]	1	*X<−Y?*
f [Σ]	f [Σ]	[ΣREG] 14, [MEAN]	2, 4	*ΣREG14, MEAN*
g [x²]	[x²]	[x²] or [X↑2]	1	*X↑2*
h [x↕]	f [x↕]	[X<>] 25	2	*X<> 25*
h [x≤y]	[x≤y]	[x≤y] or [X<>Y]	1	*X<>Y*
h [yˣ]	[yˣ]	[yˣ] or [Y↑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 [XEQ] [ALPHA] name [ALPHA] 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 ▇ [ASN] [ALPHA] name [ALPHA] 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 [XEQ] [ALPHA] name [ALPHA] 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 ▇ [ASN] [ALPHA] name [ALPHA] 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.

3. The HP-67/HP-97 labels are translated into two labels on the HP-41C, one numeric label followed by one local ALPHA label.

4. 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_{14}. The second function is the normal translated statistics function.

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.

ABRASIVE CARD FOR CLEANING RECORDING HEAD
CONSULT MANUAL FOR RECOMMENDED USE
— THIS SIDE UP —

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.

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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

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.

Service

Repair Policy

Hewlett-Packard calculators and accessories are normally repaired and reshipped within five (5) working days of receipt at any repair center. This is an average time and could possibly vary depending upon the time of year and work load at the repair center.

Shipping Instructions

Should your HP 82014A Card Reader require service, the unit should be returned with the following items:

1. A completed Service Card, including a description of the problem.
2. A sales slip or other proof of purchase (if the one-year warranty has not expired).

The card reader, Service Card, and (if required) the proof of purchase should be packaged in its original shipping case or other *adequate 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 repair center. The packaged card reader should be shipped to the address shown on the Service Card.

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

After warranty repairs are completed, the repair center returns the unit with postage prepaid. On out-of-warranty repairs, the unit is returned C.O.D. (covering shipping costs and the service charge).

Limited One-Year Warranty

What We Will Do

The HP 82104A and its accessories are warranted by Hewlett-Packard against defects in materials and workmanship for one year from the date of original purchase. If you sell your HP 82104A or give it as a gift, the warranty is automatically 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 that you return the product, shipped prepaid, to a Hewlett-Packard repair center.

How to Obtain Repair Service

Hewlett-Packard maintains repair centers in most major countries throughout the world. You may have your calculator repaired at a Hewlett-Packard repair 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. Please refer to Shipping Instructions.

The Hewlett-Packard United States Repair Center for handheld and portable printing calculators is located in Corvallis, Oregon. The mailing address is:

HEWLETT-PACKARD COMPANY
CORVALLIS DIVISION SERVICE DEPT.
P.O. BOX 999
CORVALLIS, OREGON 97330

Note: Not all Hewlett-Packard repair centers offer service for all models of HP calculators and accessories. However, if you bought your calculator or accessory from an authorized Hewlett-Packard dealer, you can be sure that service is available in the country where you bought your calculator.

If you happen to be outside of the country where you bought your card reader, you can contact the local Hewlett-Packard repair center to see if service is available for your model. If service is unavailable, please ship your card reader to the following address:

HEWLETT-PACKARD COMPANY
1000 N.E. CIRCLE BOULEVARD
CORVALLIS, OREGON 97330
U.S.A.

All shipping and reimportation arrangements are your responsibility.

What Is Not Covered

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

No other express warranty is given. The repair or replacement of a product is your exclusive remedy. **ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS IS LIMITED TO THE ONE-YEAR DURATION OF THIS WRITTEN WARRANTY.** Some states 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 CONSE-QUENTIAL DAMAGES.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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 Toll-Free Number

If you have any questions concerning this warranty please call 800/648-4711. (In Nevada call 800/992-5710.)

Programming and Applications

Should you need technical assistance concerning programming, calculator applications, etc., call Hewlett-Packard Customer Support at 503/757-2000. This is not a toll-free number, and we regret that we cannot accept collect calls. As an alternative, you may write to:

HEWLETT-PACKARD
CORVALLIS DIVISION CUSTOMER SUPPORT
1000 N.E. CIRCLE BOULEVARD
CORVALLIS, OR 97330

A great number of our users submit program applications or unique program key sequences to share with other Hewlett-Packard owners. Hewlett-Packard will only consider using ideas given freely to us. Since it is the policy of Hewlett-Packard not to accept suggestions given in confidence, please include the following statement with your submittal:

"I am voluntarily submitting this information to Hewlett-Packard Company. The information is not confidential and Hewlett-Packard may do whatever it wishes with the information without obligation to me or anyone else."

Further Information

Service contracts are not available. Circuitry and design 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 sales office or repair center.

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 recognizable 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 [RDTA], [RSUB] or [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 program contained in an application module.
	An attempt was made to merge a card program to a program other than the last program in memory.

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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 memory 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. **kk** is the next track to be written or read and **nn** is the total number of tracks required. The **kk** 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 COPY. Refer to the *HP-41C Owner's Handbook and Programming Guide*.

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 VER, the verified track was found to be good. The **t** is one of the following:

P	Program Card
D	Data Card
S	Status Card

A	"Write-All" Card
7P	HP-67/HP-97 Program Card
7D	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.)

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 [XEO] 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:

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 [SST] twice. You will see *0*. Now press [STO] 03.

4. Switch out of PRGM mode and press ■ [GTO] 17.

5. Switch to PRGM mode and press ■ [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 ■ [GTO] 00.

7. Switch to PRGM mode and press [SST] 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   ■ [CF] 00
                          ■ [e]

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] [P⇄S] 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 ■ [GTO] 19.

3. Switch to PRGM mode. You should see *LBL 19*.

4. Press ■ [BST].

5. Press [—] until you see the line with *X<>Y*.

6. Press the following keys in order.

    1. ■ [x≤y?]   5. ■ [LBL] 06
    2. ■ [GTO] 06   6. [RCL] 07
    3. [EEX] 1   7. ■ [RTN]
    4. [STO][×] 07

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

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 ■ [GTO][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 [RCL][E] to [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 [P≷S] to [XEQ][ALPHA] 7P<>S [ALPHA].

Page 10-02:

In the instructions, change [P≷S] to [XEQ][ALPHA] 7P<>S [ALPHA].

Page 11-01:

In the instructions, change [P≷S] to [XEQ][ALPHA] 7P<>S [ALPHA].

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 ■ [GTO] 13.

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 [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.

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 [XEQ][ALPHA] MRG [ALPHA] and read in your translated function card.

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	-90	-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 ■ [CF] 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 [→H.MS] to [XEO] [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 [XEO] [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 [CL REG].
7DSP0 through 7DSP9	Display 0 through 9 decimal digits. Same as HP-67/HP-97 [DSP] 0 through 9.
7DSP1	Display indirect using R_{25} for indirect control. Same as [DSP][i] on HP-67/HP-97.
7DSZ	Decrement and skip on zero. Same as [DSZ] on HP-67 and [DSZ] [I] on the HP-97.
7DSZI	Decrement and skip on zero indirect using R_{25} for indirect control. Same as [DSZ][i] on the HP-97 and DSZ(i) on the HP-67.
7ENG	Engineering notation. Does not change the number of displayed digits. Same as [ENG] on the HP-67/HP-97.
7FIX	Fixed notation. Does not change the number of displayed digits. Same as [FIX] on the HP-67/HP-97.
7GSBI	Go to subroutine indirect using R_{25} for indirect control. Same as [GSB][i] 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][i] on the HP-67/HP-97. Negative values result in *NONEXISTENT* display.
7ISZ	Increment and skip on zero. Same as [ISZ] on the HP-67 and [ISZ] [I] on the HP-97.
7ISZI	Increment and skip on zero indirect using R_{25} for indirect control. Same as [ISZ (i)] on the HP-67 and [ISZ] [i] on the HP-97.

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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 [P≵S] 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.
7RCLΣ	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).