



Unit 1: Getting Started with TI-Innovator™ Hub

Skill Builder 2: Input and Color

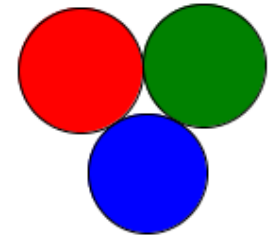
In this second lesson for Unit 1, you will learn about input to a program and controlling the COLOR LED on the TI-Innovator™ Hub.

Objectives:

- Use arguments to a program
- Control the COLOR LED

The COLOR LED (light emitting diode) has three color 'channels': red, green, and blue. This is often referred to as a, "RGB LED".

To get a particular color, you have to mix the right amounts of the three colors red, green, and blue. All other colors are possible with the right mix of these three colors.



First let's control the COLOR LED right from the Calculator app:

1. From **menu > Functions & Programs > I/O**, select the **Send** command.
2. After the keyword **Send**, type both leading and trailing quotation marks (ctrl-[x]).
3. Inside the quotation marks, type

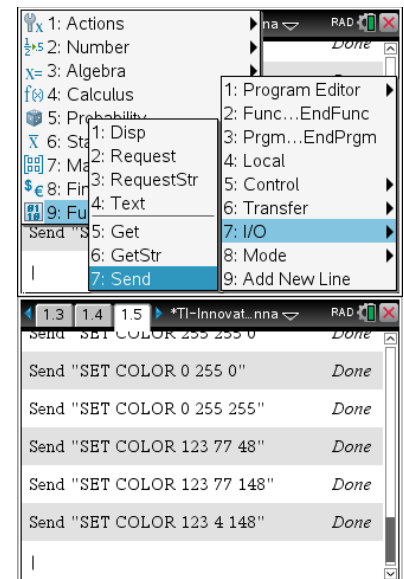
SET COLOR

and three numeric values separated by spaces representing the amount of red, green, and blue to light up.

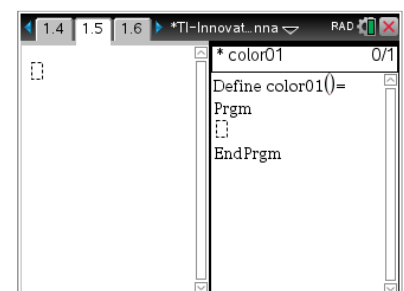
- These three numbers can be between 0 and 255. The higher the number, the brighter the color. See some examples to the right.

Notice that the LED stays lit until you change it. A program can help control the LED more precisely by turning it off before the program ends.

In the program, you will experiment with the COLOR LED. You will provide red, green, and blue values as *arguments*, and the LED will light up in the color that you chose for a few seconds and then turn off the LED.



1. To start a new program from the Calculator app, select **menu > Functions & Programs > Program Editor > New....**
2. Name the program color01.





10 Minutes of Code

TI-NSPIRE CX WITH THE TI-INNOVATOR™ HUB

3. Inside the parentheses after the program name, type three letters separated by commas to represent the colors red, green, and blue.
 - These are called ‘arguments’ to the program and will be used by the program to send the three color values to the Hub.
 - We used the letters **r,g,b** on the right.

Teacher Tip: Arguments are one way of providing information to a program. The other way is to use **Request** statements which are introduced in a later lesson. The arguments used in the program editor are called ‘formal arguments’ and are treated as local variables. They will get their values when the program is run.

Arguments are ‘placeholders’ for values that you will provide when you run the program. They are variables that the programs uses to represent your actual values. These variables exist only for the program and are not available to other apps and so are treated as ‘local variables’.

Teacher Tip: The COLOR LED can be set in two different ways. You can either send values for all three colors in one statement (“SET COLOR # # #”) or use separate Send(statements to control each color channel, COLOR.RED, COLOR.GREEN, and COLOR.BLUE. In either case, the permitted color values are in the range 0..255. Therefore, the total number of colors possible is $256^3=16777216$.

Setting up the Color Program

4. Select **menu > Hub > Send** “SET...>COLOR to paste the first part of the command into the program.

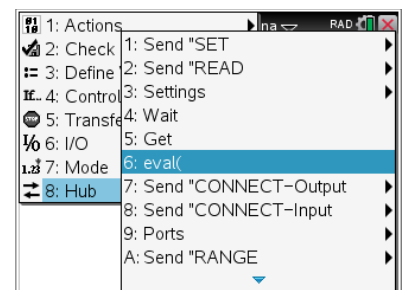
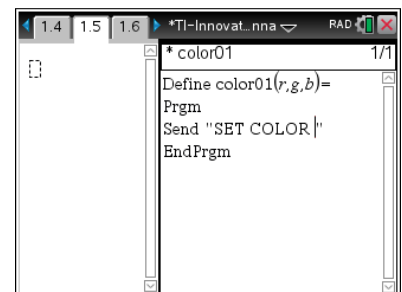
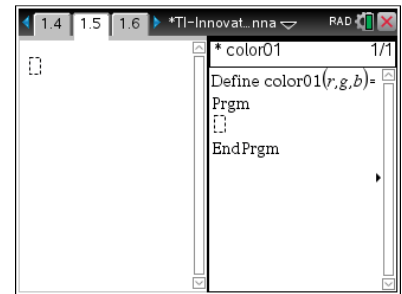
Understanding eval()

You cannot send the variables *R G B* as the color values in the **Send** statement because the *letters R, G, and B* would be sent to the TI-Innovator Hub rather than the *values* of the variables.

We need to use a special function, **eval()** from the Hub menu which is designed to convert the value of an expression in the calculator into a string representation that the TI-Innovator Hub can process.

UNIT 1: SKILL BUILDER 2

TEACHER NOTES





10 Minutes of Code

TI-NSPIRE CX WITH THE TI-INNOVATOR™ HUB

Complete the Send statement:

5. Add the **eval()** function by selecting **menu > Hub > eval(**.
6. Type the letter *r* in the parentheses.
7. Add a space after the parentheses.
8. Repeat the **eval()** function two more times for *g* and *b*. Don't forget to add a space in between each. The **Send** statement should look like image to the right.

9. After the **Send** statement, add a **Wait** statement to wait a few seconds. Remember to provide a number of seconds.

10. Finally, add another **Send** "SET COLOR ... statement to turn the color LED off.

- Use three 0's to turn off all three colors.

11. Press **ctrl-B** to check and store the program.

Run the Program:

12. With the TI-Innovator Hub connected, in the Calculator app, press **var**, and select the program name (or simply type the program name and a set of parentheses).
13. Inside the parentheses, provide three numbers representing the amount of red, green, and blue light to mix, and press enter.

- The color LED lights up for the number of seconds you specified in the Wait statement and then turns off.

To run the program again with different values, press the up arrow twice to highlight the program name, press enter, and edit the numbers before pressing enter again.

UNIT 1: SKILL BUILDER 2

TEACHER NOTES

```

1.4 1.5 1.6 *TI-Innovat...na RAD
* color01 1/1
Define color01(r,g,b)=
Prgm
Send "SET COLOR eval(r) eval(g) eval(b)"
EndPrgm

```

```

1.4 1.5 1.6 *TI-Innovat...na RAD
* color01 3/3
Define color01(r,g,b)=
Prgm
Send "SET COLOR eval(r) eval(g) eval(b)"
Wait 3
EndPrgm

```

```

1.4 1.5 1.6 *TI-Innovat...na RAD
* color01 3/3
Define color01(r,g,b)=
Prgm
Send "SET COLOR eval(r) eval(g) eval(b)"
Wait 3
Send "SET COLOR 0 0 0"
EndPrgm

```

```

1.4 1.5 1.6 *TI-Innovat...na RAD
color01(255,155,80)
Define color01(r,g,b)=
Prgm
Send "SET COLO
Wait 3
Send "SET COLO
EndPrgm

```

Teacher Tip: Sending the values 0 0 0 to the COLOR LED should turn it off. But (as of this writing) the color LED is also used as a 'ready' signal so that when it is off, it comes on as a green light.

Try sending 1 1 1 and look closely to see that the LED actually consists of three tiny lights that are really close together. Diffusion of the LED helps to blend the colors better: cover the LED with a piece of white paper to better 'mix' the three colors. Especially interesting is using the values 255 255 0 (red and green) to get YELLOW! Challenge students to make orange.

Notice that the COLOR LED will stay on even after the program ends if no SET COLOR 0 0 0 command is used. Once it is set, it remains on until the TI-Innovator™ Hub is unplugged from the calculator or a different SET COLOR command is used.



10 Minutes of Code

TI-NSPIRE CX WITH THE TI-INNOVATOR™ HUB

UNIT 1: SKILL BUILDER 2

TEACHER NOTES