

Chapter 7

Storing objects

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Introduction

You store an object by giving it a name and saving it. An object saved in this way is called a *variable*. Any object you create—numbers, equations, programs, graphics, and so on—can be stored in a variable.

You can create directories and subdirectories to store your variables, or you can store variables in the default directory (called *HOME*).

There are four areas within the HP 49G for storing variables: the HOME directory (and the subdirectories it contains), port 0, port 1, and port 2. By moving objects you want to keep to port memory, you make more user memory available for everyday operations.

Variables

Variables enable you to store and retrieve objects. You do this by giving an object a name. For example, if you regularly use a particular number in calculations—say, 9.81 m/s^2 , the acceleration of gravity—you can create a variable that associates this number with a name.

Variable names can be up to 127 characters long and can contain letters, digits, and most other characters. You could, for example, call 9.81 m/s^2 *G*, *G1*, or *GRAV*. Then when you need to use 9.81 m/s^2 in a calculation, you can enter the variable name, or select it from a menu.

Some characters cannot be included in a variable name. These are:

- characters that separate objects: space, period, comma, @
- object delimiters: # [] “ ‘ { } () : _ «»
- mathematical symbols; for example, + - * / ^ + < > ! $\sqrt{\quad}$ = \leq \geq \neq ∂ \int .

Also, you cannot use a command name or a menu name as the name of a variable.

You can store any type of object in a variable: numbers, character strings, equations, programs, graphics, and so on.

Creating a variable

1. Enter the data that you want to associate with a variable.
2. Press **(STO▶)** to select the STORE command.
3. Enter a name for the variable. (See chapter 2, “Basic operation”, for information on how to enter alphabetic characters.)
4. Press **(ENTER)** to create the variable.

For example, to create a variable named *GRAV* to store the value 9.81, enter the following on the command line:

9.81**(STO▶)** **(ALPHA)** **(ALPHA)** *GRAV* **(ENTER)**

See “Creating a directory” on page 7-6 for details of another method of creating variables.

Listing variables

There are two ways to see the variables you have created:

- press **(VAR)**
- press **(F5) FILES**. This opens the file management tool called *File Manager* and displays the directory tree. The directory tree is an expandable list of ports and directories on your HP 49G.

Using **(VAR)**

When you press **(VAR)**, the names of the variables appear on the function-key menu. If you have created more than 6 variables, press **(NXT)** to display the next set of 6 variables.

Note that only the first 5 characters of a variable's name appear on the **(VAR)** menu. To see the full name of a variable, press the function key—**(F1)** to **(F6)**—that corresponds to the variable. The full name of the variable is displayed on the command line. To see what data is stored in that variable, press **(ENTER)**.

The variables listed by pressing **(VAR)** are the variables stored in the current directory. To see the variables stored in another directory, you must first select that directory. (See “Directories” on page 7-5 for more information.)

Using File Manager

When you open File Manager, only the ports and the HOME directory are listed. To see the variables in a directory, you need to select that directory. This is explained on page 7-8.

When you select a directory, all objects in that directory—variables and sub-directories—are listed. (You also see the type of each object and its size.) To see the variables and other objects in a sub-directory, select the sub-directory.



Using a variable in a calculation

You can use a variable's contents in a calculation. To continue the example on page 7-2, suppose you have stored the acceleration of gravity in a variable named GRAV and that this variable happens to be represented by F3 . To multiply the acceleration of gravity by 7, you would press:

VAR F3 \times 7 ENTER

VAR F3 places the variable's name on the command line. Pressing ENTER causes the variable, and then the entire expression, to be evaluated.

Note that if the variable you want to use is not available when you press VAR , you must first select the directory in which the variable is stored. (See "Selecting a directory or variable" on page 7-7.)

User-defined functions

User-defined functions are a special type of variable. Like variables, you give a user-defined function a name, and store it for later use.

User-defined functions operate in the same way as normal functions: that is, you enter the function name, specify the argument or arguments in parentheses, and then press ENTER or FNUM to evaluate the function. The difference is that you create the function yourself, and give it a name of your choosing.

Creating a user-defined function

The following example illustrates how to create a user-defined function to evaluate $3 \cos(x^2)$ and store it with the name "F2(x)":

1. Press DEF to place the DEFINE command on the command line.
2. With the cursor between the command's parentheses, define the function.

ALPHA F2 DEF $($ x $)$ $=$ 3 COS $($ x^2 $)$

Note that the name you want to give your function must appear to the left of the equals sign. You specify the function to the right of the equals sign.

3. Press ENTER to define the function and store it in the current directory. In this example, it is stored as "F2".

Evaluating a user-defined function

To evaluate a user-defined function:

1. Go to the directory where you stored the function, and press **(VAR)**.
The variables in the directory are displayed on the function-key menu.
2. Press the function key that corresponds to the variable.
The function name is displayed on the command line.
3. With the cursor after the function name, press **(⏏)(⏏)** to insert parentheses.
4. Enter the argument or arguments between the parentheses.
If the function takes more than one argument, separate each argument with a comma.
5. To evaluate the function:
 - press **(ENTER)** to obtain an exact answer, or
 - press **(⏏)(+NUM)** to obtain an approximate answer.

Directories

You can create directories on the HP 49G just as you create directories on a computer. A directory is simply a named area of memory in which you can store variables (and other directories).

For example, you might create a number of variables relating to mechanical engineering calculations. You would probably find these variables more easily if they were stored together. Therefore, you could create a directory and store just your mechanical engineering variables in that directory. Then, when you need one of these variables, you go to that directory and select the variable.

When you turn on the HP 49G for the very first time, you will find just one directory. This is called *HOME*. Unless you specify otherwise, all the variables you create will be stored in *HOME*. If you intend to create numerous variables, you may find it easier if you create a directory for each set of similar variables you create: one directory for your mechanical engineering variables, another for chemistry variables, and so on.

Creating a directory

1. Press **(F) FILES**.

This opens the file management tool called *File Manager* and displays the directory tree.

2. Select the directory that is to be the parent of your new directory. (See “Selecting a directory or variable” on page 7-7.)

Note that any directory you create must be a child of another directory (that is, contained within some other directory). The very first directory you create will be a child of HOME.

3. Press OK.

The screen now lists the variables and subdirectories in the directory selected at step 2. The File Manager function-key menu is also displayed.

4. Press **(N) NXT** NEW.

The New Variable input form is displayed.



```
NEW VARIABLE
Object: 
Name:
_ Directory
Enter New Object
EDIT CHOOS  CANCEL  OK
```

5. Press **(V) V** to select the Name field.

The Object field must be left blank when you are creating a new directory.

6. In the Name field, enter a name for the new directory.

The naming conventions and restrictions that apply to directory names are the same as those that apply to variable names. See page 7-2 for more information.

The cursor jumps to the Directory field after you enter the name.

7. Press **CHK** to indicate that you are creating a directory.

8. Press **OK** or **(E) ENTER**.

The list of variables and subdirectories displayed at step 3 above now includes the directory you just created.

9. To return to the default display, press **(C) CANCEL**.



You can also create a variable using the above procedure. With the cursor in the Object field, you either enter an object's contents, or press **CHOOS** to select an existing object for editing (the contents appear in the Object field). You specify a name for the variable in the Name field, and leave the Directory field unchecked.

Selecting a directory or variable

Your current directory—also known as your path—is shown at the start of the second line of the status area. To work with another directory, you need to select that directory. You must do this, for example, if you want to use a variable stored in that directory.



The methods described below for selecting a directory are the same methods you use to select a variable within a directory.

Method 1

Use this method if the directory you want to select is below—but not too far below—the current directory in the directory tree.

1. Press **(VAR)**.

A menu of the variables and subdirectories in the current directory is displayed. Subdirectories can be distinguished from variables by a small bar across the top left-hand corner of the menu item. The example at the right shows that the HOME directory contains a subdirectory called ENGIN and a number of variables: REALA, MODUL, OHM, and so on.



Whenever you press **(VAR)**, the variables and subdirectories displayed are just those contained in the directory whose name is shown in the status area. Also, whenever you create a new variable or subdirectory, that variable or subdirectory is placed in the directory whose name is shown in the status area.

2. Select a directory by pressing the corresponding function key and then pressing **(ENTER)**.

In the above example, you press **(F4)** and **(ENTER)** to select the ENGIN subdirectory.

If there are more than 6 variables and subdirectories in your current directory, you may need to press **(NXT)** before the name of the subdirectory you want to select appears on the screen.

The variables and directories now shown on the menu are those contained in the subdirectory you chose. If the subdirectory you want to finally work with is further down the directory tree, you will need to repeat step 2 until its name is displayed on the menu.

Method 2

Use this method when the directory you want to select is on a different branch of the directory tree or is many levels above or below your current directory.

1. Press **⏪** **FILES**

The directory tree is displayed showing, for each directory, its parent directory and its subdirectories (if any). Your current directory is highlighted.

2. Press **▲** or **▼** until the directory you want to select is highlighted.
3. Press **▶**.
4. Press **NXT** **NXT** **F1** HALT.

The default display returns and your new path is the directory you chose from the directory tree.

Method 3

If the directory you want to select is above, and on the same branch as, your current directory, you can press **⏪** **UPDIR** **ENTER** until the directory you want becomes the current directory.

Managing variables and directories

The HP 49G provides many tools to help you manage your variables and directories. For example, you can delete, copy, move, and rename variables and directories. You can also edit a variable's data.

Deleting a variable or directory

The variables in a directory are deleted when you delete the directory. However, you cannot delete a directory if it contains another directory.

1. Use File Manager (**⏪** **FILES**) to select the parent directory of the variable or directory you want to delete. (See “Selecting a directory or variable” on page 7-7.) A list of all the objects in that directory is displayed.
2. Highlight the name of the variable or directory you want to delete.
3. Press **NXT** **F1** to select PURGE.

A message is displayed asking you to confirm that you want to delete the variable or directory you selected.

4. Press **F1** to delete the variable or directory.
5. Press **CANCEL** to return to the default display.

Copying or moving a variable or directory

1. Use File Manager ($\left(\square\right)$ FILES) to select the parent directory of the variable or directory you want to copy or move. (See “Selecting a directory or variable” on page 7-7.) A list of all the objects in that directory is displayed.
2. Highlight the name of the variable or directory you want to copy or move.
3. To copy your selection, press COPY, to move your selection, press MOVE. The directory tree is redisplayed.
4. Press $\left(\blacktriangle\right)$ or $\left(\blacktriangledown\right)$ until the *destination* directory is highlighted. The destination directory is the directory where you want the variable or directory copied or moved to.
5. Press OK.

A warning is displayed if the variable or directory you are copying or moving already exists in the destination directory. In this case, either:

- overwrite the existing variable or directory (by pressing YES or ALL)
- cancel the operation (by pressing ABORT or NO), or
- rename the variable or directory you are copying or moving (by pressing REN).

To check the new directory tree, press TREE.

6. Press $\left(\square\right)$ CANCEL to return to the default display.

Renaming a variable or directory

1. Use File Manager ($\left(\square\right)$ FILES) to select the parent directory of the variable or directory you want to rename. (See “Selecting a directory or variable” on page 7-7.) A list of all the objects in that directory is displayed.
2. Highlight the name of the variable or directory you want to rename.
3. Press $\left(\square\right)$ NEXT RENAME. The present name of the variable or directory is displayed on the command line. Note that the alpha keyboard has become active and you do not need to press $\left(\square\right)$ ALPHA before changing the name.
4. Change the name of the variable or directory. (See chapter 2 for instructions on how to edit the contents of the command line.)
5. Press $\left(\square\right)$ ENTER. The contents of the parent directory are redisplayed, showing the new name of the variable or directory.
6. Press $\left(\square\right)$ CANCEL to return to the default display.

Editing a variable

Edit a variable when you want to change its contents.

1. Use File Manager ( FILES) to select the directory that contains the variable you want to edit. (See “Selecting a directory or variable” on page 7-7.) A list of all the objects in that directory is displayed.
2. Highlight the name of the variable or directory you want to edit.
3. Press   EDITB.

The contents of the variable are now available.

The EDITB command enables you to edit the contents using an editor that is appropriate to the type of object stored in the variable. For example, if the variable is storing a matrix, EDITB displays the matrix in Matrix Writer. If it is storing an equation, it displays the equation in Equation Writer, and so on).

4. Change the contents of the variable.
5. Press .
6. Press  to return to the default display.

Memory Management

The HP 49G has 512 Kb of RAM and 2 Mb of Flash ROM.

RAM is segmented into system memory, user memory, port 0 and port 1.

System memory stores system variables. You do not have access to system memory.

User memory contains the HOME directory (and its subdirectories), history, working memory (that is, memory available for use by calculations and executing programs) and a number of temporary variables created either by the system or by executing programs.

Port 0 is available for storing libraries and for backed-up objects, and port 1 can be used to store objects.

Flash ROM is segmented into system memory—which is an extension of RAM system memory—and port 2. Like port 1, port 2 can be used to store objects you create or download.

Objects stored in port memory can be called or executed, but they cannot be viewed or edited unless copied to main memory.

In total, the HP 49G offers over 1 Mb of port memory.

Using port memory

Objects that you want to keep should be moved from user memory to port memory. This not only makes more user memory available for everyday operations, but it puts objects you want to keep into a safer storage environment. (Ports 0 and 1 are safer than user memory, and port 2 is safer than ports 0 and 1.)

Moving objects to port memory

You move objects to port memory in the same way that you move objects from HOME directory to subdirectories of HOME (or between subdirectories). To view or edit an object in port memory, you must first copy or move it to user memory.

To move an object to a port:

1. Use File Manager to select the object you want to move. (Follow the steps in “Selecting a directory or variable” on page 7-7.)

2. Press MOVE.

The directory tree is redisplayed.

3. Press **▲** or **▼** until the destination port is highlighted.

The destination port is the port where you want to store the object.

4. Press OK.

A warning is displayed if an object of the same name already exists in the destination port. In this case, either:

- overwrite the existing object (by pressing YES or ALL)
- cancel the operation (by pressing ABORT or NO), or
- rename the object you are moving (by pressing REN).

5. Press **CANCEL** to return to the default display.

