



hp calculators

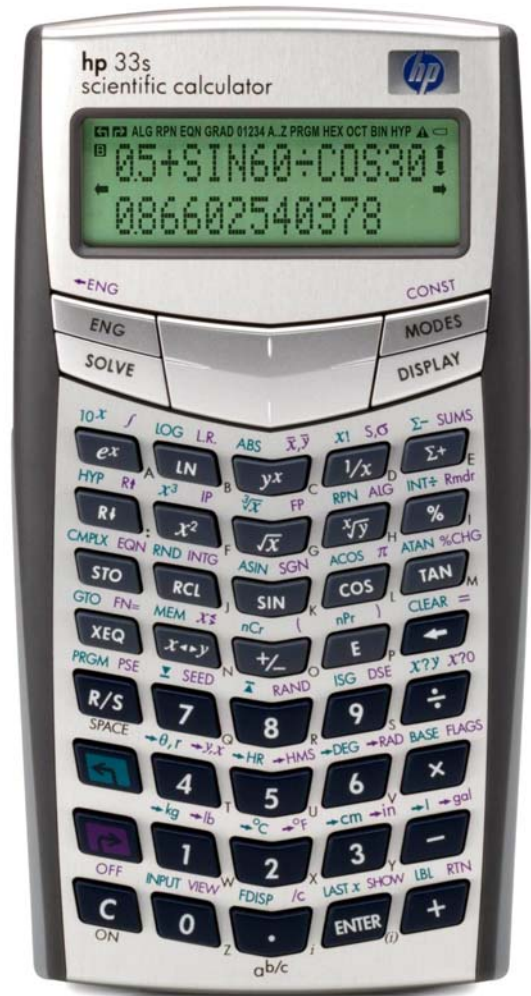
HP 33S Using HP 33S Flags

What are flags?

An example of using a flag to display a message

General-purpose flags and special flags

Using flags in programs



What are flags?

Ships use flags to signal special conditions. For example a ship might raise a flag as a distress signal, or to signal that an admiral is on board. Computers and calculators also use flags to signal special conditions. For example a flag could be used on the HP 33S to mark that financial calculations are being carried out in Canadian dollars, not in US dollars.

Flags can be raised (or set) or else they can be lowered (or cleared). They provide the answers to simple yes/no questions. Wherever a question like this needs to be asked, especially in a program or in the display, a flag can be used.

An Example of using a Flag to Display a Message

An easy example of flag use is to display some simple message, for example a reminder.

Example 1: A student who uses an HP 33S wants to display a reminder to complete Tuesday's assignment.

Solution: Set flag 1, which will show up in the display.

First the user must press  **FLAGS** to display the flag operations menu.



Figure 1

Then the user must press **1** to select the SF (Set Flag) operation.



Figure 2

Now the user needs to press **1** again to make the SF operation act on flag 1.



Figure 3

Answer: Flag 1 is now set, and a small number 1 is displayed at the top of the calculator screen. The small "1" looks like an exclamation point and reminds the student that something important needs to be done. Alternatively flag 2 could be used, as a reminder of Tuesday's assignment, as "two" sounds like "Tue".

Example 2: Once Tuesday's assignment has been completed, the student no longer needs to display the 1.

Solution: Clear flag 1, so it will no longer show up on the screen.

Again the user must press  **FLAGS** to display the flag operations menu.

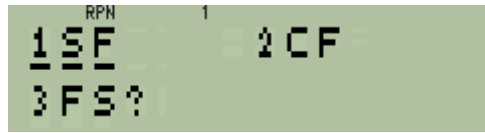


Figure 4

This time the user must press **2** to select the CF (Clear Flag) operation.



Figure 5

The little 1 is still shown. Now the user needs to press **1** to make the CF operation act on flag 1.



Figure 6

Answer: Flag 1 is now clear, so the small number 1 is no longer at the top of the calculator screen.

Example 3: Use the “Flag Set?” command to confirm that flag 1 is now clear.

Solution: Use the same steps, but this time choose the third command in the flags menu, to ask if flag 1 is set.

→ **FLAGS** **3** **1**



Figure 7

Answer: The display shows the message NO to tell the user that the answer to the question “is Flag 1 Set?” is “No”.

Note: If the flag is set, the message YES is shown. The messages YES and NO replace the normal display of numbers on the HP 33S screen, and the message symbol ▲ is displayed. This does not mean that an error has been detected, instead it warns the user that a message is being shown, and must be cleared before normal operation can continue. To clear the message, press one of the two keys **←** or **C**. **C** is the “Clear” key, at the lower left of the keyboard; it is also used as the **ON** key.

The examples above show how flags can be set, cleared and tested by commands carried out on the keyboard. Flags are also very useful in programs, as is described below.

General-purpose Flags and Special Flags

HP 33S users can set, clear, and test 12 different flags. When the HP 33S is turned on first, all these flags are clear.

Flags 0 through 4 are general-purpose flags, for use as signals and in programs. When one of these flags is set, its number is shown at the top of the HP 33S screen. The 0 looks like a degree sign and 1 like an exclamation point.

HP 33S Using HP 33S Flags

Flags 5 through 11 are special-purpose flags, and their state is not shown at the top of the screen. Each flag has a special meaning when it is set.

The user can set flag 5 to say that a program should stop if any calculation produces a result bigger than the largest number the HP 33S can handle. The number is replaced by the largest number the HP 33S can handle and the message OVERFLOW is displayed. If flag 5 is clear, the program continues to run, and OVERFLOW is displayed for a short time when the program finishes running.

The calculator automatically sets flag 6 if an overflow occurs, or if a number in a non-decimal base is larger than the calculator can handle. This can be very useful in programs – a program can test flag 6 to see if a calculation has produced an overflow, and if so then the program can deal with the problem. Flag 6 should be cleared after it has been set, so that it can be used to test if another error occurs later.

Flag 7 is set when fraction display mode is active. It becomes set when $\left[\leftarrow \right] \left[\text{FDISP} \right]$ is first pressed, and it is cleared when $\left[\leftarrow \right] \left[\text{FDISP} \right]$ is pressed again. It is also set when SF 7 is carried out on the keyboard or in a program. When flag 7 is cleared, fraction display is cancelled. This means that a program can set flag 7 to display a result as a fraction, and can later clear flag 7 so that further results can be displayed as usual.

When flag 8 is set, fractions are displayed with the denominator equal to the number stored by the $\left[\text{D} \right]$ command, but the fraction is simplified unless flag 9 is set too. For example, the number 0.5 is displayed as 5/10 if 10 is stored by the $\left[\text{D} \right]$ command and flag 8 is set. If flag 9 is clear, the 5/10 is simplified to 1/2 but if flag 9 is set, it is not simplified.

When flag 10 is clear (its normal state) any equation in a program is worked out and its result is put on the stack for use by the program. When flag 10 is set an equation in a running program is displayed as a message and is not worked out. This means that an equation can be shown to the user, or that a message can be written as if it were an equation, and can then be displayed instead of being calculated; the message does not need to work as an equation, it could even say "HELLO, WORLD". Flag 10 can be set before some equations, and cleared before others, so that a mixture of equations and messages can be used in a program.

When flag 11 is set, a working program stops and asks for the value of each variable in an equation when it comes to an equation and flag 10 is clear. If the equation is used in integration ($\left[\int \right]$) or in solving ($\left[\text{FN} \right] \left[\text{SOLVE} \right]$), there is no prompt for the unknown variable, or the variable of integration. If flag 11 is clear, the value already stored in each variable, or 0 if no value has been stored, is used.

Flags 5 through 11 can also be used in programs as if they were general-purpose flags, as long as this does not interfere with their special uses. For example flag 9 can be used freely so long as flag 8 is not set. Any program that uses these flags for general purposes should leave them cleared when it is completed.

To use flags 10 and 11 with the flag commands, first press the decimal point key $\left[\cdot \right]$, then press $\left[\text{0} \right]$ or $\left[\text{1} \right]$.

Note: for details of equations, programs, fractions, solve and integrate, see the separate training aids on these topics.

Using Flags in Programs

The commands SF, CF and FS? can be very useful in programs. The examples below will show some of the ways in which flags can help in programs.

Example 4: A long program has three parts. To let the user see how far it has gone, it can set flag 1 in the first part, flag 2 in the second part, and flag 3 in the third part. How is this done?

Solution: At the beginning of the program, the user puts “SF 1” immediately after the first label.

⏪ PRGM ⏪ LBL A ⏩ FLAGS 1 1

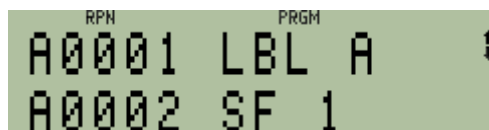


Figure 8

At the end of the first part of the program, the user clears flag 1 and sets flag 2.

⏩ FLAGS 2 1 ⏩ FLAGS 1 2

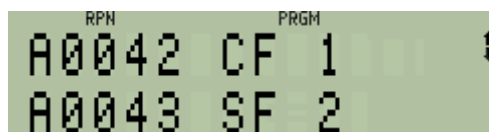


Figure 9

At the end of the second part of the program, the user does the same, but clearing flag 2 and setting flag 3.

Finally at the end of the program, the user clears flag 3.

⏩ FLAGS 2 3 ⏩ RTN



Figure 10

Answer: When the program runs, with the above steps in it, it will display flag 1 in the first part, flag 2 in the second part, and flag 3 in the third part. A long program will most likely have several labels in it, so the line numbers at the end might have a different letter in them, not A.

Example 5: A program calculates a factorial and then uses it. To make sure the program warns the user if the factorial of a number larger than 253 is calculated, and the result overflows, the program sets flag 5. How is this done?

Solution: “SF 5” is put in the program, just after the first label or just before the factorial is calculated.

⏪ PRGM ⏪ LBL A ⏩ FLAGS 1 5 ⏪ x! 1

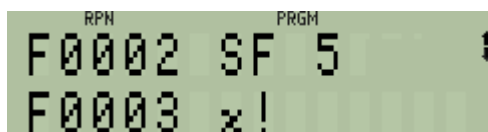


Figure 11

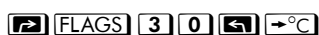
If an overflow occurs, the program will stop at line F0003 and will show the message OVERFLOW.

It is best to clear flag 5 at the end of the program, so the calculator will behave the usual way after the program is finished.

Answer: This example shows how flag 5 can be useful in a program.

Example 6: A program that uses temperatures must work with degrees Fahrenheit or degrees Celsius. Use flag 0 to make the program work with both temperature scales.

Solution: The program is written so that it checks flag 0. If flag 0 is set, it converts from Fahrenheit to Celsius, if flag 0 is clear, it assumes the temperature is already in Celsius. In the program, these steps are typed:



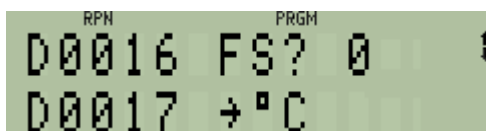


Figure 12

If flag 0 is set at step D0016, then the answer to the test is YES, and step D0017 is carried out. If flag 0 is clear then the answer to the test is NO and step D0017 is skipped. The answer YES or NO is *not* displayed when a program is running. Instead, the rule “do the next step only if the answer is YES” is followed.

To use the program, the user sets flag 0 if measurements are in degrees Fahrenheit. The little 0 is displayed at the top of the screen, to remind the user that flag 0 is set and that measurements in degrees Fahrenheit are expected. The zero looks like a degrees symbol, which is a useful reminder at times when the user is working with temperatures. The user must clear flag 0 if measurements are in degrees Celsius, and the zero will disappear.

Answer: When the program is used with measurements in degrees Fahrenheit, the user must set flag 0. Step D0017 of the program converts the measurement to degrees Celsius before the measurement is used. When the program is used with measurements in degrees Celsius, the user must clear flag 0. At step D0016 the flag is not set, so step D0017 is skipped, and the temperature is not converted to Celsius, as it already is in Celsius.

These examples show just some of the ways in which flags can be used in programs. Some of the other training aids show other uses of flags on the HP 33S.