Lightshow Pi Hardware Setup

using a Breadboard and Breakout board

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First Things, First

- The first thing you need to do is setup your Raspberry Pi.
- Next follow the instructions on the LightshowPi Wiki

Advice

The best piece of advice that I can give, that was given to me, is do NOT let the breakout board confuse you. It simply transfers the GPIO pins from the Pi to the breadboard, making them easily accessible. The second thing I (think) figured out, is that when working with the breadboard, connections are made in rows, not columns. I urge you to read to learn more about the breadboard.

Last but not least, just jump in and start playing. I felt overwhelmed at first, but just started reading various tutorials online and playing around with things.

Required Hardware:

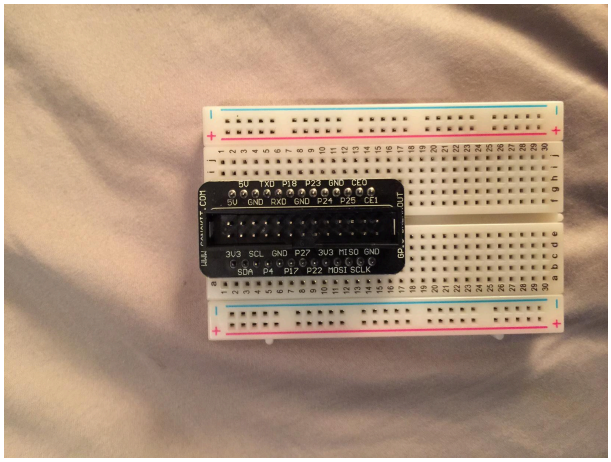
Raspberry Pi
Breadboard
26- or 40-pin Breakout board with accompanying ribbon cable
8 LEDs
8 Resistors
12 jumper cables

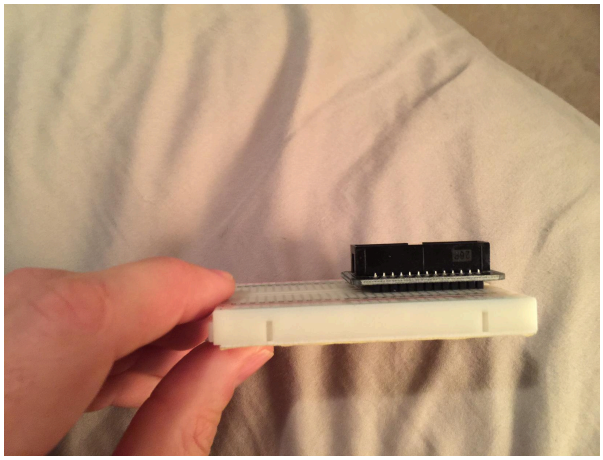
NOTE: I used the CanaKit Ultimate Starter Kit

Lets get started with LightShowPi!

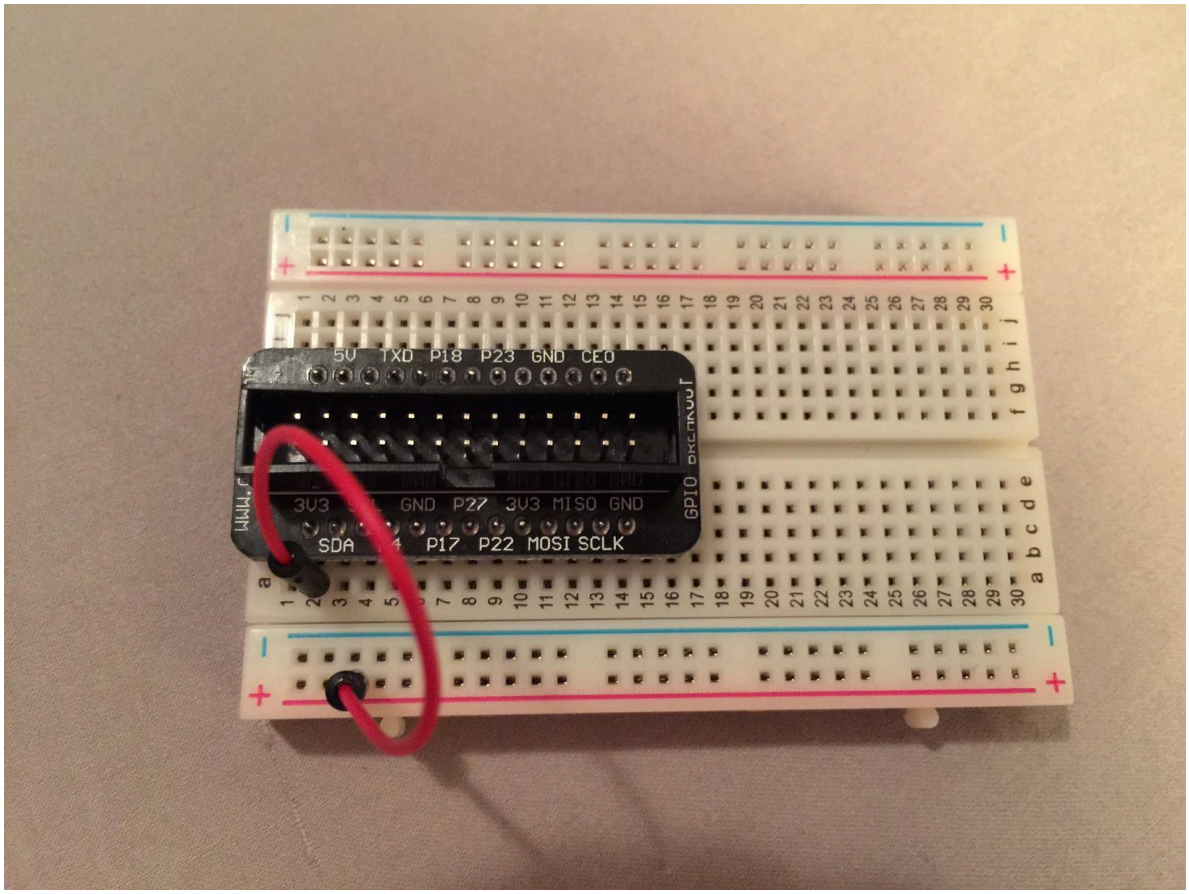
1. Connect the ribbon cable to the Pi and set it aside

2. Now we need to plug the breakout board into the breadboard. The important thing here, is to make sure pins of the breakout board are on opposite sides of the “bridge” (which runs down the middle of the breadboard). This keeps us from shorting out the Pi/LEDs. Align the holes and snap it into place, making sure it sits flush with the breadboard. This takes some force. If you have a smaller breadboard, do this near the top or bottom to save some room. Location, otherwise, doesn’t really matter though.

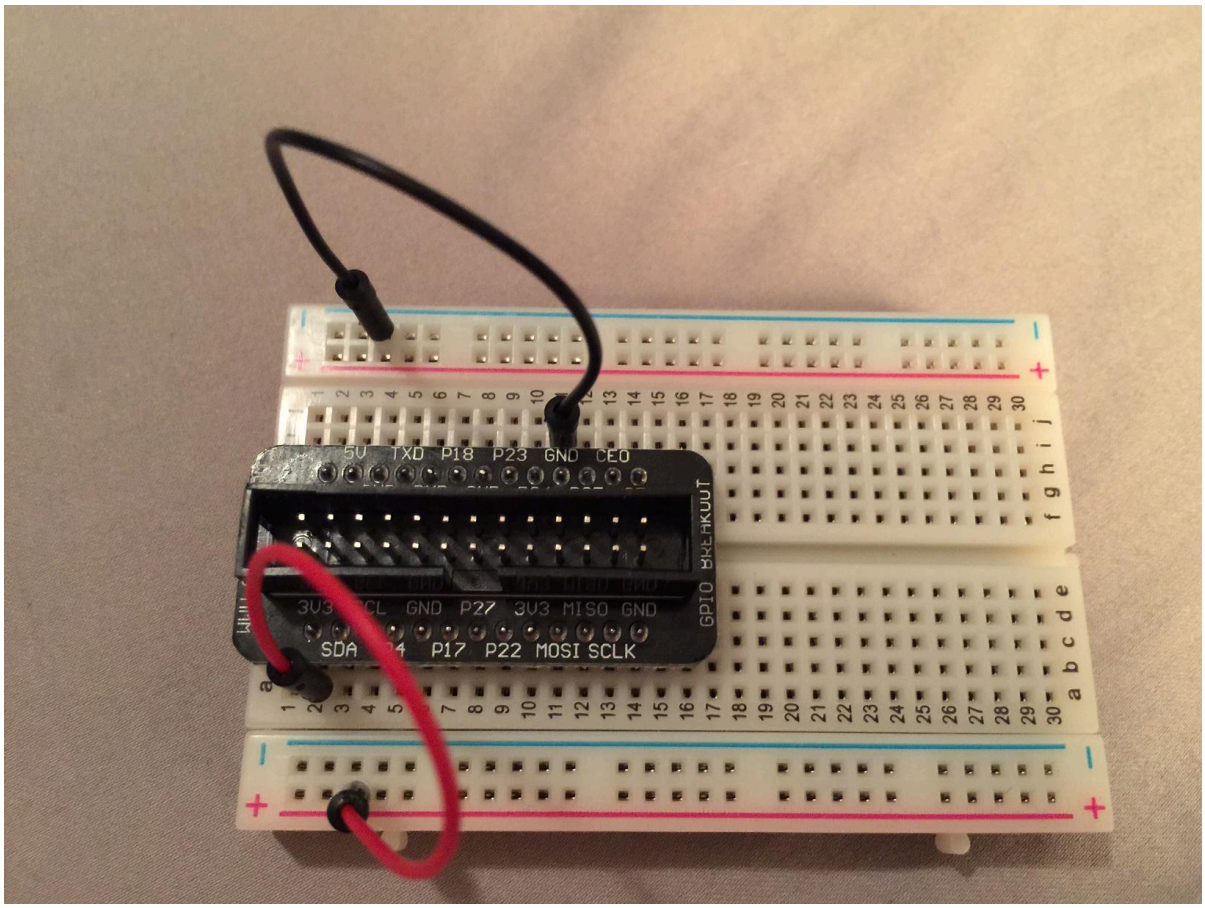




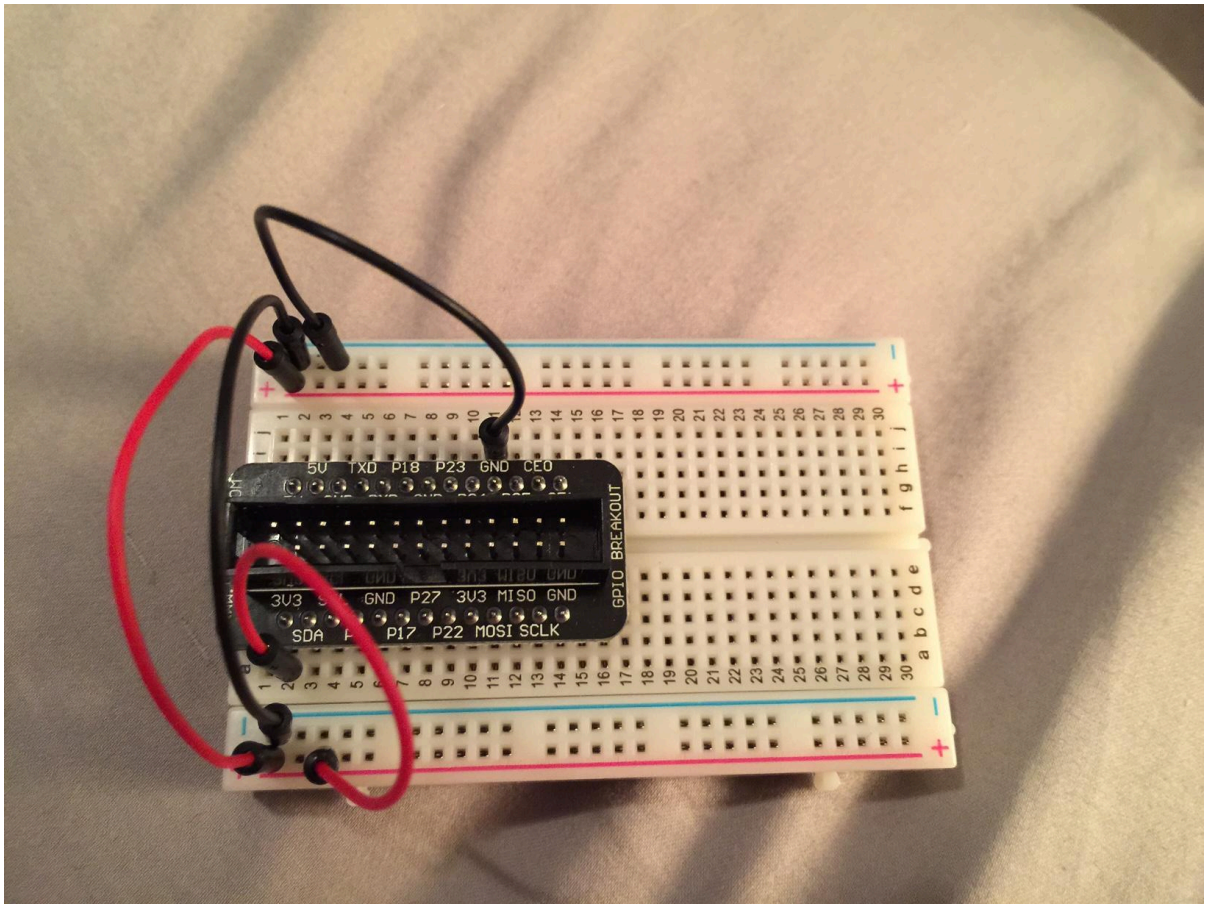
3. Locate the 3v3 pin (there may be multiple, any of them will do) on the on the breakout board and connect one end of a jumper cable in the same row. The other end of the jumper will connect to ANY of the holes on a power rail on the outside of the breadboard.



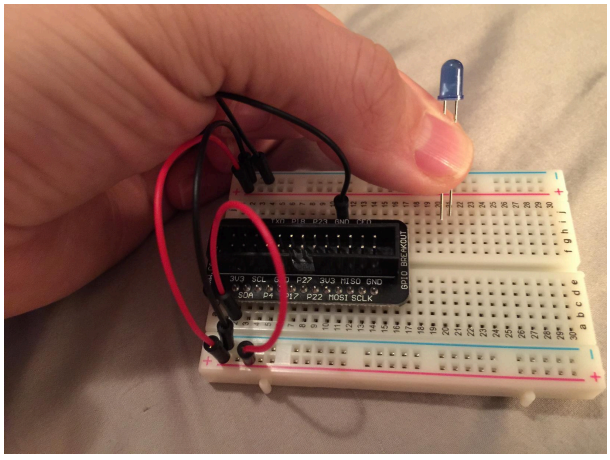
4. Locate the ground (GND) pin (there may be multiple, any of them will do) on the breakout board and connect one end of a jumper cable in the same row. The other end of the jumper will connect to ANY of the holes on a ground rail on the outside of the breadboard.

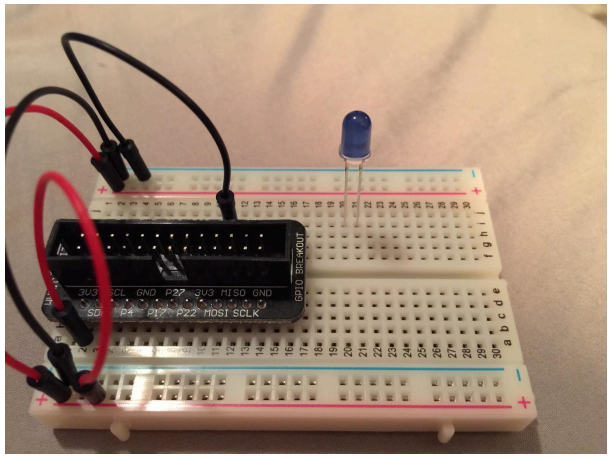


5. Next we are going to “bridge” the power and ground rails of both sides of the breadboard. I believe this “completes” the circuit to power both sides of the board, but I’m not entirely sure. I do know that it is necessary to do it though if you don’t connect the power (3v3 pin) and ground (GND pin) to opposite sides of the board, so it just seems like a good practice to follow.

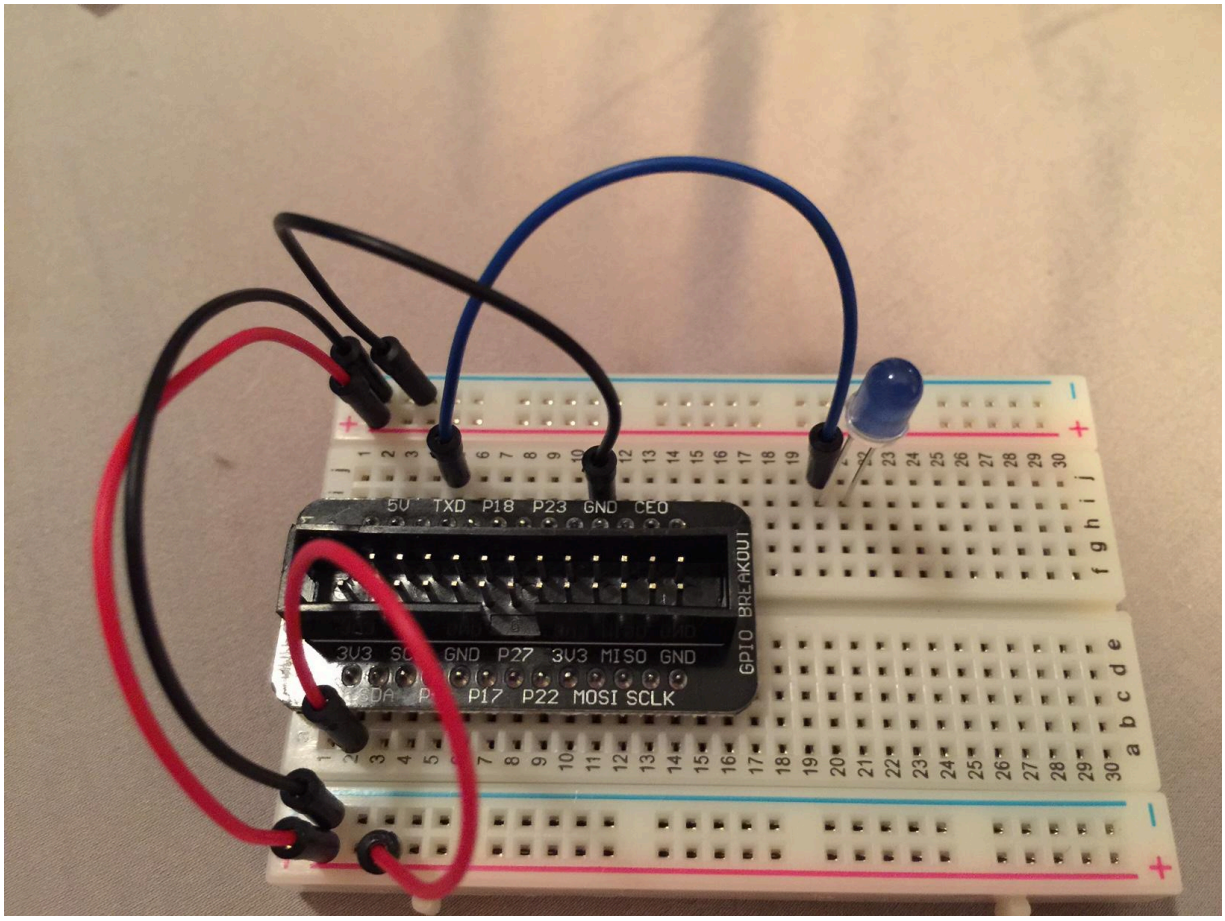


6. Now is a good time to test our progress. To do so, take your favorite color LED and place it your breadboard across 2 empty rows (pins in same column). Note the side that is longer, as this is the side you want to run the power to, from your GPIO pin.





7. Run a jumper from the UART-TXD GPIO pin (labeled TXD on the breakout board) to the same row of the longer side of the LED (left side in the picture). This GPIO pin receives power to it when the OS starts up and is running.



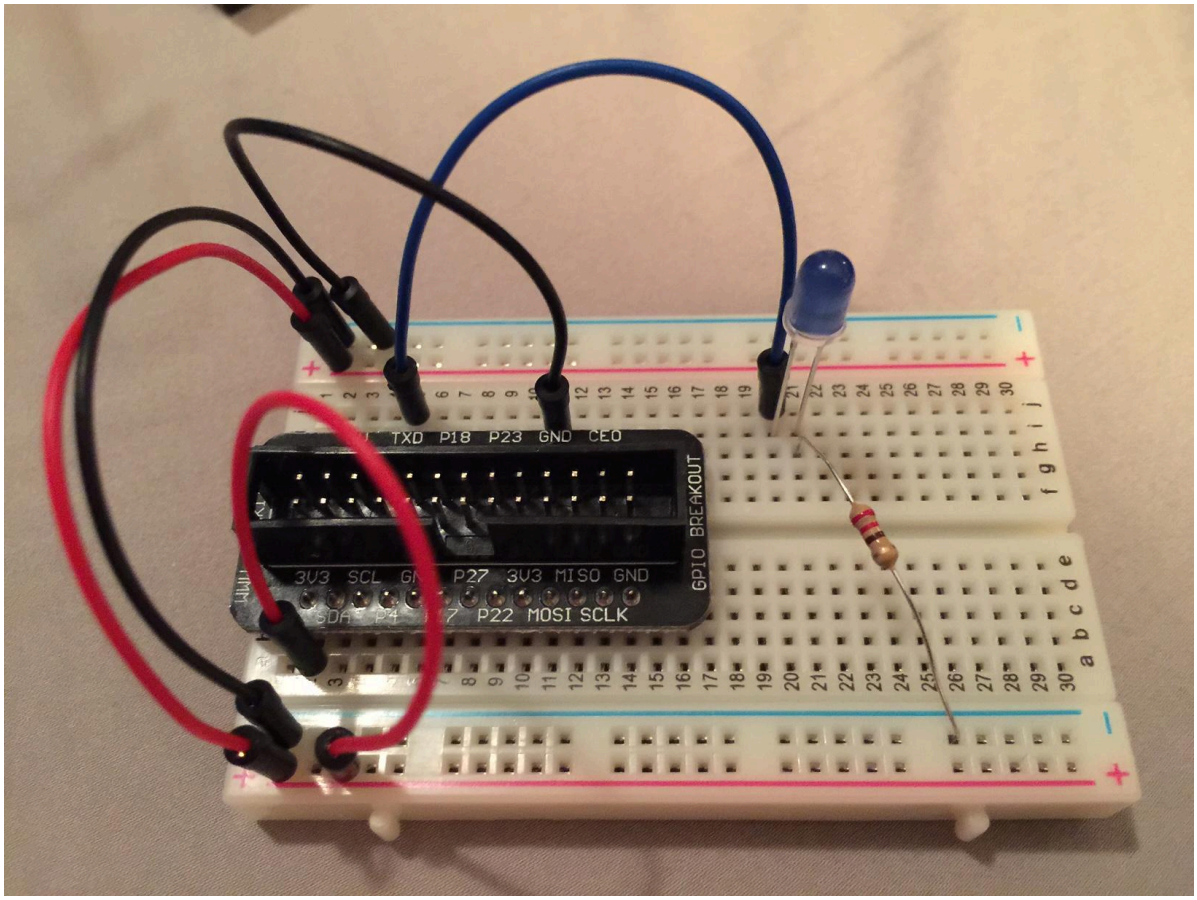
8. In order for us not to burn out the LEDs, we need to use a resistor. This will prevent the LED from getting too much current. To calculate we can use Ohm's Law. Since we want to calculate the resistance we need, we use the formula: R = V / I

   In more understandable terminology:
   Resistance (in ohms) = Voltage (in volts) / Current (in amps)

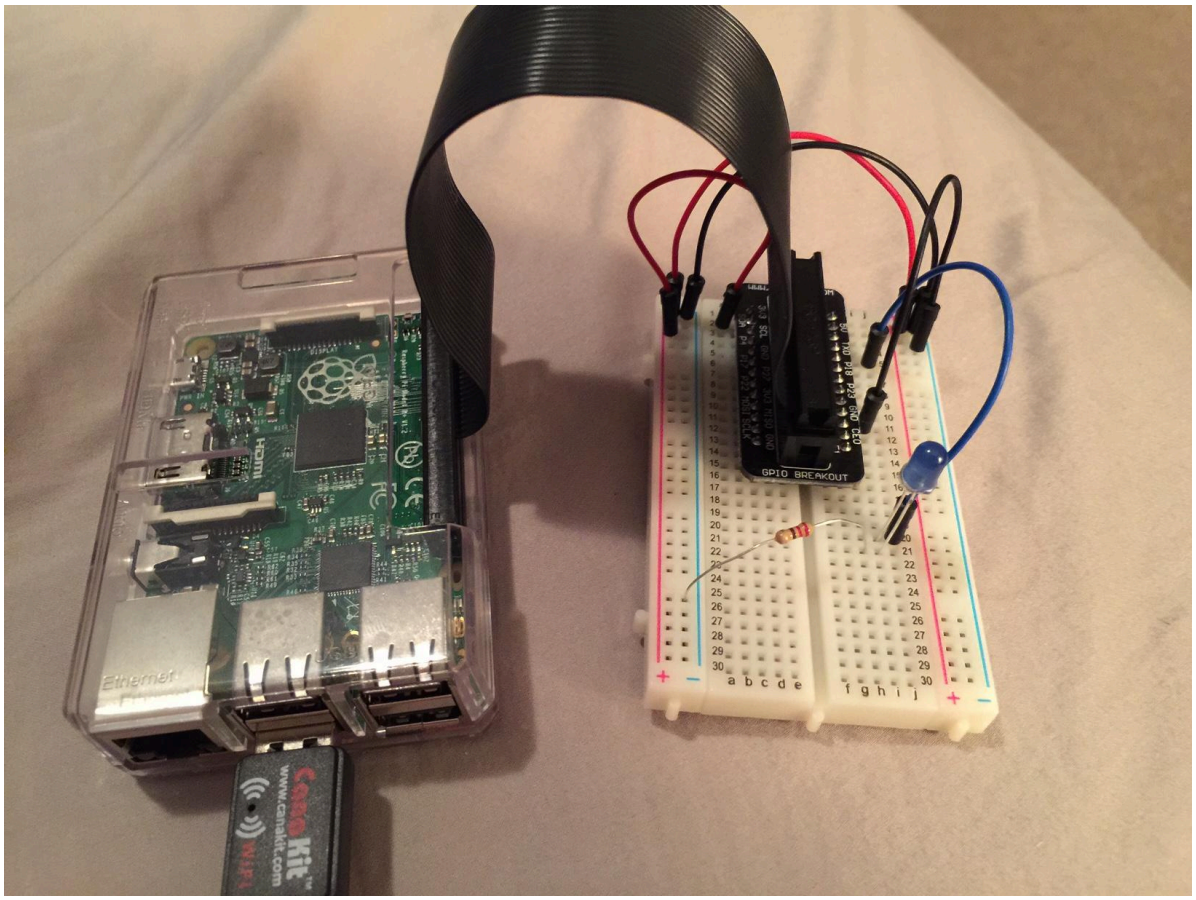
   For a 20 milliamp LED using 3.3V of power, we end up with:
   R = 3.3V / .02A

   This equals 165 ohms of resistance needed to keep the LED from receiving too much power. The lowest resistor I have is 230 ohms, but it still does the trick. Just realize that if you don't use enough resistance, you can burn out the LED and if you use too much resistance, the LED may not get enough power.

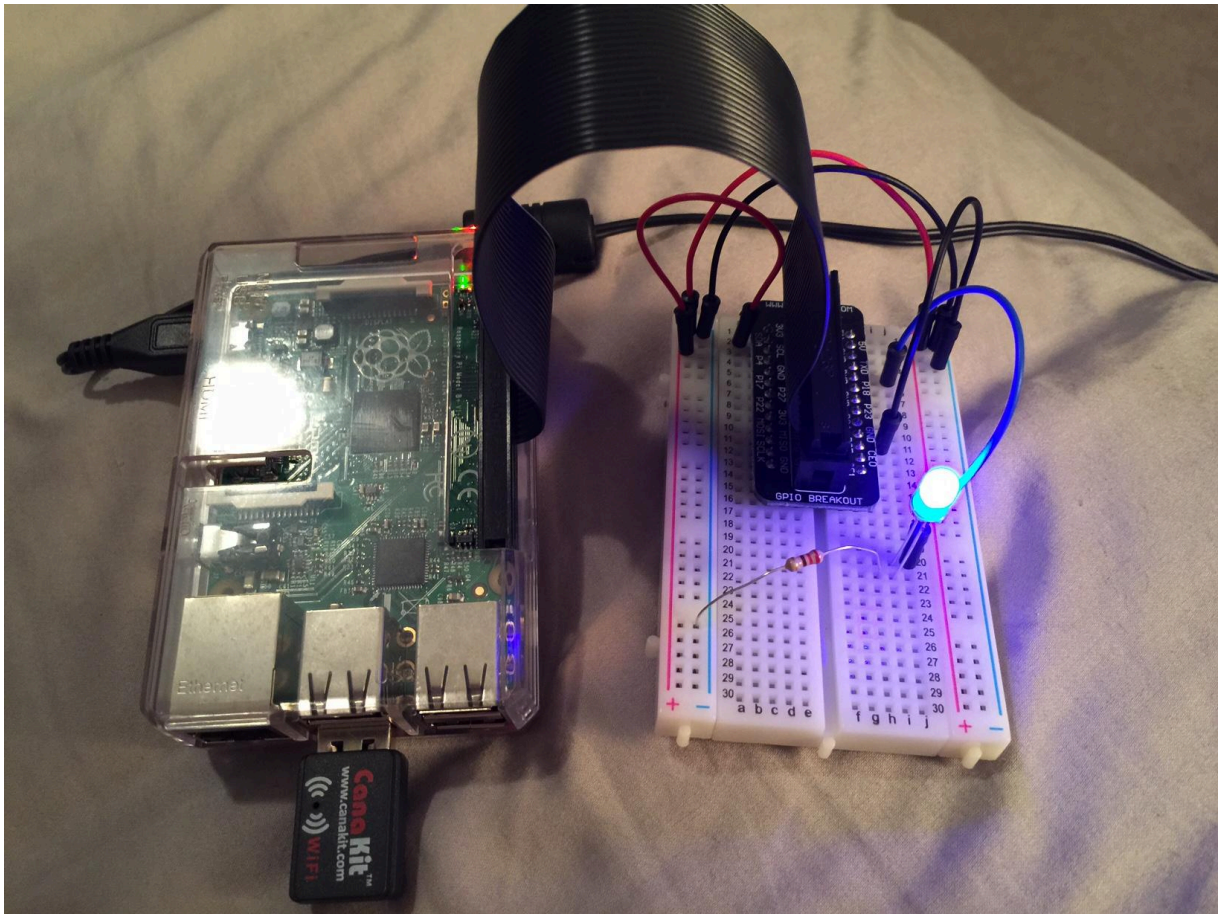
9. Now that we know how much resistance we need, we put our resistor in place, with one end connected to a ground rail and the other end in the same row as shorter side of our LED (right side)


TXD P18 P23 GND CE0
GPIO BREAKOUT
3V3 SCL
P27 3V3 MISO GND
P22 MOSI SCLK

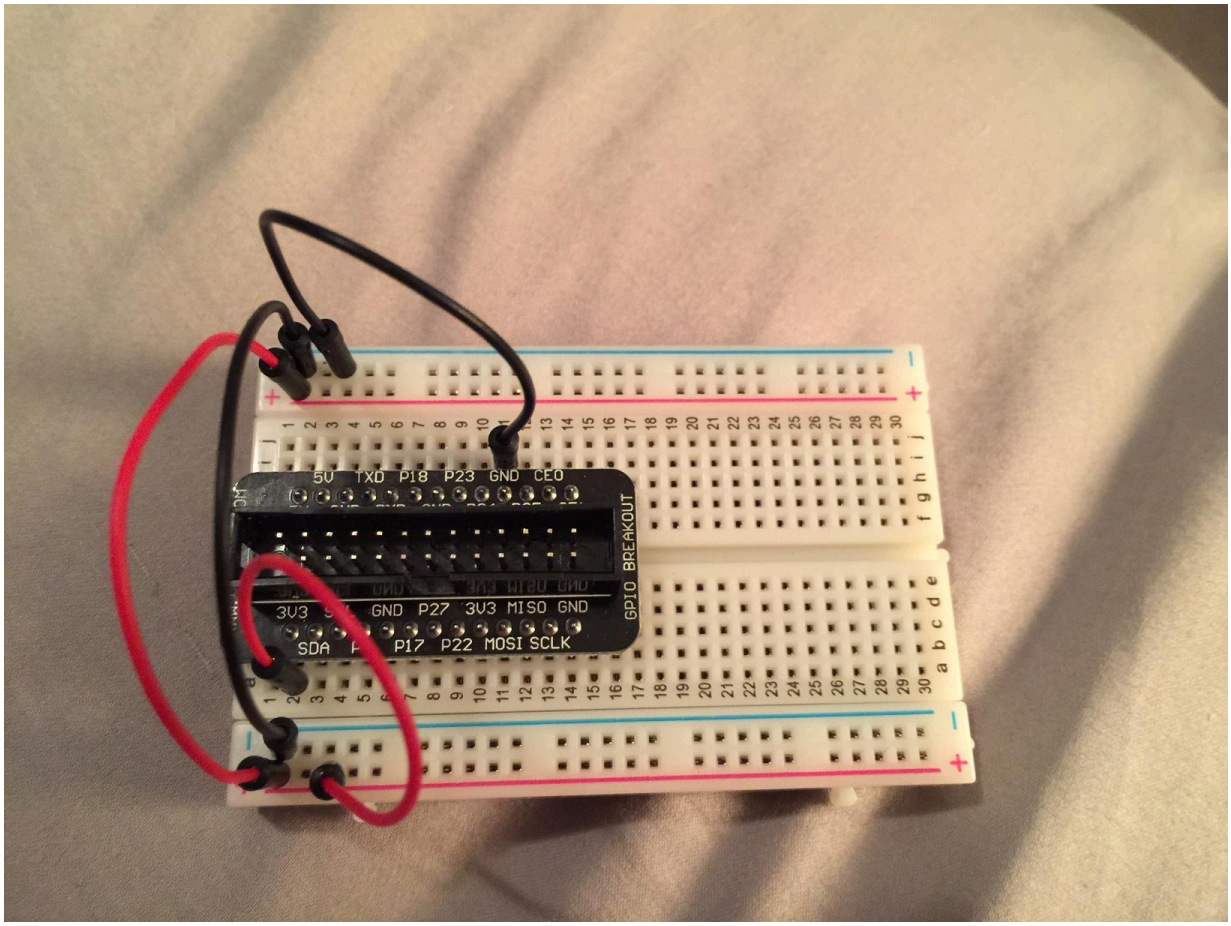
10. Now we are ready to connect up the ribbon cable from our Pi to our breakout board



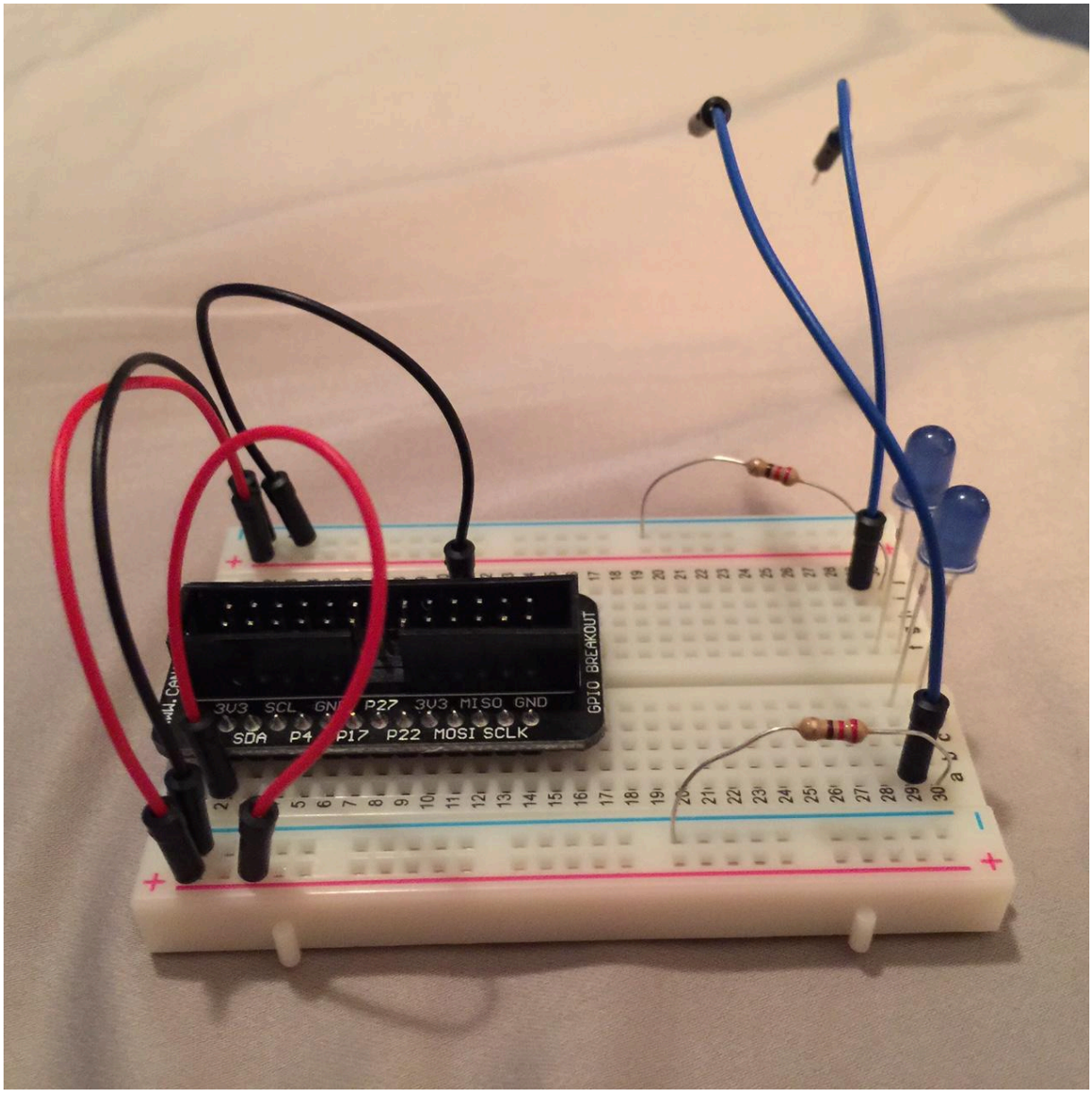
11. Power up your Pi. Once the OS kicks off, you should see the LED shine in all its glory!

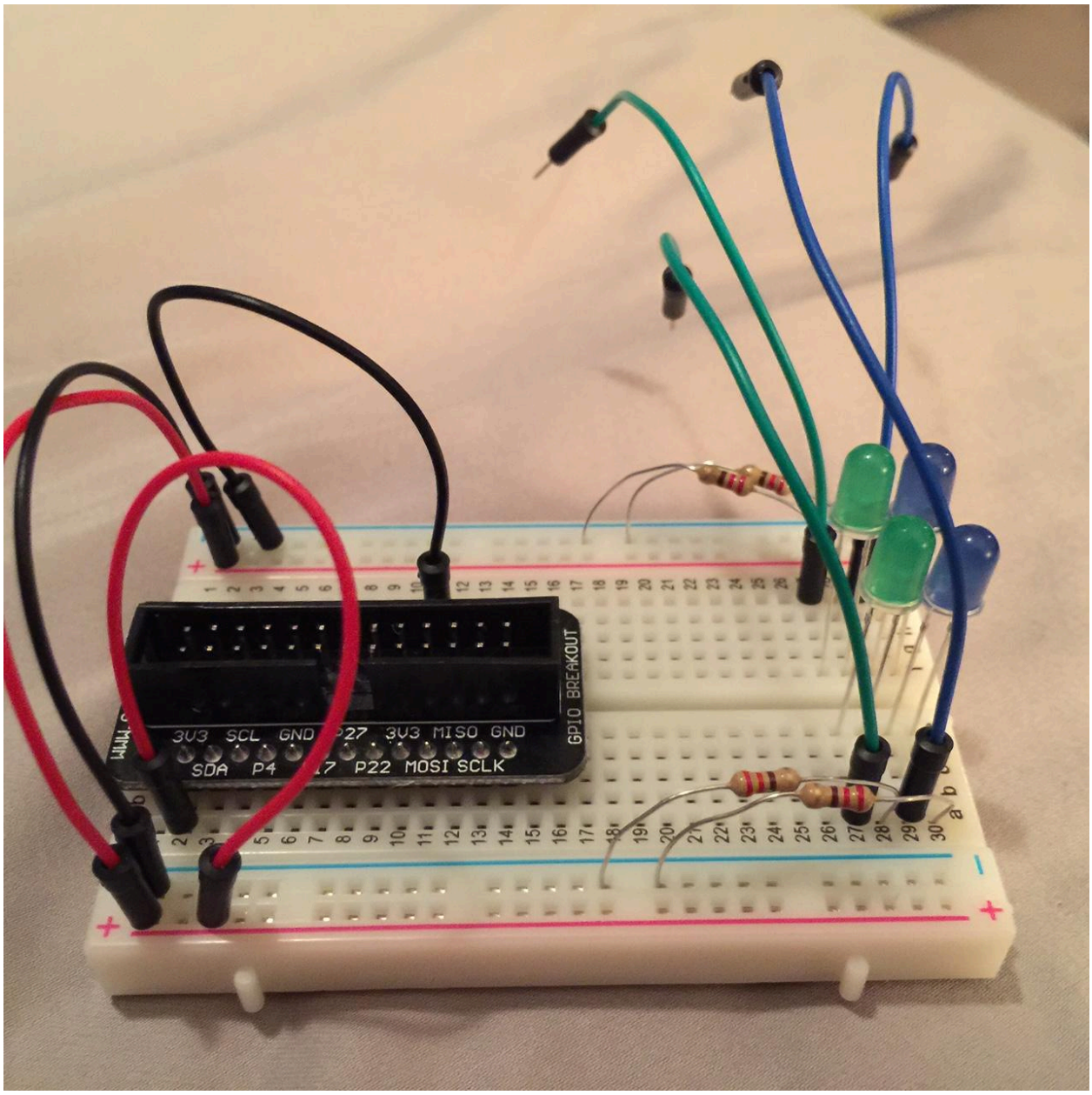


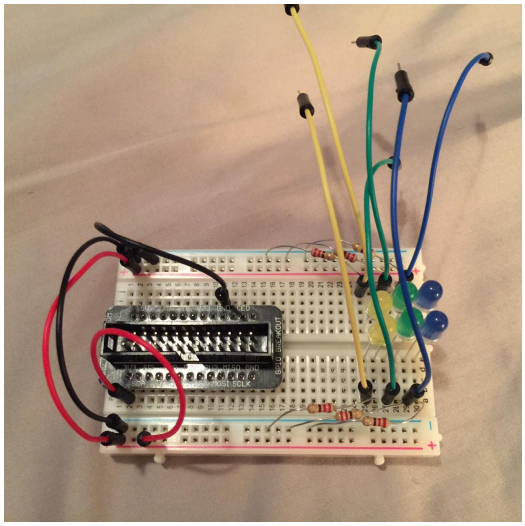
12. Okay, so now we have a working LED. Power down the Pi, disconnect the ribbon cable from the breakout board, remove the LED, resistor and TXD jumper cable. Your breadboard should once again look like this:

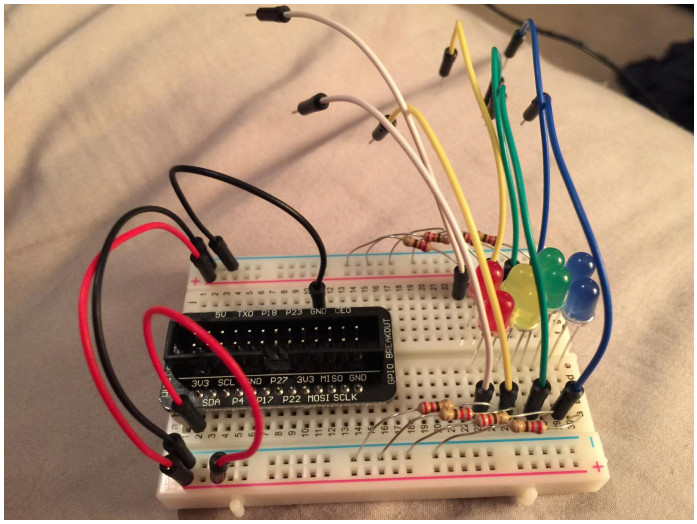


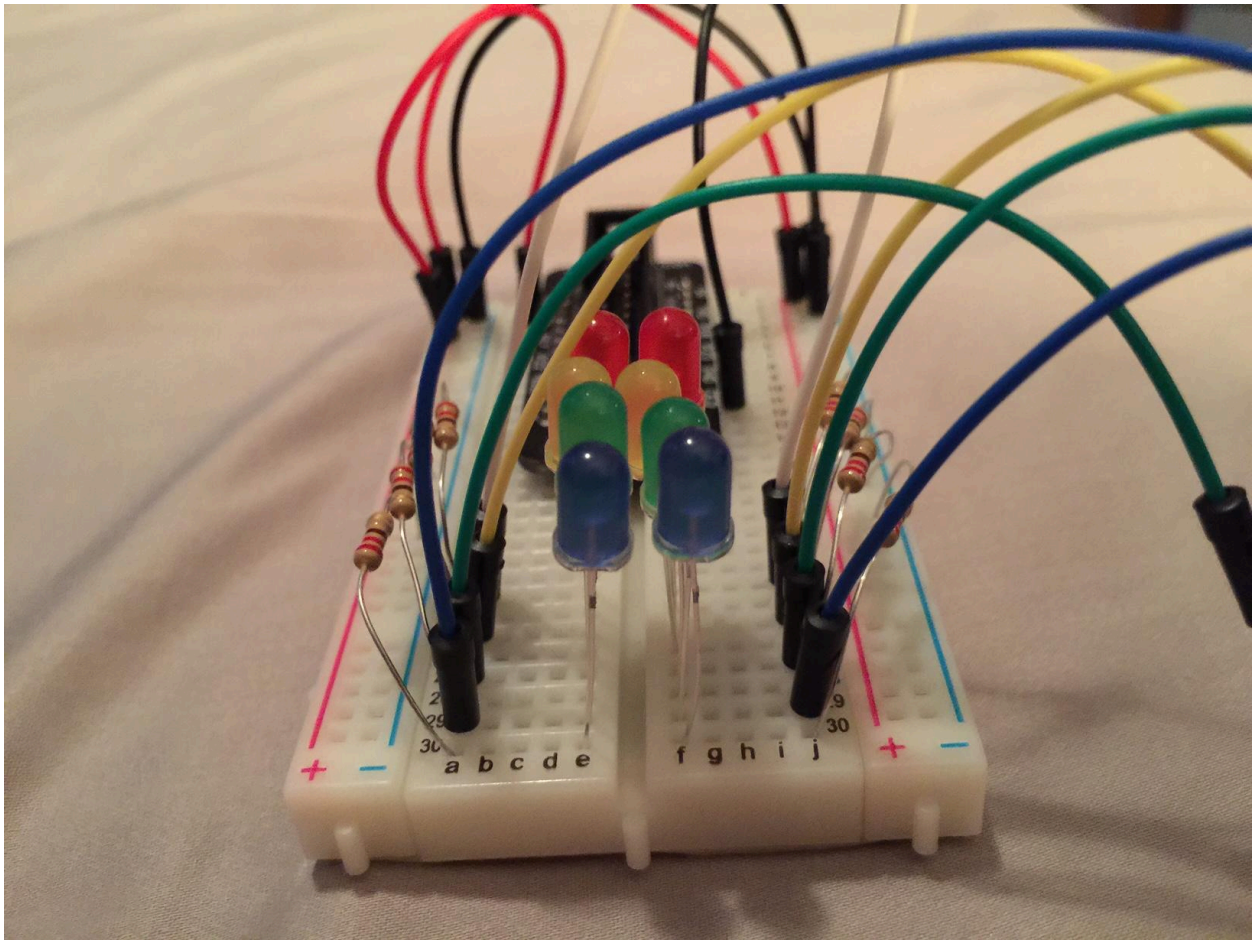
13. Next, to speed things up a little, lets go ahead and connect up our 8 LEDs, the LED end of our jumper cables and our resistors. Remember, the jumper cable connects to the same row as the longer end of the LED and the resistor connects to the same row as the shorter end of the LED. To make it easy to remember we will put the long-side of the LED on our left for all 8 of them.


3V3 SCL GND P27 3V3 MISO GND
SDA P4 P17 P22 MOSI SCLK
GPIO BREAKOUT

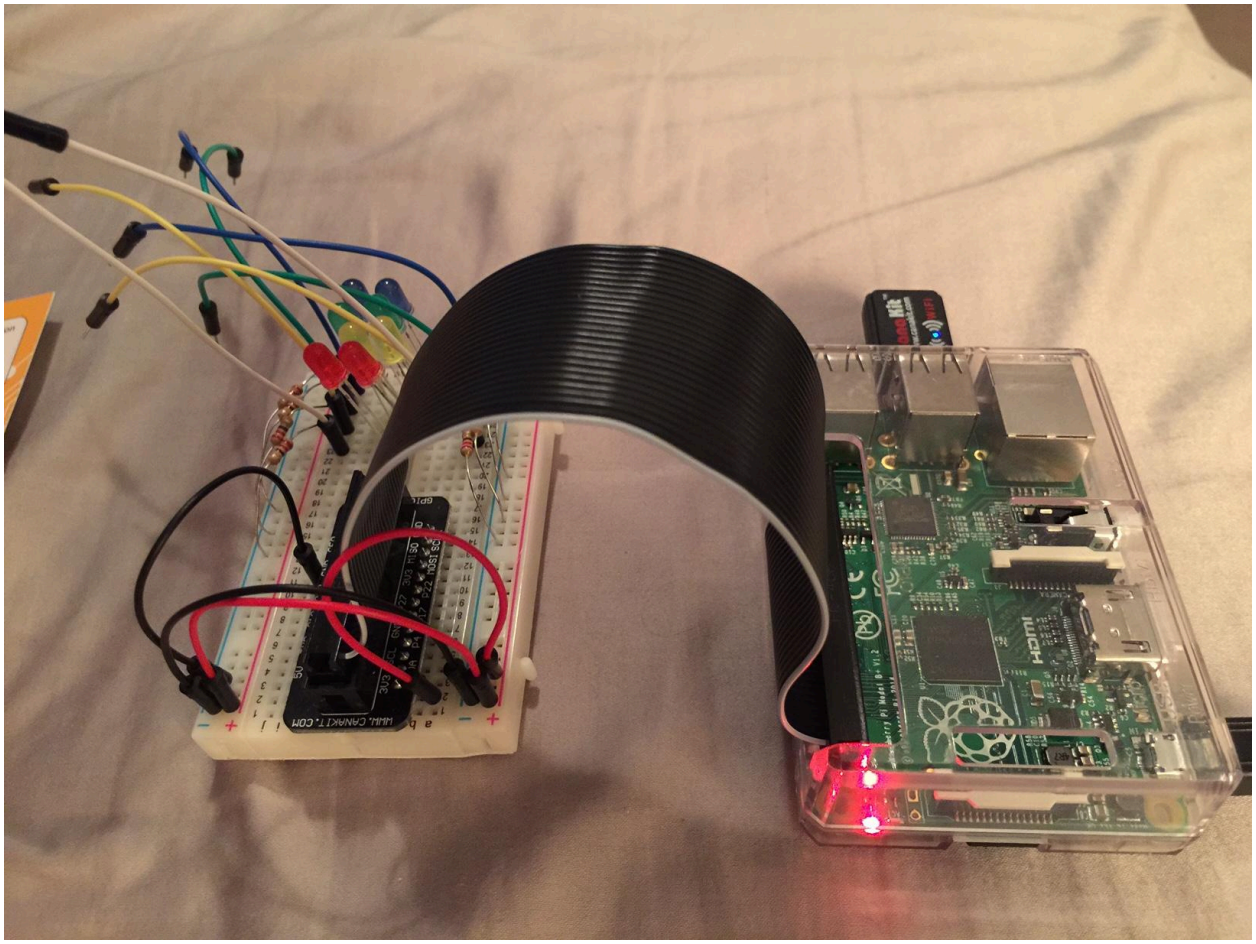

3V3 SCL GND
SDA P4
P22 MOSI SCLK
3V3 MISO GND
GPIO BREAKOUT







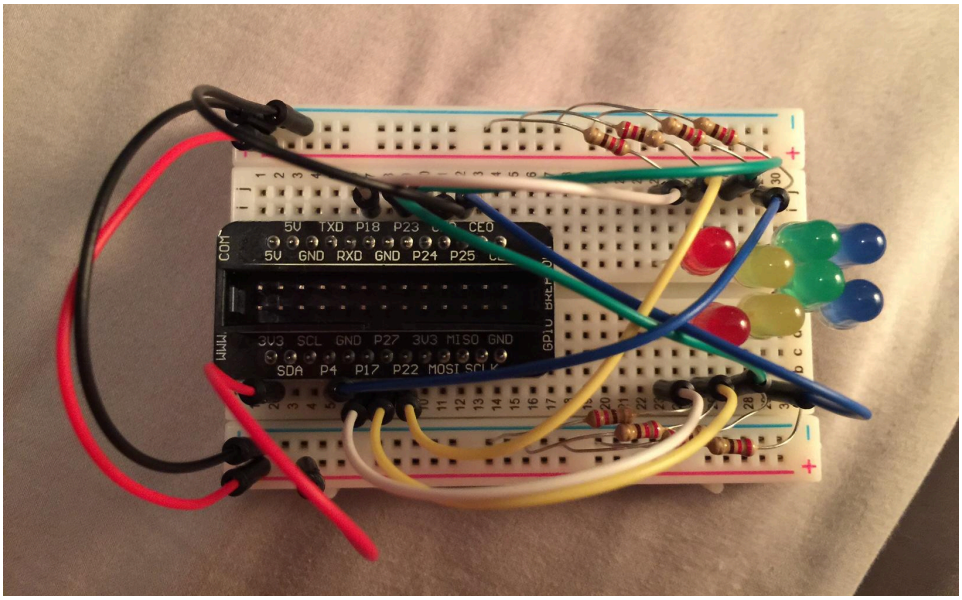
14. All thats left is to connect the jumper to the proper GPIO pin. Unfortunately, these didn't seem to match up the way I thought, so I did it by trial and error. To figure out what's what, boot up and login to your Pi and connect the ribbon cable from the Pi to the breadboard.



15. From the wiki, [follow these steps](#).
    NOTE: make sure you are in the ‘lightshowpi’ directory.

16. The script that is now running is flashing each GPIO pin (LED) in succession. All we need to do is take the disconnected end from one of the LED jumper cables and try each pin. Here’s what I found…

    P17: Channel 0
    P18: Channel 1
    P27: Channel 2
    P22: Channel 3
    P23: Channel 4
    P24: Channel 5
    P25: Channel 6
    P4: Channel 7



Now you're ready to play your first song! Enjoy!

Flashing lights video
Lights to music video