

67C Classic Calculator Simulator

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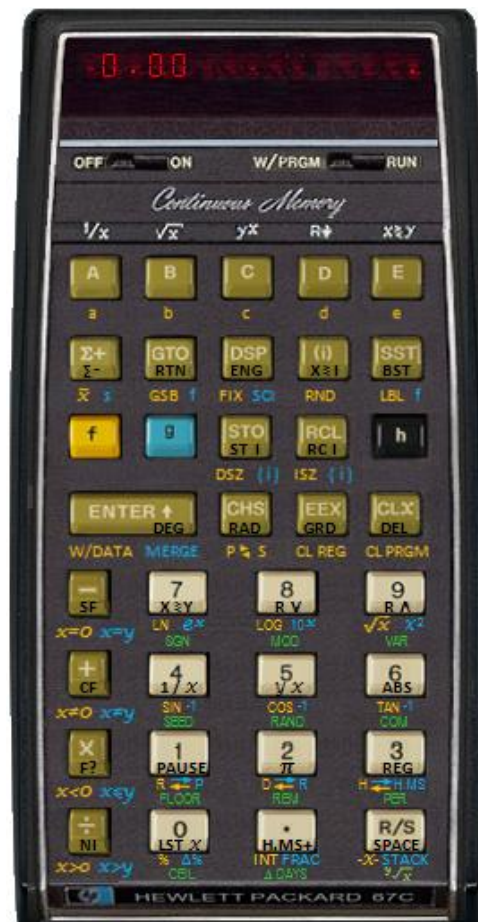
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Best viewed in 1920 x 1080 screen resolution. (Minimum is 1280 x 720)

Disclaimer

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This calculator simulation is for an imaginary calculator based on the HP-67.

Some features are:

- Most operating code is still based on original HP code

- 999 program steps

- 100 memory locations

- 5 level subroutine stack

- Keyboard map or alphanumeric program display

- Code editor

- Module Editor

- Up to 12 HP-67 programs can be assigned to keys 0 – 9, . and R/S

- Animated card reader with Park function

- RAM memory viewer

- Constant Memory

Limitations

Key entries during a pause are not supported.

Options Menu

Show program as text	Displays program codes as 7 segment alphanumerics
Full Reset	Resets calculator as if all power was removed
Initialise program memory	Clears the program memory and also resets the default key functions for A – E.
Recharge batteries	Charges the <i>batteries</i> for a further 3 hours.
Calculator key legend	Shows the PC keyboard keys corresponding to each key.
Sound	Turn the sound effects on or off
OFF removes card	When selected, and the power switch is turned off, the card will be removed from the top window slot.

Program Notes

It may be handy to have the calculator display a note when a certain event happens during program execution. This function allows that to happen and up to 100 messages can be stored for use. The Notes Editor can be opened from the menu item `Edit Program Notes`.

Notes can have up to 11 characters displayed and only the listed characters can be used.

Enter a note by typing any of the allowed characters into the list. When completed, press OK. You will be notified if any errors occur.

To enable any of these notes while a program is running you need to include either a RSNT or a PSNT instruction in your program or directly from the keyboard.

The RSNT instruction displays the message and stops the program running.

The PSNT instruction displays the message and pauses for a second and then continues.

Prior to using these instructions load the I register with a value from 0 – 99 which corresponds to the message number. Notes are not displayed for values > 99.

Example:

You wish note number 29 to be displayed either from the keyboard or from within a program.

```
Keys [2] [9] [h] [ST I]
```

```
[h] [A]
```

The I register can be incremented with the [ISZ] key. This can help with concatenating notes to form a message.

Subroutine Stack

The subroutine stack has 5 levels. If more subroutines are called than the stack can handle then an error will be displayed on the calculator screen. If the stack pointer overflows, an error will be generated and a running program will stop.

The stack is cleared:

- when a program is started by the [A]..[E] keys
- when switching to PRGM mode
- when a non merged program is loaded.

Special Key Codes

All of the original HP-67 key functions are available, and there are some extra ones added and some altered because of the change in register and program size..

h Reg	Opens a window to see and edit registers
h A	Display note and halt program
h B	Display note and pause
g Stack	Clear Stack registers
h f Sig+	Clear Sigma registers
h f CLx	Clear Module registers 0-9
f P<>S	Swap registers 90-99 with Module registers 0-9
h f 0-9, ., R/S	Run Module program
h g 0-9, ., R/S	Briefly display Module name

Low Battery

The low battery indicator will light when there is 5 minutes of battery remaining.

The low battery indicator will start to flash when there is less than 1 minute remaining.

When the battery is discharged, the calculator will lose power and turn off.

You can use the “Recharge Battery” menu item to give the battery another 3 hour operating life span.

Card Read/Merge During Program Pause

These functions are supported and work the same as for the original HP-67 except that larger card storage is enabled for the 999 steps. The function is enabled by clicking on the Card -> Park menu item when a program is running.

The card can be removed by clicking the Card -> Remove menu item.

Card Program Editor

While programs can be entered in the normal way, the Card Editor allows easier code creation for large programs. Programs are entered in text format and can be saved as text files, or as formatted card files which can be loaded into the calculator via the card reader. Programs can also be transferred between the editor and the calculator.

The panel to the left is a code status indicator and will show any errors in the listing as well as the current Program Counter value and other data. Program entries can have comments on them if they are followed by `'/'` characters.

The right of the screen has a list of available program key combinations. These can be placed in the editor by double clicking on them. Some of these are combined to save space, as for example, items like GTO can have up to 999 entries, so they are listed as STO 00..99. These are not valid codes, but can be edited on screen to STO 69.

The panel at right, also has a RAM name editor so that RAM registers can be assigned a text name like [Counter_1]. These can be used in the program listing with instruction that access the RAM registers instead of writing the address number.

Example: Storing a value using a digit. STO 00
 Storing a value named "Count". STO Count

Other RAM access codes can also be used with this labelling such as STO Count, RCL Count etc. These labels are limited to 20 characters.

Numbers can be entered as a single digit per line or as a number string.

Example:
Single One Line
 1 123.5 eex 5 chs
 2
 3
 .
 5
 EEX
 5
 CHS

When saving the files, either as text or as a card, the program file will have the Flags, Display Mode and Radix included in the file.

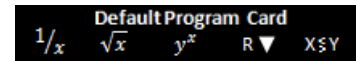
When transferring a successfully compiled program to the calculator, you can also send this information if the [Flags] item is checked.

When saving card file, you will be prompted asking if you want to include an image file for the card. This image file must be located in the same directory as the card file or it will not be found when loading the card into the calculator.

Program cards can be made up using any graphics editor and must be saved in 24 bit BMP format. These graphic files can be displayed on the calculator face after loading a program or data file.

The images should be sized at 215 pixels wide by 35 pixels high. If the images are any larger they will be cropped before displaying. White text on a black background works well.

Example: `TestCard67C.bmp` from the install directory



There is also a `Template67C.bmp` which can be used as a template for new designs. There are small dots along the bottom of the image which correspond with the centre of the A – E keys.

Modules

Modules are a collection of 12 programs that can be attached to the numbered keys 0 – 9 and the decimal point and the R/S button.

The number keys associate with the programs 0 – 9, while the decimal point is associated with program 10 and the R/S key, program 12.

These programs are written in standard HP-67 code and can be executed from the keyboard or from within a running program.

Module Editor

The Module Editor allows you to create Modules and the associated programs.

It is accessed by right clicking the calculator and selecting [Module] [Editor]

The editor is similar in operation to the Card Editor. The main screen is for adding code in text format. To the right is a listing of HP-67 codes which can be entered onto the editor notepad by double clicking an item

The drop down list at the top of the screen selects one of the 12 different program names included in a module.

The [A] button next to this item allows you to attach a name to each program. As these names can be displayed on the HP-67's 7 segment display, not all alphanumeric characters can be displayed. Those that can be displayed are listed in the Program Name window.

The buttons on the top left of the screen are for:

- Initializing a new module
- Loading a module
- Saving a module
- Loading a HP-67 card program (CCE33 Emulator format)
- Testing the code listing for errors

These programs are meant to be created to perform simple or complex functions and as such there are some HP-67 program codes that cannot be used in the module programs.

These are:

- h PAUSE
- f -x-
- g STK
- f WDATA
- g MERGE
- h REG
- PSNT
- RSNT

Multiple `f LBL A` instructions can appear anywhere in the program space, but module programs start running from the first found `f LBL A`.

The following is an example program from the `Module_1` file that is supplied with the software. Program #11 – [Root]

This small program calculates the Y root of X.

```
f LBL A
h X<->Y
h 1/x
h YtoX
```

To use it from the keyboard, first load the module – (Located in install directory).

```
Right Click Calculator
Select [Module] [Load]
Select Module_1.xmd
```

Once a Module is loaded, the decimal point in the Exponent Unit digit will light.

Key in the following:

```
3
ENTER
9
h f R/S           // h f R/S is access for Program #11
```

The display should show 2.08

Eg – 2.08 Power 3 = 9

To access Program #0, key in – `h f 0` (Ceiling Function)

To view the name of program #11, key in:

```
h f R/S
```

The display should show `root`

Stack and Sigma Transfers

The Module uses its own HP-67 operating core and memory when executing programs.

When a program is to be executed, the normal stack (X, Y, Z and T) registers are transferred to the module execution stack. After the program has executed you can set select which of the Module stack registers you want transferred back to the normal stack. For example, if you want register C and register D transferred back after the program finished execution, the select [C D] from the Stack Transfers drop down list.

The corresponding registers of the normal stack will be overwritten with these registers.

You may need to make the Sigma registers available in your module programs. You can use the Sigma Transfers drop down list to select these options.

None	Nothing transferred
Sig->Mod	Sigma transferred prior to execution
Mod->Sig	Sigma transferred back after execution
Sig->Mod->Sig	Sigma transferred prior and after execution

An example of using this feature is the Variance program which is included in the supplied **Module_1.xmd** module.

Module Face Image

To make it easier to see the module functions, keys can be assigned names and or symbols. It is not easily accomplished to assign labels to the keys due to the text sizes and possible symbols. Therefore a blank keyboard bitmap image is available in the install directory called `Blank_Keys.bmp`.

The idea is to create the required text and symbols and then paste them underneath the assigned button. To make text and symbol design a bit easier, there is a Word document called `Keys Text.docx` available in the install directory. This has a panel with the HP-67 keyboard colour and text set to a size that fits easily under the keys. Symbols from the Word library can also be added. You can zoom in on the Word page to make text editing easier. Once the text is ready, the screen is captured using the computer `Print Screen` function and the resulting image in the PC clip board is pasted into `Paint` or other image editing application. The text can then be selected and copied to the `Blank_Keys` bitmap under the appropriate button.



Once the buttons have the required text under them, the Blank Keys image should be saved with the same file name as the module it will represent.

For example, you created a module of programs called `Math_Module.xmd`. The associated keyboard overlay image should be saved as `Math_Module.bmp` in the same directory as the module.

When a module is loaded, the software checks to see if there a name matching bitmap image available and if so, it will load it and attach it to the calculator face.

Note that if you alter the buttons on the image, it will not display and operate correctly on the calculator.

When a module is changed and saved before exiting the editor screen, if it is also loaded into the calculator the menu item `Module -> Reload` will update the changes.

Module_1.xmd included in the zip file has the following programs:

0	CEIL	Ceiling	5.6 = 6
1	FLOOR	Floor	5.6 = 5
2	REM	Remainder	8 ENT 3 = 2
3	PER	Permutation	Eg 3 out of 10 10 ENTER 3 = 720
4	COM	Combination	Eg 3 out of 10 10 ENTER 3 = 120
5	SEED	Random Seed	(Integer in X) Seed
6	RAND	Random Number	Random (0 <= X <= Seed)
7	SGN	Sign	-55 = -1, +22 = +1
8	MOD	Modulus	66 ENT 5 = 1
9	VAR	Variance*	
10	Δ Days	Delta Days	MM.DDYYYY 12.011972 12.311972 = 30
11	Root	Y Root of X	3 ENT 70 = 4.12

* The Variance routine can be demonstrated by using the example shown in the HP-27 owner's manual starting on page 80.

You need to enter all the Sigma data into the calculator as normal. You can clear the Sigma registers by pressing [h] [f] [Sig+].

Then press [h] [f] [9] to start the VAR function. You should get the same results as shown in the HP-27 example.