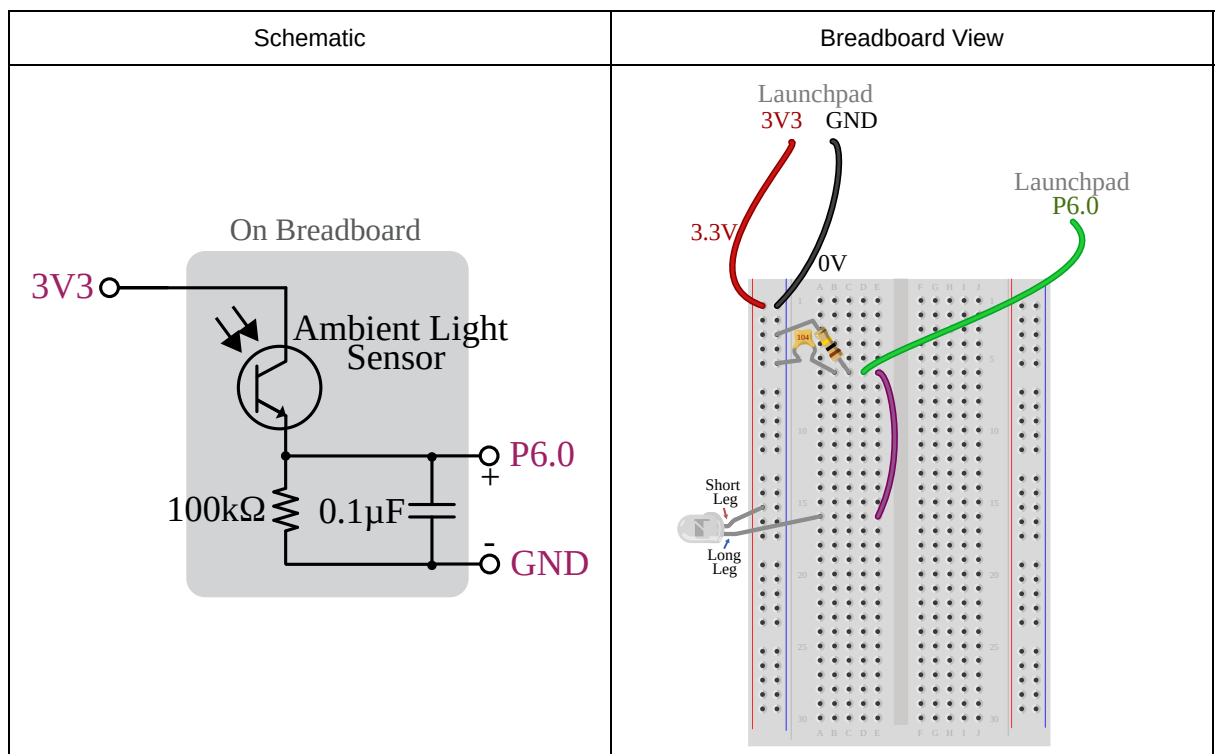# Light Sensor Breadboard Circuit - Cory 125

Build the ambient light sensor circuit on a breadboard and hook it up to the Launchpad, as you did in Imaging Lab 1. This requires the following parts:

- **1x Breadboard**
- **4x Male-to-Male Jumper Wires (Exposed metal connections on both ends)**
- **1x AAXA Technologies Projector with Light Sensor on it**
- **1x 0.1μF Capacitor (104)**
- **1x 100$k\Omega$ Resistor (Brown-Black-Yellow-Gold)**
- **1x TI Launchpad MSP430F5529LP**
- **1x Micro-USB to USB-A Cable (Long, supplied for this lab)**

The schematic that you will build is shown below. Labels in purple indicate connections to the Launchpad. First, we will plug the necessary circuit elements into the breadboard. Follow the instructions below exactly.

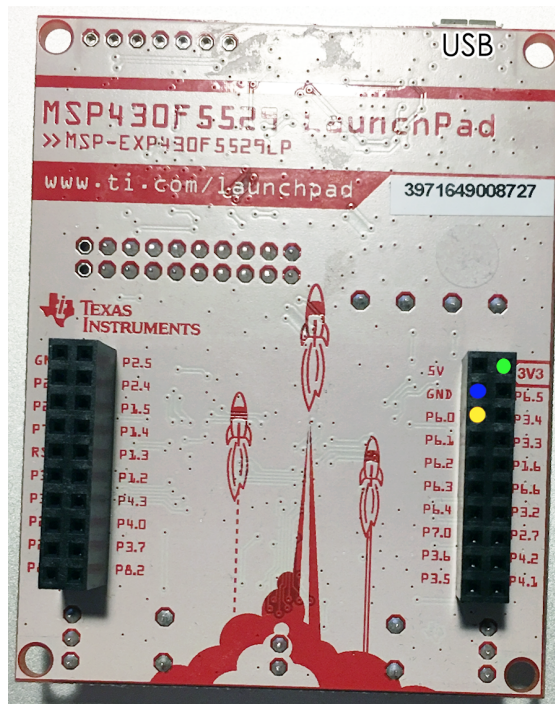| Schematic	Breadboard View

Setting up the Breadboard:

- Plug in the negative jumper wire (labeled with a **minus**) from the light sensor that is taped onto the projector to **Row 16, Column A of the breadboard**, as illustrated in the breadboard diagram above. The positive jumper wire (labeled with a **plus**) from the light sensor should be plugged into a hole in the **red (+) column** of the breadboard. *You will be using the light sensor that is taped onto the projector as opposed to your own.*

- Plug one leg of the **100kΩ resistor** into a hole in **Row 6** of the breadboard. Plug its other leg into a nearby hole in the **blue (-) column**.

- Both Setups: In a similar fashion, plug the **0.1μF capacitor** into a hole in **Row 6** of the breadboard. The other leg should also be plugged into the **blue (-) column**. *Warning: Make sure that none of the legs are touching each other to prevent shorting!*

- Both Setups: Use a **male-to-male jumper wire** to connect (short) **Row 16, Column E** to **Row 6, Column E**.
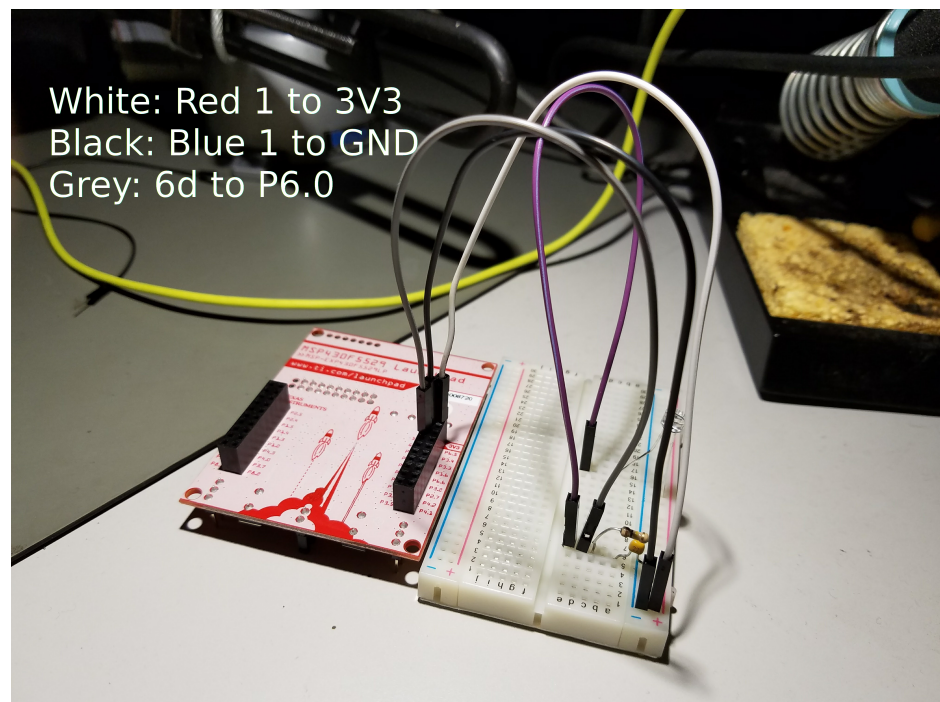
Stand Setup

The light sensor should be facing the center of the image being captured (roughly the center of the projected display), and should not be tilted away. No components, wires, etc. should get in its way. Therefore, everything else is carefully placed to the side. This is evidenced from the photos below:

Side	Top

- Place the **Launchpad at the stand's base** and use a **male-to-male jumper wire** to connect **Row 6** (= sensor circuit output) to **P6.0 on the back of the Launchpad (yellow)**. The Launchpad can read analog voltage values from our circuit, convert them into digital values, and then send them over to our computer.

- The Launchpad supplies 3.3V to our circuit. Use a **male-to-male jumper wire** to connect the right-most hole (~Row 1) in the **red (+) column** (3.3V supply) to **3V3 on the back of the Launchpad (green)**.

- Use a **male-to-male jumper wire** to connect the right-most hole in the **blue (-) column** (0V) to **GND on the back of the Launchpad (blue)**.

White: Red 1 to 3V3
Black: Blue 1 to GND
Grey: 6d to P6.0

Again, make sure none of your wires get in the way of the projector or light sensor. If they do, consider taping them down.
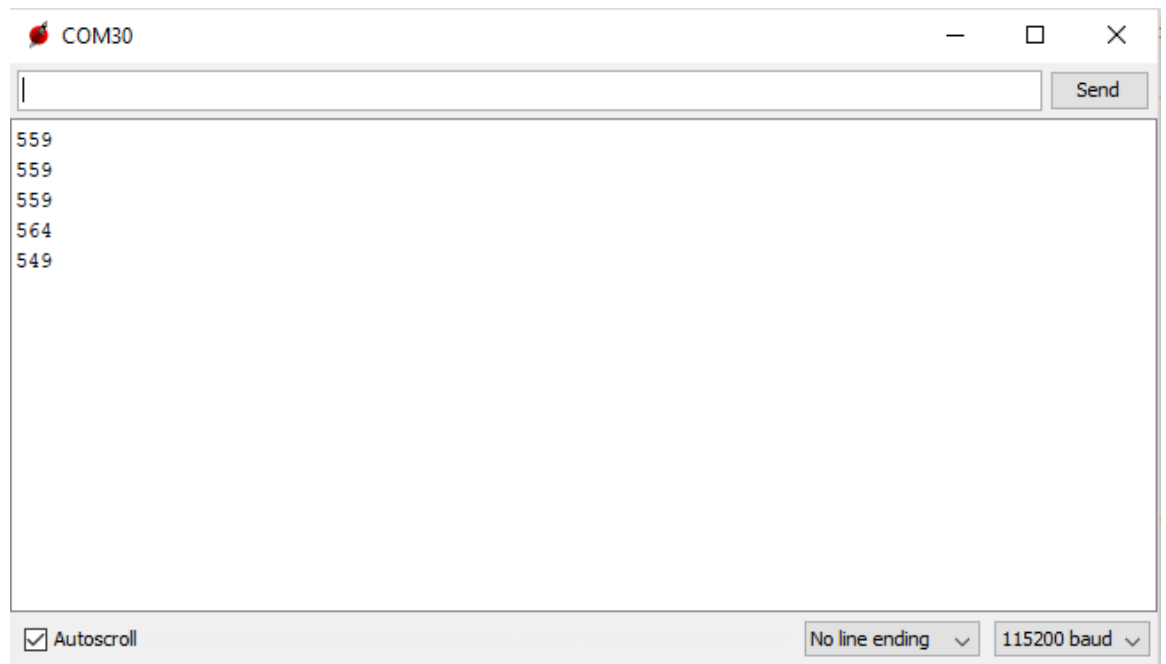
Launchpad (MSP430) Setup

- First, move **everything into the cardboard box**. If you are having trouble keeping the projector upright, really spread open the tripod legs. Feel free to put the breadboard and MSP anywhere in the box (on top of the projector, in front of the projector) as long as it does not get in the way of the projected image.

- Feed a **long Micro-USB cable** (already connected to your computer on the USB-A end) **through the hole in the box closest to the Launchpad's Micro-USB port. Plug it into the Launchpad's Micro-USB port.** You can find the cable in the box.

- Open the `AnalogReadSerial` program in `Energia (File > Open)`. This is a different Launchpad code from last week, and can be found in the Imaging Lab 2 folder you downloaded. Upload the code by clicking on the `Upload` button (white circle with a right-pointing arrow, as shown below):
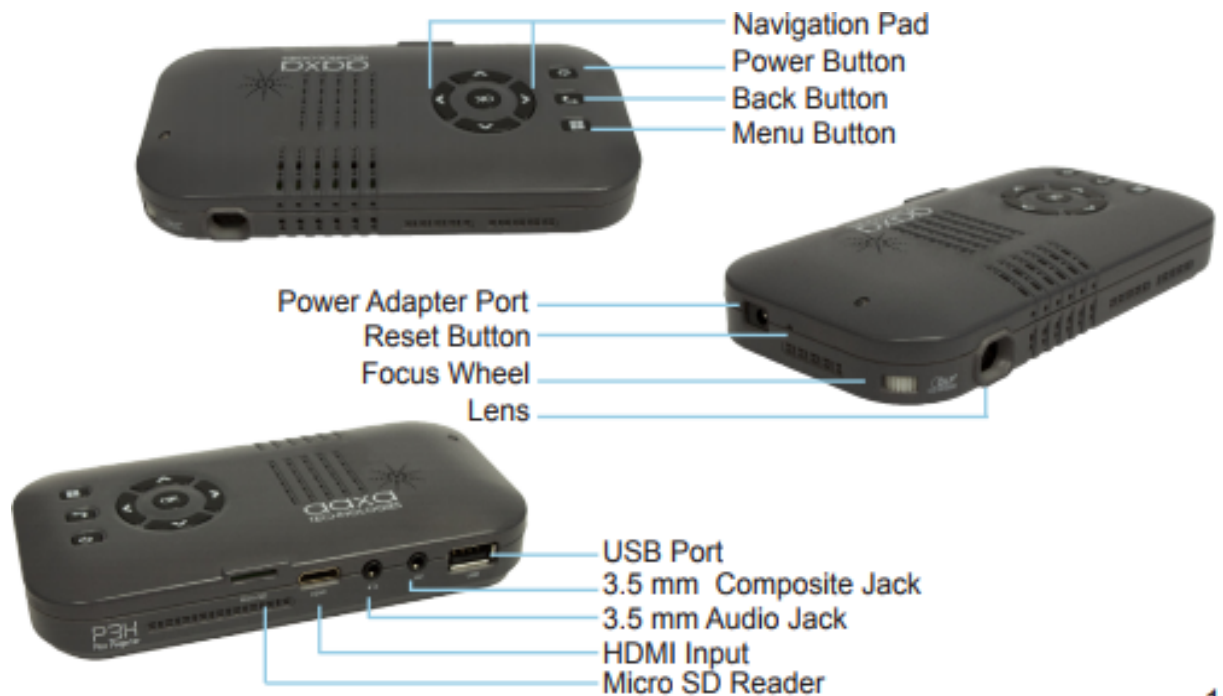
- **To verify that the program is working, type a `6` into the serial monitor (accessed in Energia via `Tools > Serial Monitor`). You will need to set the `Baud Rate to 115200`. You should see a reading from the ambient light sensor appear. Take note of the highest and lowest values you can read.**

*Note: If you're having any trouble connecting to your Launchpad, double check that the right board is selected via **Tools > Board > MSP-EXP430F5529LP**. Also double check that the right serial port is selected via **Tools > Port > COM#**. In order to upload code to the device, we have to select the serial port that the Launchpad is connected to. Use the **Windows Device Manager** to figure out which COM port is connected to **UART1**.
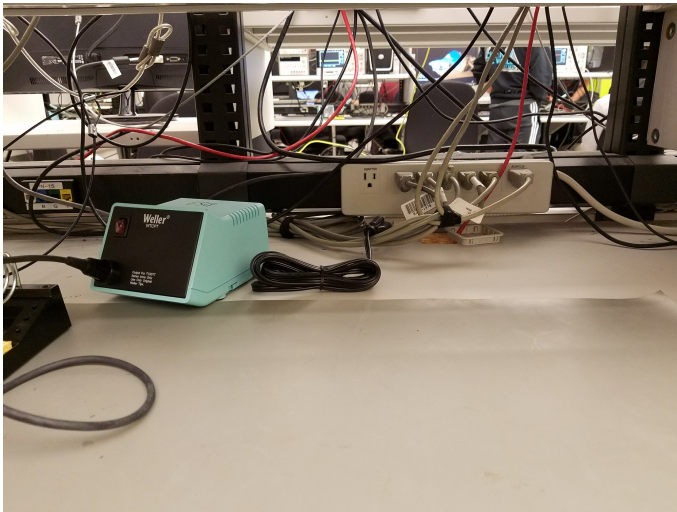
Projector Setup

Navigation Pad
Power Button
Back Button
Menu Button

Power Adapter Port
Reset Button
Focus Wheel
Lens

USB Port
3.5 mm Composite Jack
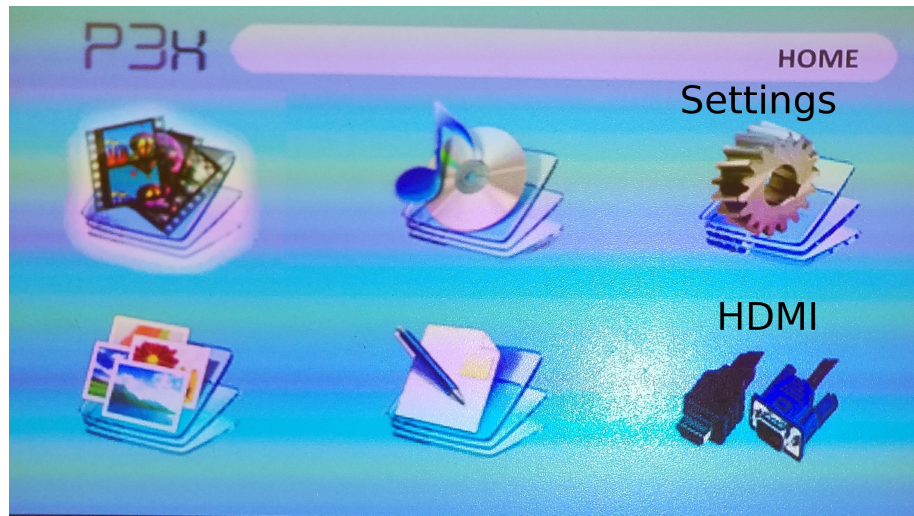3.5 mm Audio Jack
HDMI Input
Micro SD Reader

1

Setup the projector with the following steps:

- **Feed the Mini-HDMI cable and projector power cable through the box holes closest to corresponding projector ports (refer back to Launchpad Setup as reference) and connect them to the projector.** The Mini-HDMI cable should already be plugged into the computer. You can likely find it on the computer or behind the monitor. The power adapter should be plugged into one of the outlets at the back of your workstation, behind your keyboard. In Cory 125, all the outlets may be used. Unplug the Soldering Iron (turquoise, shown below).

- Turn on the projector by holding down the **Power button** (see the previous figure).

- Find the **Focus Adjustment** wheel on the side of the projector to adjust the focus of the projection onto the box. Get it as close as possible; *Cory 125* projectors will not have perfect focus.

- Using the left/right arrows on the **Directional Pads**, select **HDMI** on the projector's **main menu**. After a few seconds, you should see the Windows 10 desktop.

- If you see the Windows 10 taskbar at the bottom of the projected screen, take the following precautions:

    1. Hit the **Windows key** and type **Settings**.
    2. Click on the **Personalization** icon.
    3. Click on **Taskbar** on the left side.
    4. Under the **Multiple Displays** section, turn **Show taskbar on all displays off** .

- Use the **Back button** on the projector to return to displaying the **main menu**.

- Use the left/right arrows to select the **Settings** option (gears icon).

- Change the **Picture Mode** from Standard to **User**.

- **IMPORTANT**: Use the down arrow to move the cursor down to **Contrast**. Then use the right arrow to adjust the contrast to **100**.

- **IMPORTANT**: Move the cursor down to **Brightness** and use the left arrow to adjust the brightness to **0**.

- To **Confirm the Selection**, hit OK and exit the menu with the **Back button**.

- Again, select **HDMI** on the projector's **main menu** and make sure that you see the Windows 10 desktop on your projector.

  MAKE SURE YOU HAVE FOLLOWED ALL THESE STEPS - IF YOU TURN OFF YOUR PROJECTOR THE SETTINGS WILL RESET