

Programming Basis

A program in the HP-12C calculator is simply a sequence of keystrokes that is stored in the calculator. Whenever you have to calculate with the same sequence of keystrokes several times, you can save a great deal of time by incorporating these keystrokes into a program. Then pressing only one key starts the keystroke sequence and the calculator does the rest automatically.

Creating a Program:

- 1) Press **[f] [P/R]** to set the calculator to **program** mode. In this mode, functions are not executed when they are keyed in, but instead are stored inside the program memory. The display will show the **PRGM** indicator, and the program line number (from 000 to 999) with the key codes of keystrokes.
- 2) Press **[f] clear [PRGM]** to erase any previous programs that may be stored inside the calculator. If you want to create a new program without erasing a program already stored, skip this step.
- 3) Key in the sequence of keystrokes that constitute the program.
- 4) When the keystroke sequence is finished, press **[f] [P/R]** to set the calculator back to **run** mode. The display will be normal showing the stack-X registers and the **PRGM** indicator will vanish.

Running a Program:

Once a program is created, key in any data that the program uses and start the program by pressing the **[R/S]** key.

When a program is running, touching any key will stop execution after the current line.

Programming Special Keys

The calculator has several special keys that only have meaning when you are dealing with programs. Some of them are programmable and others are not. The nonprogrammable keys are for reviewing or debugging the program. The programmable keys are for controlling the program execution, such as displaying intermediate results, performing a conditional jump or continuing the execution at a specific program line.

Nonprogrammable Commands:

Command	Description
[f] [P/R]	In Program Mode: Sets the calculator to run mode and resets the program line to 0. In Run Mode: Sets the calculator to program mode and displays the current program line.
[f] clear [PRGM]	In Program Mode: Clears the program memory. In Run Mode: Sets program line to the beginning of the program memory, program line "001".
[SST]	In Program Mode: Advances the calculator to the next program line in the program memory. In Run Mode: Shows the current program line, executes it and advances the calculator to the next program line.
[g] [BST]	In both modes, sets the calculator to the previous line in program memory.
[g] [GTO] [·]	In both modes, followed by three digits "###", sets the current program line to the designated "###" line in program memory.

Programmable Commands:

Command	Description
[R/S]	<p>In Program Mode: Enters the Run-Stop command.</p> <p>In Run Mode: Starts the program execution from the current program line in program memory.</p> <p>In a Program Execution: Stops program execution and shows the normal display (stack-X).</p>
[g] [PSE]	<p>In Program Mode: Enters the Pause command.</p> <p>In Run Mode: Does nothing.</p> <p>In a Program Execution: Stops program for about 2 seconds showing the normal display (stack-X), and then resumes the program execution.</p>
[g] [GTO]	<p>In Program Mode: Followed by three digits “###”, enters the Go to line “###” command.</p> <p>In Run Mode: Followed by three digits “###”, sets the current program line to the designated “###” line in program memory.</p> <p>In a Program Execution: Jumps the program execution to the designated program line.</p>
<p>[g] [X≤Y] (stack-X ≤ stack-Y?)</p> <p>[g] [X=0] (stack-X = 0?)</p>	<p>In Program Mode: Enters the comparison command.</p> <p>In Run Mode: Does nothing.</p> <p>In a Program Execution: If condition is False the program execution skips the next line. If True, the next line is executed.</p>
<p>NOTE: A running program automatically stops if an instruction [g] [GTO] 000 or [R/S] is executed. It also stops if an error condition arises from an improper operation or if any key is touched during the execution or if the next line to execute is empty.</p>	

Example: Variable Tax Rate Program

The following program calculates income tax and the net value applying different tax rates depending on the value entered. If the value is less than or equal to a test value, the tax rate stored in R₁ is used, otherwise the tax rate stored in R₂ is used. The test value is stored in R₀.

Enter the program in the calculator following the next sequence:

Keystrokes	Display	Description
[f] [P/R]		Sets the calculator to program mode
[f] clear [PRGM]	000, 42 16	Clear the program memory and enters the RPN code in line 000.
[RCL] 0	001, 45 0	Recall the test amount for comparison.
[X \leftrightarrow Y]	002, 34	Swap stack-X and stack-Y
[g] [X \leq Y]	003, 43 34	Compare the entered value with the test value.
[g] [GTO] 007	004, 43, 33, 007	Execution continues at line 007 if the entered value is less than or equal to the test value.
[RCL] 2	005, 45 2	Recall the tax rate for amounts greater than the test value.
[g] [GTO] 008	006, 43, 33, 008	Jump to line 008 to calculate the tax amount
[RCL] 1	007, 45 1	Recall the tax rate for amounts less than or equal to the test value
[%]	008, 25	Calculate the tax amount applying the proper tax rate to the entered value.
[g] [PSE]	009, 43 31	Pause execution to display the tax amount
[-]	010, 30	Subtract tax amount from the entered amount and program stops showing the net amount.
[f] [P/R]	0	Sets the calculator in "Run" mode

If the test value is \$20,000; the tax rate for values less than or equal to test value is 20%, and for greater values is 25%. What is the tax amount and the net amount for \$15,000; \$20,000 and \$25,000 incomes?

Keystrokes	Display	Description
Type "20000" [STO] 0	20,000	Type the test value and store it in R ₀ .
Type "20" [STO] 1	20	Type the tax rate for values ≤ test value and store it in R ₁ .
Type "25" [STO] 2	25	Type the tax rate for values > test value and store it in R ₂ .
Type "15000" [R/S]	"running" 3,000.00 "running" 12,000.00	Type the Income value and run the program. The program pauses to display the tax amount, then continues and ends showing the net amount.
Type "20000" [R/S]	"running" 4,000.00 "running" 16,000.00	Type the Income value and run the program. The program pauses to display the tax amount, then continues and ends showing the net amount.
Type "25000" [R/S]	"running" 6,250.00 "running" 18,750.00	Type the Income value and run the program. The program pauses to display the tax amount, then continues and ends showing the net amount.

NOTE: For a complete explanation, details and program examples, please download the HP-12C Owner's Manual from the Hewlett-Packard website at "www.hp.com"