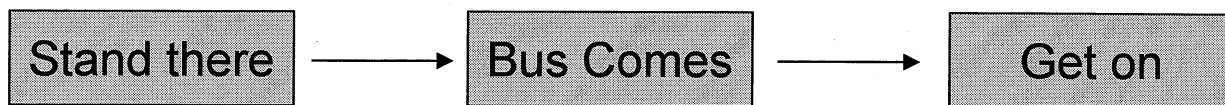


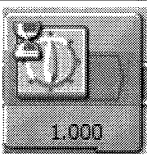
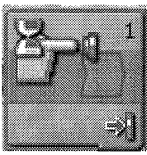
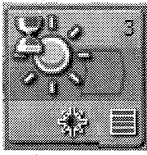
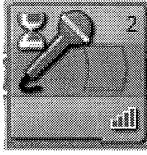
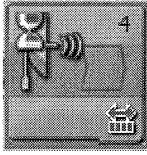
# Wait Block *An Explanation*

Wait blocks are used when you want an action to keep going until something happens. It is like when you stand at your bus stop waiting for your bus to come. The bus comes and then you get on the bus. So we would write this out like this:



How long do you stand there? It could be a few seconds or it may be several minutes. You don't know exactly. You just know that you will continue to stand there until the bus arrives and that will be your signal for you to go on to the next step which will be to get on the bus.

Here is a short explanation of the different types of wait blocks:

	<b>Time:</b> You can set the number of seconds to wait before the next program block starts.
	<b>Touch:</b> You can set it to wait until it touches something before the next program block starts.
	<b>Light:</b> You can set it to wait until it senses something light or dark before the next program block starts.
	<b>Sound:</b> You can set it to wait until it senses a sound before the next program block starts.
	<b>Distance:</b> You can set it to wait until it senses an object by saying if it is closer or farther away than a set number of inches or centimeters before the next program block starts. Using the ultrasonic sensor, it bounces an ultrasonic beep off of an object and measures the distance. It works like how a bat uses sound to find distance. It's like sonar.

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# Light Sensor, *An Explanation*

When you first put a light block on the program line, the light block is set with a greater than sign and the threshold of 50. That means that the light block will be triggered by any amount of light above the 50 percent level. This is not very consistent since the distance of the surface and the brightness of the surrounding light will influence it. It is best to take measurements of the light sensor setting the robot down on the field with the light sensor over the white surface and then seeing what the percentage is over the dark line. Write down both percentages so that you know what levels you need to use. Also, the exercises call for the sensor being triggered by a dark line so in almost every mission, we will change the greater than sign to a less than sign. This means the light wait block will trigger when the it senses something darker than the set percentage—like a dark line, for instance.

Attach the light sensor so that it faces down. It needs to be at least  $\frac{1}{4}$  of an inch (.5 cm) off the floor. It can be higher but sometimes it isn't as accurate at reading the reflected light if it is.

Don't make the robot move too fast. Sometimes the robot will move right past the line before the program can react and make the robot back up and turn.

Program the robot so that it will move forward until it senses the line of tape; then, have it back up, turn, and continue on moving forward again. Use a loop so that it will continue indefinitely.

# Light Block, *An Explanation*

This is the light sensor block and the screen that is below it. Notice that on the block is a number 3. This means that the light block will be looking for a reading from Port 3. If the light sensor is not plugged into a different port, it will not get its readings. You can change what port you want the block to look into, but it is better not to since you might remember to change it once or twice, but forget to change it on some of the light blocks in other parts of your programs, so just leave it in Port 3 unless you have a real good reason not to plug it there.

Notice that you can choose a greater than symbol ">" or a less than symbol "<" on the right side. Most of the time you will want to find a dark line, so you will want to look for something whose brightness is less than the surrounding surface, so you will usually select the less than symbol "<."

On the bottom right side, there is a radio button that says "Generate light." This will default to this setting. It means that the light sensor will shine a red light. This is what you usually want since you want the robot to shine a light on the surface and sense how dark or light the surface is so that the robot can stop on a line or follow a line. Sometimes you may want to measure the light in the room or under a shade of some kind. In this case, you want to click on it so that the light does not shine.

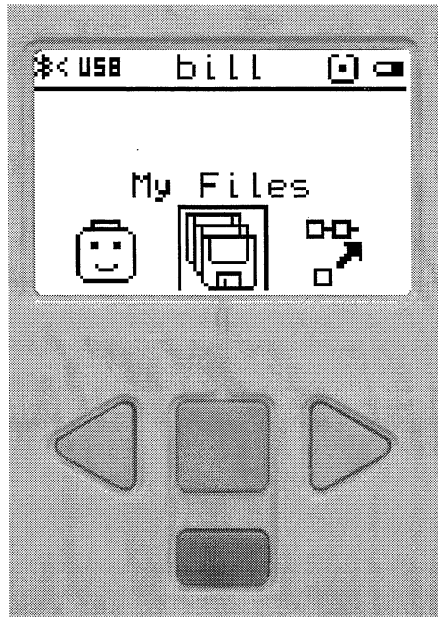
You can adjust the light level two ways. You can use the slider or you can delete the numbers in the box and type in new numbers. Either way works just fine. It is just what you are comfortable doing.

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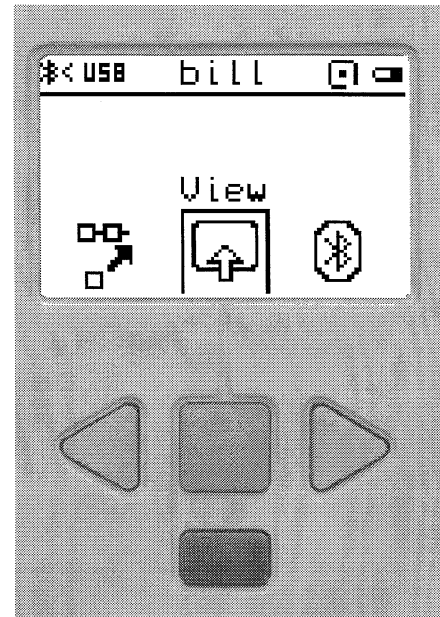
# Light Sensor Readings

This is how you can check a light sensor inside the view section.

1. Start with the level that says My Files.



2. Scroll to the right by pushing the right gray button until you see View. Push the center orange button.



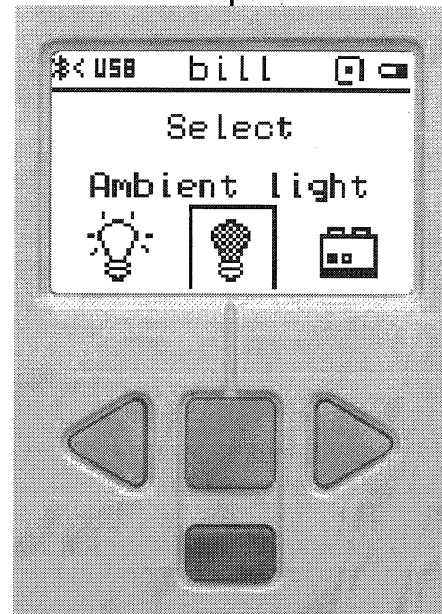
*This will open up the view section so you can check the various sensors as well as the rotations of the motors.*

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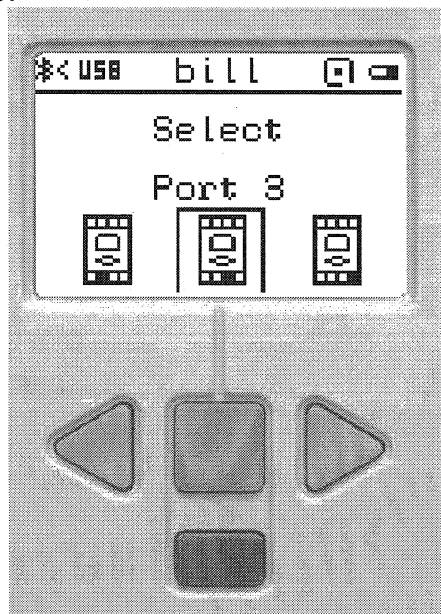
1. There is two ways to use the light sensor. One is to have the light sensor shine its light and have the electric eye measure how much light bounces back. Press the center orange button to access this part.



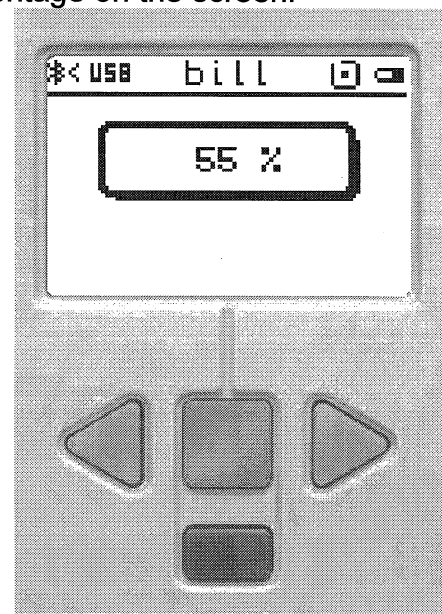
2. The other way to use the light sensor is to not shine the light and just measure the light in the room. The dark light bulb means the little red light on the sensor does not turn on. Press the center orange button to access this part.



3. The light sensor is usually attached to Port 3. Press the center orange button to access this part.



4. The light sensor will show as a percentage on the screen. Press the center orange button to access this part.



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# Light Readings

**Mission:** The student will use the robot to see what readings the light sensor will give on various objects and in various lighting conditions.

**Equipment:** light sensor

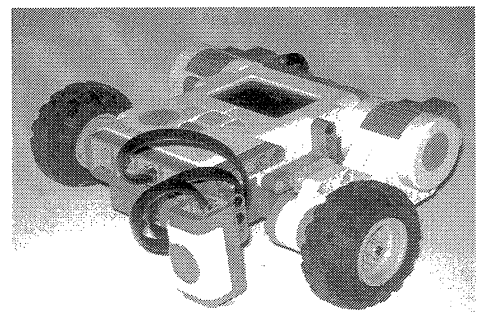
**Directions:**

1. Attach the light sensor so that it faces down to the surface below the robot.
2. Set the robot so that the screen shows the light sensor shining.
3. Scroll over to Port 3 which is the default port of the light sensor.
4. Set the robot on the first object.
5. Write down the reading of the first object in on your hand out. Move on to the next object and get a reading for that. Continue to do the same for each object.

Generating light	
Surface	Reading

Not generating light	
Surface	Reading

Set the light sensor so that it faces down and that it is about  $\frac{1}{4}$  to  $\frac{1}{2}$  inches (.5 to 1 cm) from the surface so the light can hit the surface and bounce back to the light sensor.



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