

Unit 2: Skill Builder 1 - Brightness Sensor

Goals:

You will write programs on the calculator to measure and display light intensity. You will code the calculator to use the light intensity to control various rover responses.

1. Learn how to use the BRIGHTNESS sensor to measure light intensity.
2. Use the For and While loops to repeatedly take measurements and display messages.
3. Use how to use If..Then statements to determine what code should be executed.

Background:

Light can be described as an electromagnetic wave. One property of that wave is frequency, which is how fast it vibrates up and down; the human eye perceives this as the color of the light. Another property of the wave is the amplitude, which is how much energy the wave possesses; the human eye perceives this as the brightness of the light. The human eye possesses millions of photoreceptors in the retina that are sensitive to both color and intensity. Engineers and scientists have discovered semiconductor materials that are sensitive to light intensity. These materials are used to build light intensity sensors that are used in many electronics technologies that require a response to the surrounding brightness. For example, a computer screen may dim in response to how bright the room is. The TI Innovator Hub that is inserted into the Rover has a light brightness sensor. If you look closely at the Hub within the Rover, you will see a small window with the word BRIGHTNESS printed below. This sensor detects intensity only, not color. A TI-BASIC program can read this sensor value with a range from 0 (dark) to 16383 (bright). You could read the Hub's BRIGHTNESS sensor within a TI-BASIC program and use it to control the motion of the Rover!



INPUT
On-Board Light Brightness Sensor

Hub Command	Example	Behavior
READ BRIGHTNESS	Send("READ BRIGHTNESS")	This Hub command reads the light intensity of the BRIGHTNESS sensor located on the TI-Innovator Hub at the rear of the Rover and returns that reading to the calculator when the program requests it with the Get command.
Get(variable)	Get(<i>b</i>)	The Get command retrieves the value returned to the calculator from the Hub after a READ command is issued. In this example, the brightness measurement is stored in the variable named <i>b</i> .
RANGE BRIGHTNESS min max	Send("RANGE BRIGHTNESS 0 255")	The RANGE command scales the output of a sensor to minimum and maximum values. In the example, the values of BRIGHTNESS are scaled between 0 and 255.
SET RV.COLOR red green blue	Send("SET RV.COLOR 255 128 0")	This command sets the three primary colors of the RGB LED, in this example, the appearance of the LED will be yellow since the red is set fully bright (at a value of 255) the green is set to medium and the blue is set off (at a value of 0).

eval(variable or expression)	Send("SET RV.COLOR 0 0 eval(b)")	When the eval(b) command is inserted into the Hub command that sets the RGB LED, the blue channel will be set with the value contained within the variable name <i>b</i> . That is, <i>b</i> is evaluated and then substituted into the command. The eval command can also be used to evaluate expressions.
RV STOP	Send("RV STOP")	Stops the Rover immediately.
If <i>condition</i> Then..... End	If <i>b</i> < 10 Then.....End	Executes commands within structure if the value stored in <i>b</i> is less than 10
For <i>index variable</i> , <i>start</i> , <i>stop</i> .. End	For <i>n</i> , 1, 10 ... End	Repeats commands within structure 10 times with the loop count in variable <i>n</i> .
While <i>condition</i>End	While <i>b</i> ≠ 10.....End	Repeats commands within structure until the variable <i>b</i> equals 10.

Challenges:

Challenge 1: Write a program named **c1** that makes the RV.COLOR LED bright blue when you shine a bright light into the BRIGHTNESS sensor and then a soft blue when the light in the room is dim. Your program should run for at least 10 seconds. While running, it should display the light intensity as it changes and adjust the color if necessary.

Challenge 2: Write a program named **c2** that drives the Rover backward until the BRIGHTNESS light level sensor reads a value above 25%.

Challenge 3: Write a program named **c3** that causes Rover to turn by steps in a full circle searching for the brightest position on the circle. Once the rover has completed a full circle while reading brightness levels, the rover should then turn back to the brightest position.

