30
min

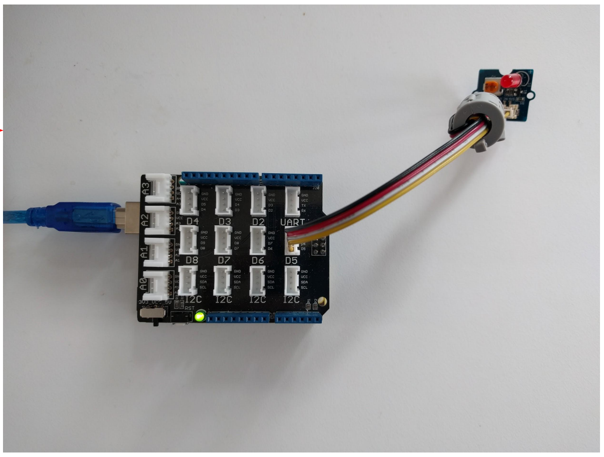
App Inventor + IoT: LED

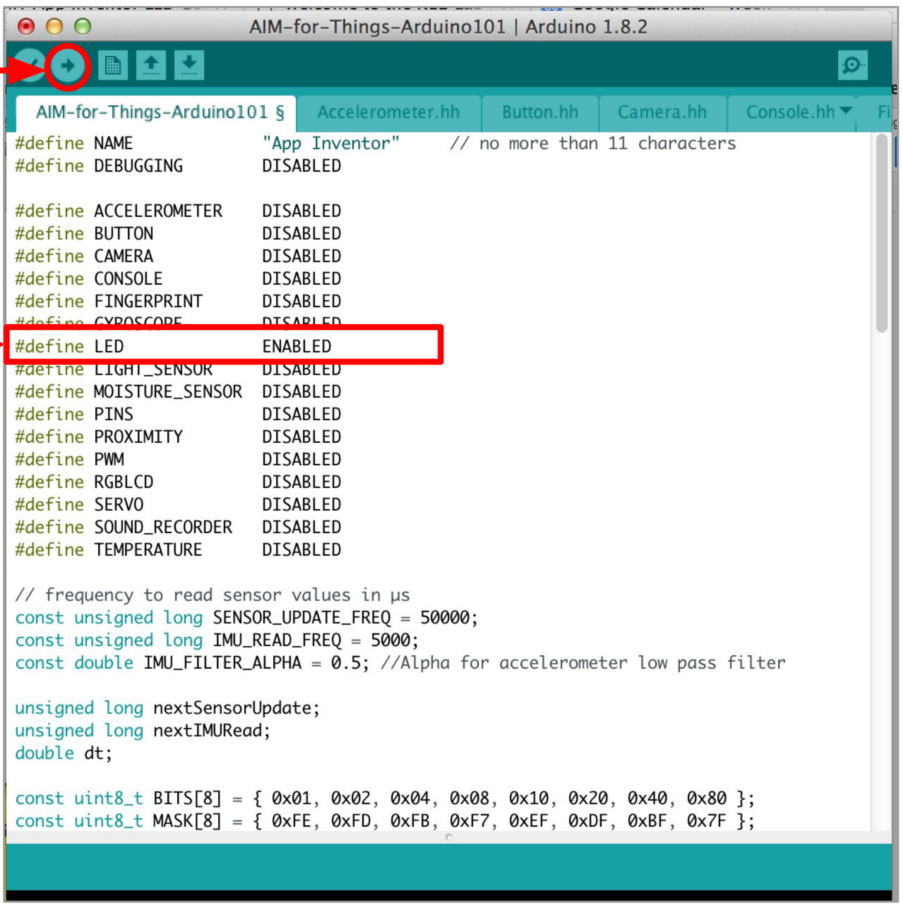
(with IoT Setup and Basic Connection tutorials completed)

This tutorial will help you get started with App Inventor + IoT and an LED (light emitting diode … basically a small light) attached to an Arduino 101 controller. We are also using a Seeed Grove shield for this tutorial. You do not need to use this board, but it does make things easier. The LED control we recommend is the Grove White LED. (They come in different colors).

Before you start, please complete the App Inventor + IoT Setup tutorial to set up your Arduino device.

- Connect the LED to the Grove board in the D5 pin connector.
- For this tutorial make sure **LED** is set to **ENABLED** and all others are set to **DISABLED.**
- You should also click the arrow button in the top left to upload the code.





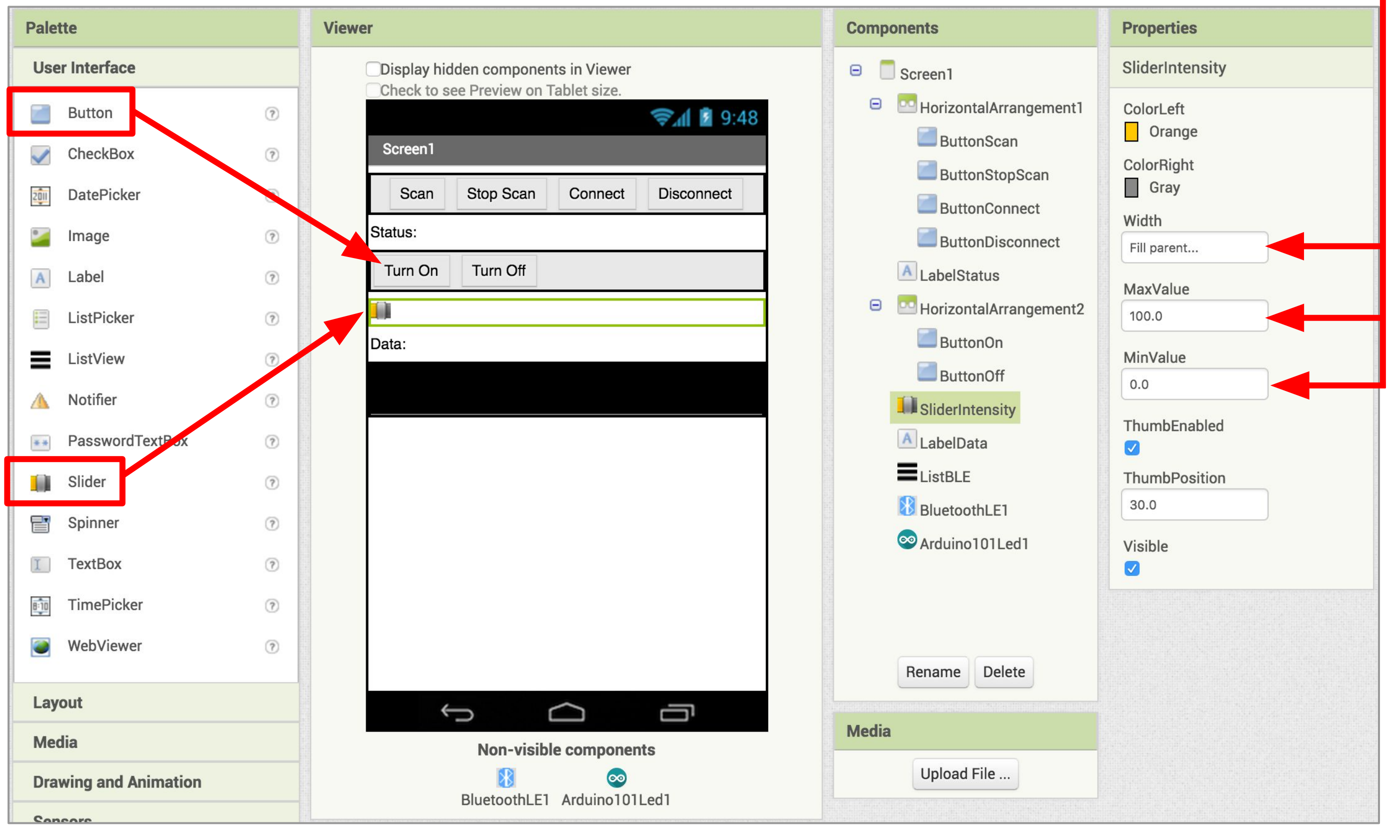
AIM-for-Things-Arduino101 | Arduino 1.8.2
AIM-for-Things-Arduino101 §
Accelerometer.hh
Button.hh
Camera.hh
Console.hh

```
#define NAME              "App Inventor"     // no more than 11 characters
#define DEBUGGING         DISABLED

#define ACCELEROMETER     DISABLED
#define BUTTON            DISABLED
#define CAMERA            DISABLED
#define CONSOLE           DISABLED
#define FINGERPRINT       DISABLED
#define GYROSCOPE         DISABLED
#define LED               ENABLED
#define LIGHT_SENSOR      DISABLED
#define MOISTURE_SENSOR   DISABLED
#define PINS              DISABLED
#define PROXIMITY         DISABLED
#define PWM               DISABLED
#define RGBLCD            DISABLED
#define SERVO             DISABLED
#define SOUND_RECORDER    DISABLED
#define TEMPERATURE       DISABLED

// frequency to read sensor values in µs
const unsigned long SENSOR_UPDATE_FREQ = 50000;
const unsigned long IMU_READ_FREQ = 5000;
const double IMU_FILTER_ALPHA = 0.5; //Alpha for accelerometer low pass filter

unsigned long nextSensorUpdate;
unsigned long nextIMURead;
double dt;

const uint8_t BITS[8] = { 0x01, 0x02, 0x04, 0x08, 0x10, 0x20, 0x40, 0x80 };
const uint8_t MASK[8] = { 0xFE, 0xFD, 0xFB, 0xF7, 0xEF, 0xDF, 0xBF, 0x7F };
```

Next, you should complete the App Inventor + IoT Basic Connection tutorial to make a basic connection to the Arduino device. If you prefer, you can download the completed .aia file here.

The remaining steps all build off of the the starter code for Basic Connection tutorial and .aia:

- Drag a *HorizontalArrangement* from the Layout drawer in the Palette window and place it below **LabelStatus.**
    - Drag two **Buttons** from the User Interface drawer and drag into the *HorizontalArrangement.*
        - Rename the first "ButtonOn" and change its text to "Turn On".
        - Rename the second "ButtonOff" and change its text to "Turn Off".
- Below the *HorizontalArrangement*, drag in a **Slider** from the User Interface drawer of the Palette window.
    - Rename the Slider to “SliderIntensity”.
    - Set the Slider’s *Width* to "Fill parent"
    - Set its *MaxValue* to 100 and *MinValue* to 0

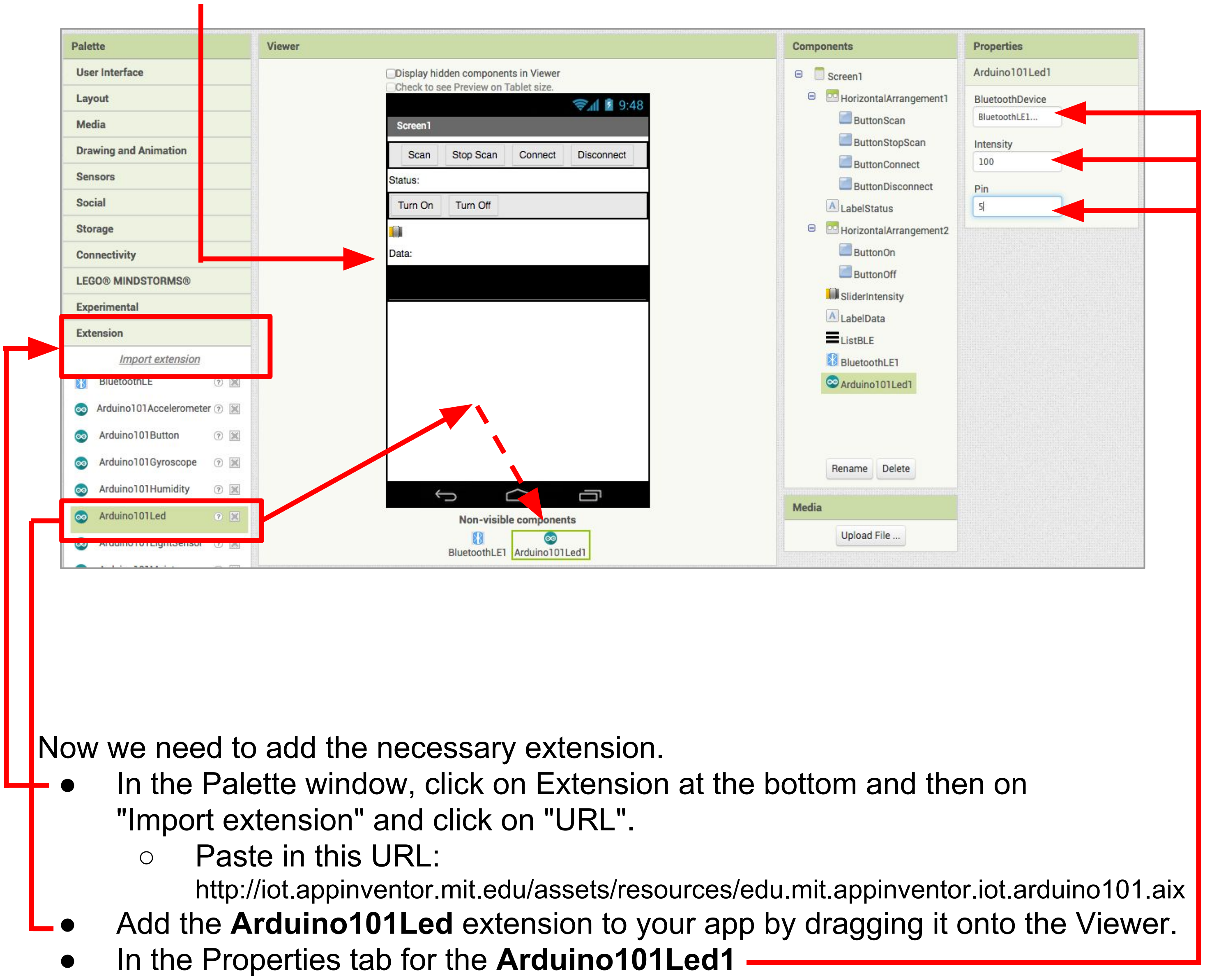


SliderIntensity

ColorLeft: Orange
ColorRight: Gray
Width: Fill parent...
MaxValue: 100.0
MinValue: 0.0
ThumbEnabled: ✓
ThumbPosition: 30.0
Visible: ✓

Drag a **Label** from the User Interface drawer in the Palette window and drop it between **SliderIntensity** and **ListBLE.**

- Rename the **Label** "LabelData".
- Change its Text property to “Data: “.



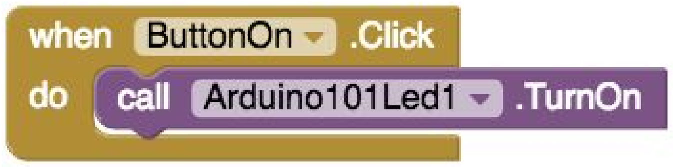
Now we need to add the necessary extension.

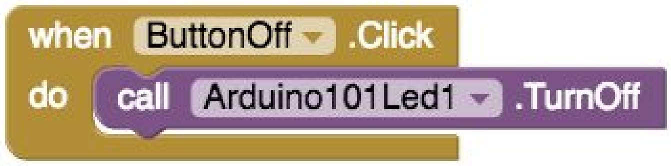
- In the Palette window, click on Extension at the bottom and then on "Import extension" and click on "URL".
  - Paste in this URL: http://iot.appinventor.mit.edu/assets/resources/edu.mit.appinventor.iot.arduino101.aix
- Add the **Arduino101Led** extension to your app by dragging it onto the Viewer.
- In the Properties tab for the **Arduino101Led1**
  - Set *BluetoothDevice* to "BluetoothLE1".
  - Check that *Intensity* is set to "100."
  - Set *Pin to* the digital pin that matches the one the LED control is plugged into on the Grove board. (in this case D5)
  - *Note: You only need to put the number (5), not the letter ”D”.*

Now switch to the Blocks Editor view

Now we need turn the LED on and off when we press the buttons.

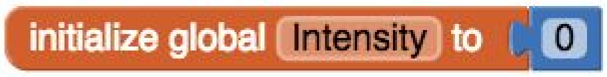
- From the Blocks pane, click on **ButtonON** and drag a **when ButtonOn.Click** block into the Blocks viewer.
- From **Arduino101Led1** in the Blocks pane, add **call ArduinoLed1.TurnOn.**
- From the Blocks pane, click on **ButtonOFF** and drag a **when ButtonOff.Click** block into the Blocks viewer.
- From **Arduino101Led1** in the Blocks pane, add **call ArduinoLed1.TurnOff**


when ButtonOn .Click
do call Arduino101Led1 .TurnOn


when ButtonOff .Click
do call Arduino101Led1 .TurnOff

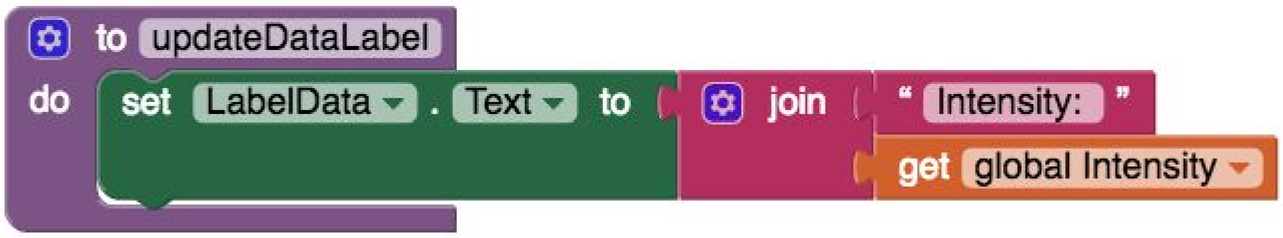
Next we need to store the data we receive from the sensor.

- From the Variables drawer in the Blocks pane, drag an **initialize global name to** block and name it "Intensity".
- From the Math drawer add a number block and set it to "0". We'll use this to keep track of the slider setting for the LED brightness (intensity).


initialize global Intensity to 0

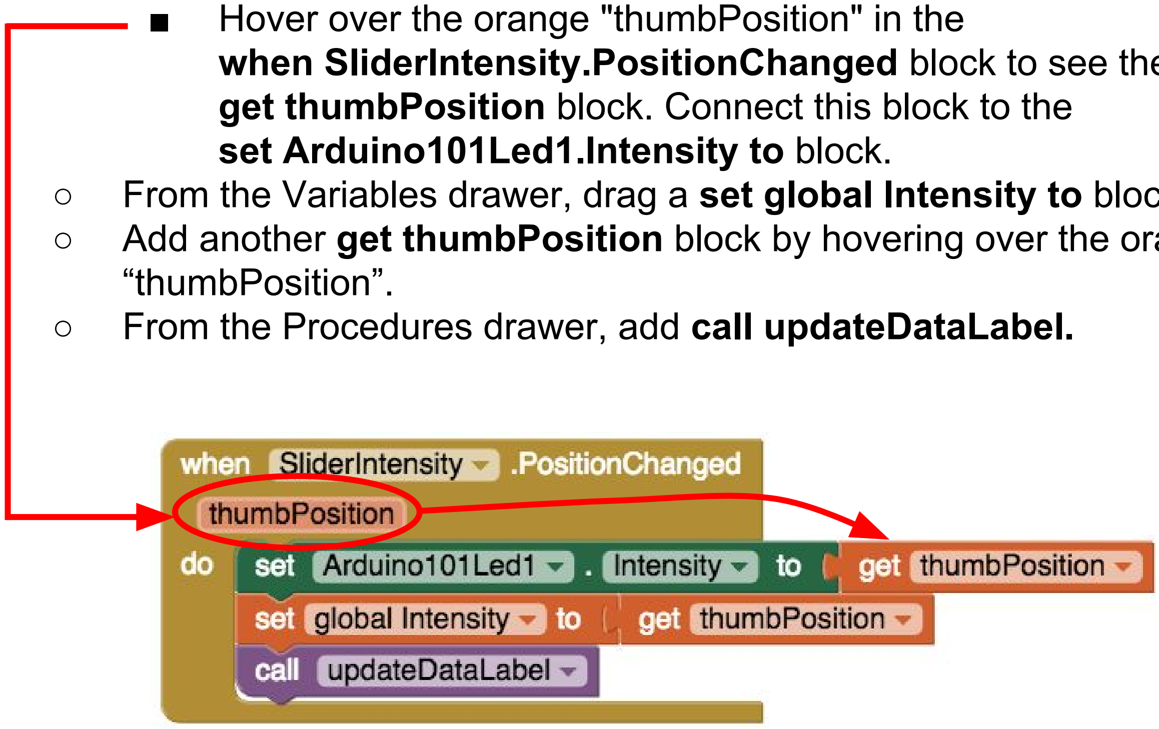
Let's make a new procedure to display the current LED intensity in the **LabelData**. You can create a procedure by dragging out a purple procedure block from the Procedures drawer in the Blocks pane. Let's rename it **updateDataLabel.**

- From LabelData in the Blocks pane, add a **set LabelData.Text to** block.
  - From the Text drawer, add a **join** block.
  - From the Text drawer drag out a text block and type in **"Intensity: "** and snap to the **join** block**.**
  - From the Variables drawer, drag out a **get global Intensity** block and snap to the **join** block**.**

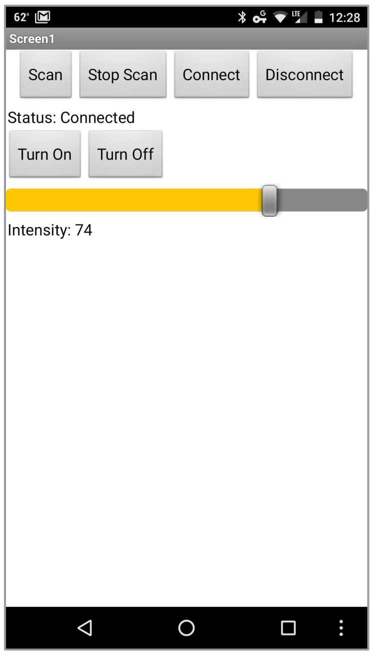

to updateDataLabel
do set LabelData . Text to join " Intensity: "
get global Intensity

Finally, we want to change the brightness of the LED when we move the slider.

- From **SliderIntensity** in the Blocks pane, drag out **when SliderIntensity.PositionChanged.**
    - from the Variables drawer, add **set Arduino101Led1.Intensity to.**
        - Hover over the orange "thumbPosition" in the **when SliderIntensity.PositionChanged** block to see the **get thumbPosition** block. Connect this block to the **set Arduino101Led1.Intensity to** block.
    - From the Variables drawer, drag a **set global Intensity to** block.
    - Add another **get thumbPosition** block by hovering over the orange “thumbPosition”.
    - From the Procedures drawer, add **call updateDataLabel.**


when SliderIntensity .PositionChanged
thumbPosition
do set Arduino101Led1 . Intensity to get thumbPosition
set global Intensity to get thumbPosition
call updateDataLabel

Your app should now be working! Connect your Arduino device using the MIT AI2 Companion (if you haven't already). Test it out by pressing the "On" and "Off" buttons, and moving the slider left and right. The LED light on your Arduino board should respond.



Status: Connected

Intensity: 74