



DIY Magic Mirror

Building the Magic Mirror Sensor Hub
Board Version 4.0

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Part List

Part	Qty	Description
Arduino Board	1	Arduino Diecimila, Duemilanove, and Seeeduino have been tested
DIY Magic Mirror Custom PCB	1	2 Layer PCB Layer Board: 3 inches x 2.70 inches
10K Linear Potentiometer (PCB Mount)	1	16mm Pot, Linear Pot, 20mm shaft length, teeth kurl shaft type, 41 detent preferred but 21 or 11 detent also ok, PC pins (not Long Pins or Rear Adjust PC Pins)
10K Linear Potentiometer	1	Panel Mount Potentiometers Linear D-Shaft 10K, for externally mounted POT
5mm LED Blue	1	
Male DB9 Connector - PCB Right Angle Mount	1	
40-Pin Header	1	
220 Ohm 1/4 watt resistors	4	
10K Ohm 1/4 watt resistors	5	
SPDT Slide Switch	1	SPDT slide switch ON-ON with .1" spacing

Part	Qty	Description
Buckled Connectors	7	Used for the plug and play sensors
6 Position Screw Terminals	2	
JST 2 Pin Jack	1	
JST 2 Pin Power Connector	1	
USB Cable	1	Mini-USB cable if using Seeeduino
Red Stranded Wire 24 AWG	1	Length will depend on how much wire is needed for your installation
Black Stranded Wire 24 AWG	1	Length will depend on how much wire is needed for your installation
White Stranded Wire 24 AWG	1	Length will depend on how much wire is needed for your installation
3 ft Cat-5e cable - White (Stranded UTP, T568B wiring convention)	1	OPTIONAL - Must be Stranded and T568B Wiring Convention One end of the cable will plug into the DIY Magic Mirror PCB board and then other end will be cut-off and the user will connect the sensors to the corresponding wire per the wiring diagram
3 ft Cat-5e cable - Black (Stranded UTP, T568B wiring convention)	1	OPTIONAL - Must be Stranded and T568B Wiring Convention One end of the cable will plug into the DIY Magic Mirror PCB board and then other end will be cut-off and the user will connect the sensors to the corresponding wire per the wiring diagram
RJ45 Jack (PCB Mount) – Black and White/Silver	2	OPTIONAL

Tools

- Soldering Iron
- Solder
- Wire stripper
- Wire cutters (flush edge)
- Safety Goggles
- Reusable Adhesive Puddy (Blue Stik, Blu-Tack, or equivalent)
- Panavise PCB holder (not required but helps if you have one)



Figure 1 – Tools

Building the Magic Mirror Sensor Hub

Background

Figure 1 shows the logical architecture of the DIY Magic Mirror. Running a program called Firmata, the Arduino sends sensor data to a serial server running on the PC. The serial server then passes the data to a local network port that the Magic Mirror software reads. The Magic Mirror software sends commands back to the Arduino for X-10 and LED control.

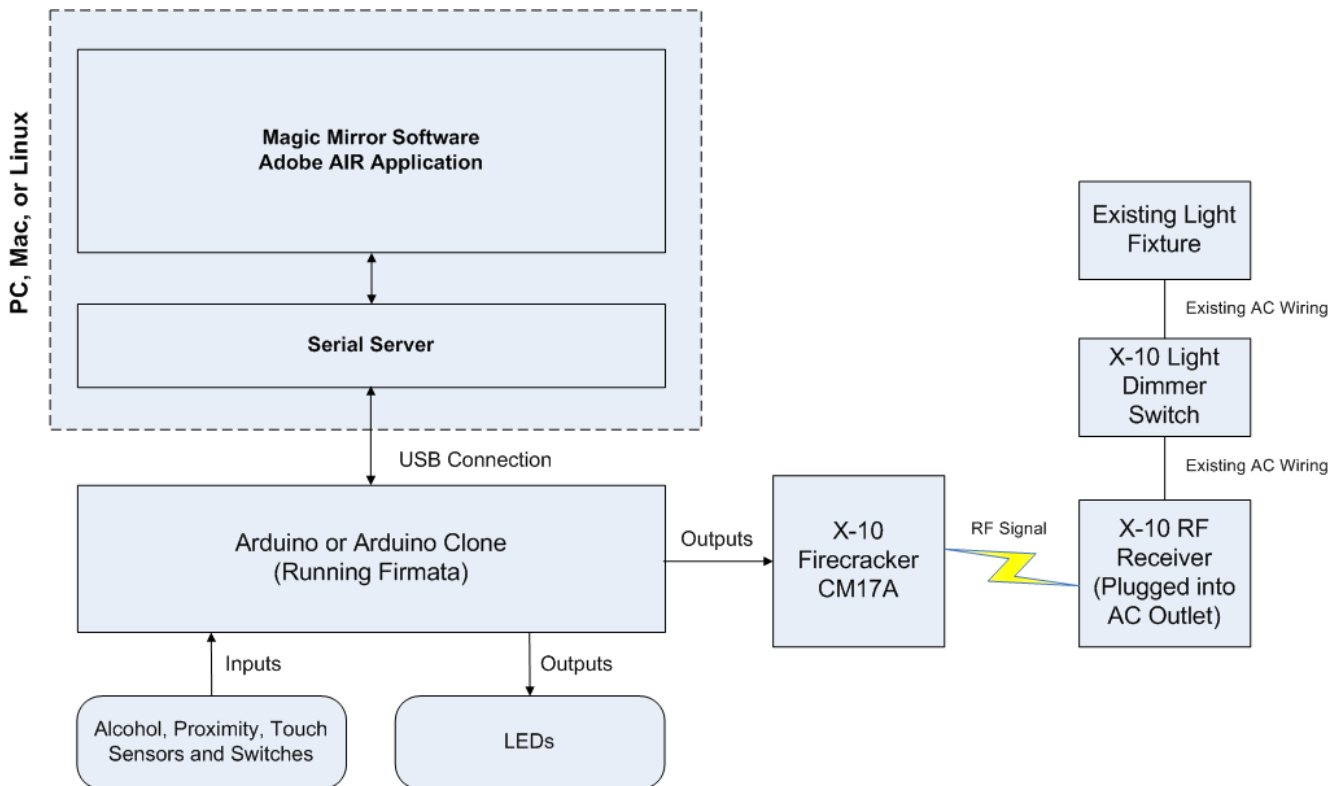


Figure 2 – DIY Magic Mirror Logical Architecture

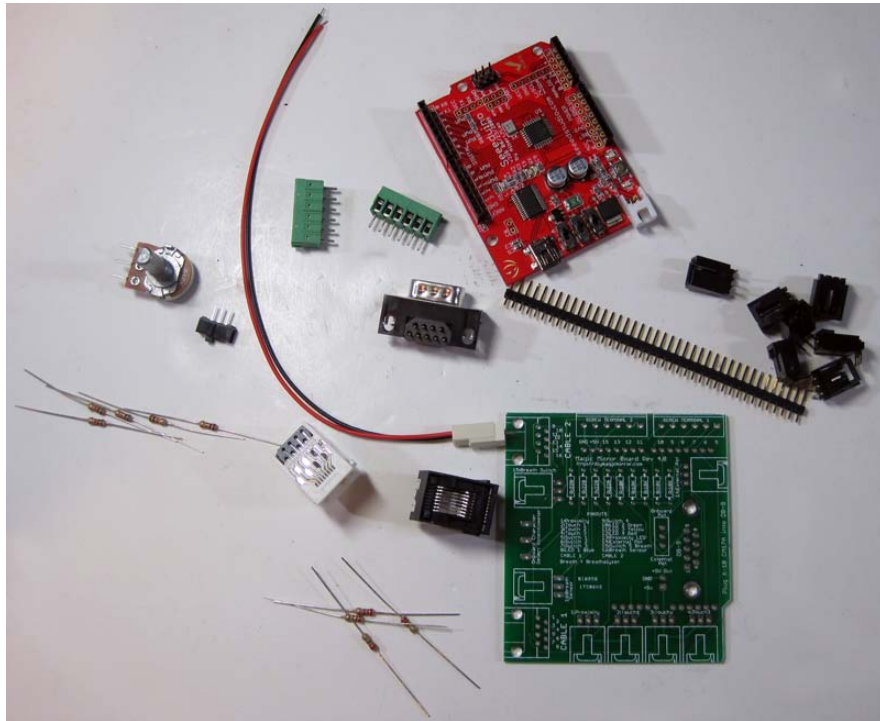


Figure 4 – Magic Mirror Kit

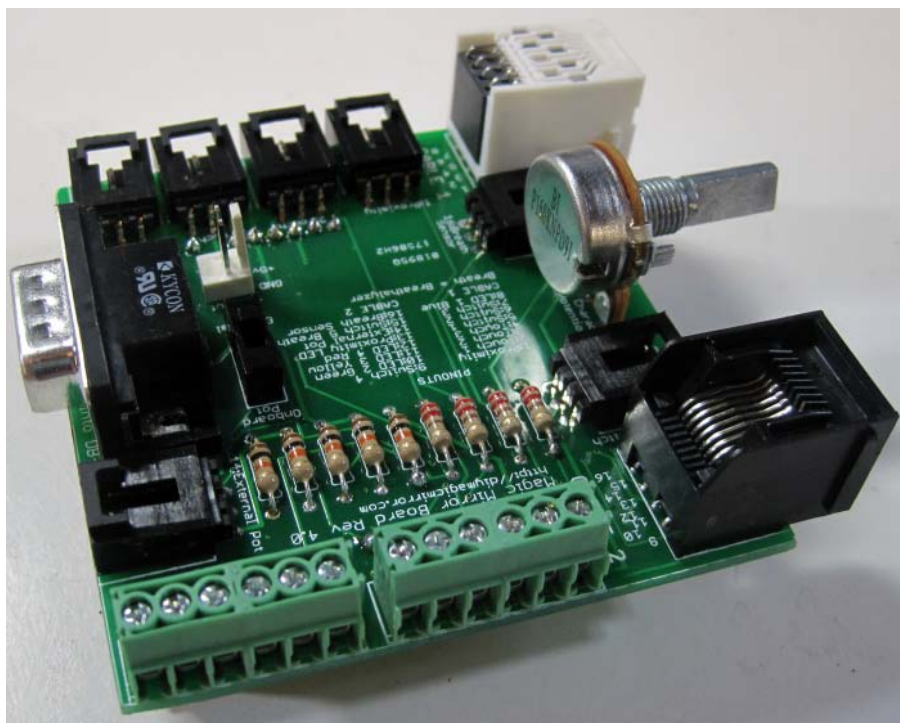
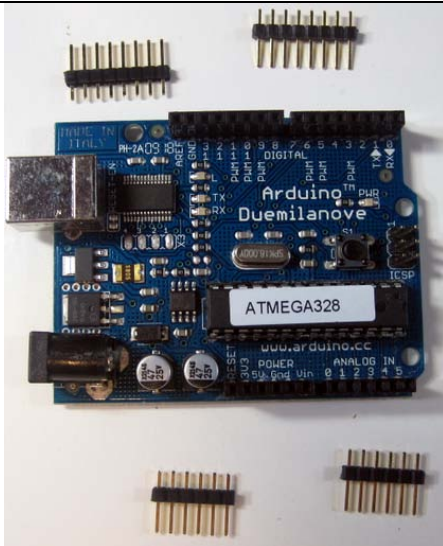
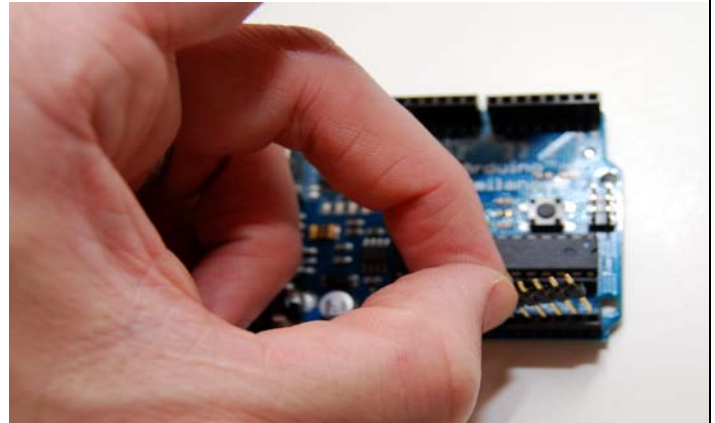


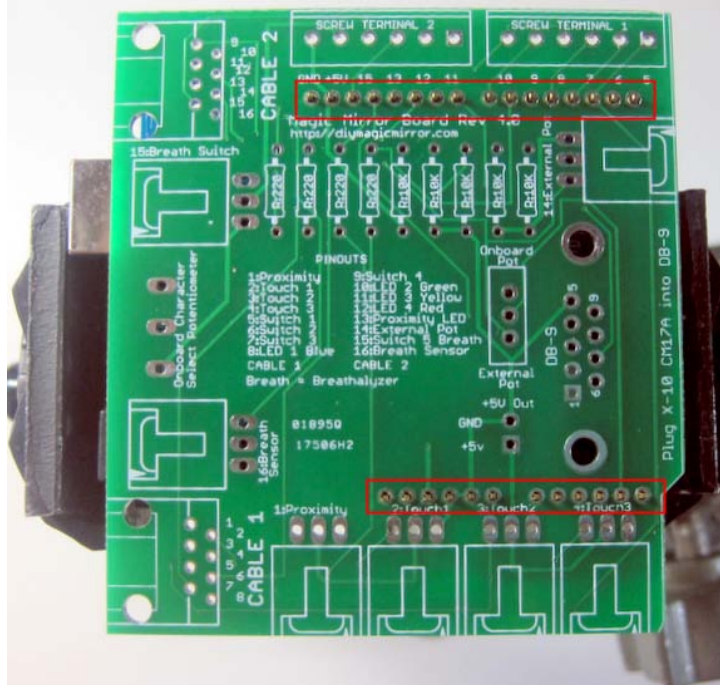
Figure 5 – Assembled Magic Mirror Hub



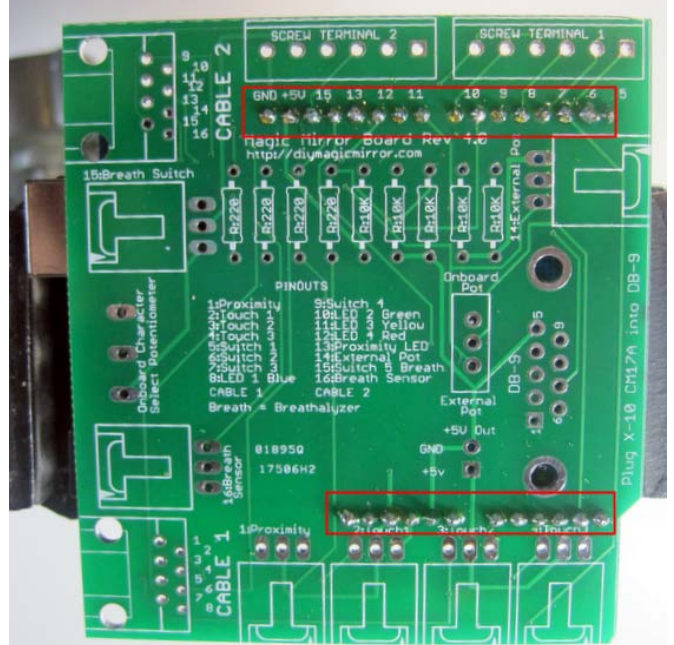
Using your pliers, separate the 40-pin header breakaway into 2 sections of 8 pins and 2 sections of 6 pins.



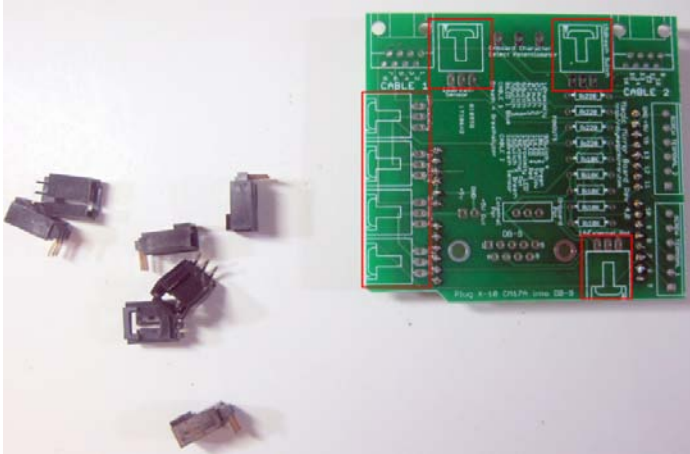
Plug the long end of the pins into the Arduino or Seeeduino.



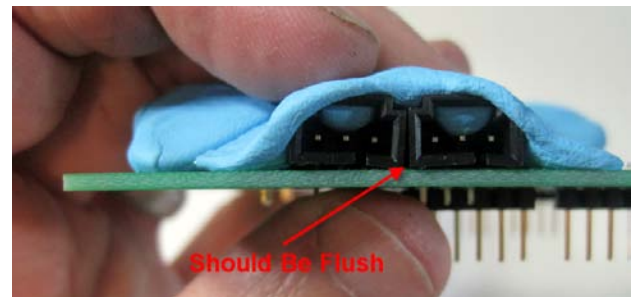
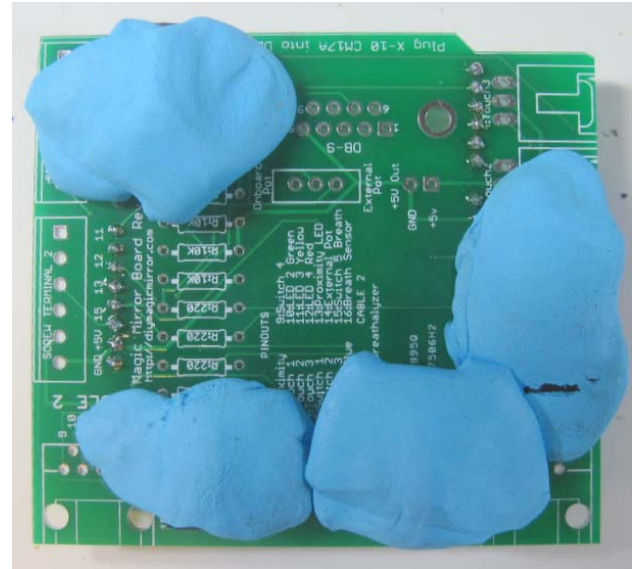
Set the Magic Mirror Shield on top of the Arduino lining it up with the header pins such that the pins are sticking out.



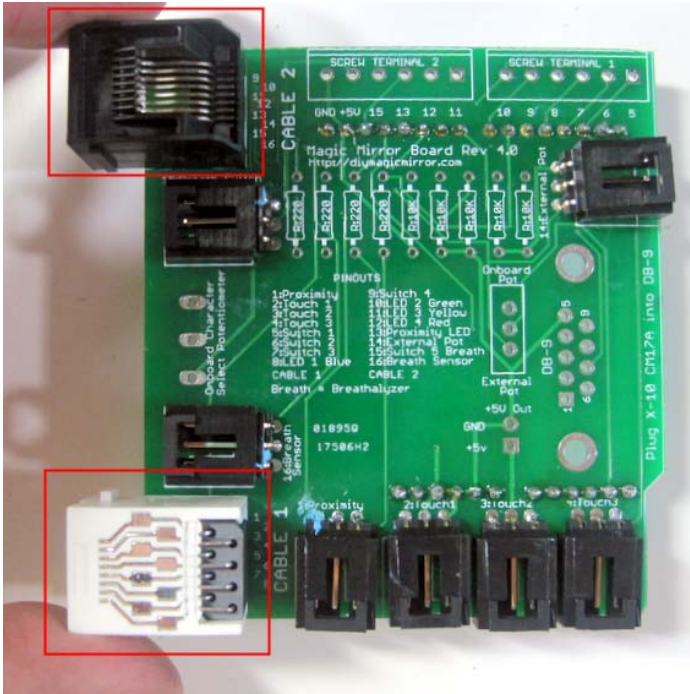
Solder



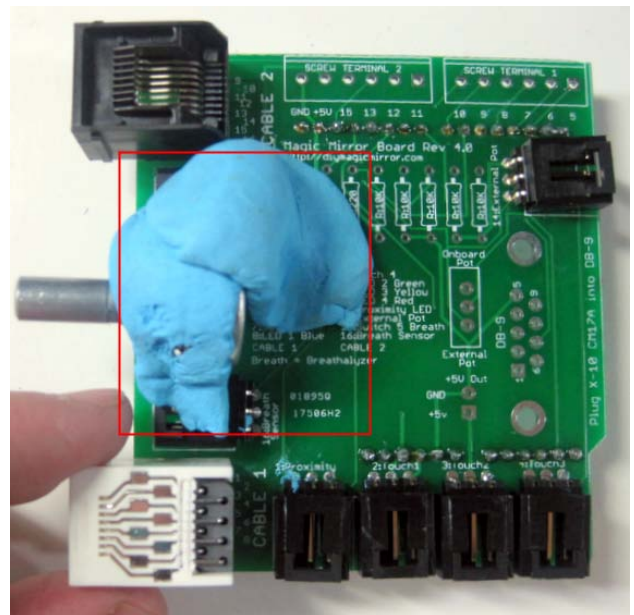
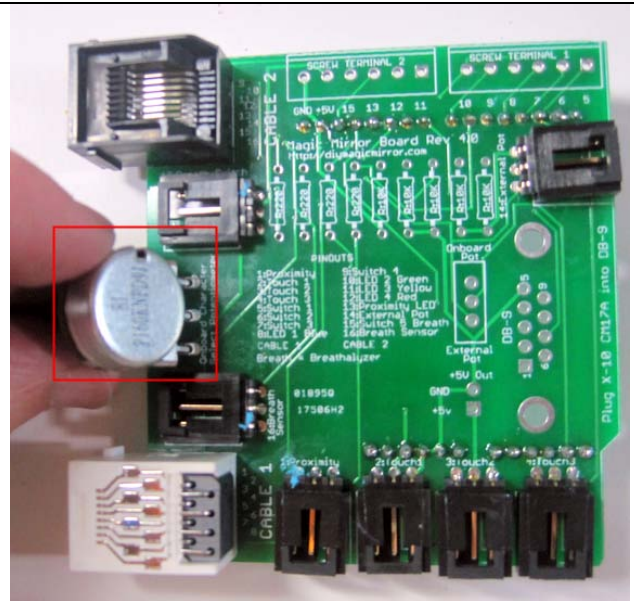
Insert the 7 buckled connectors.



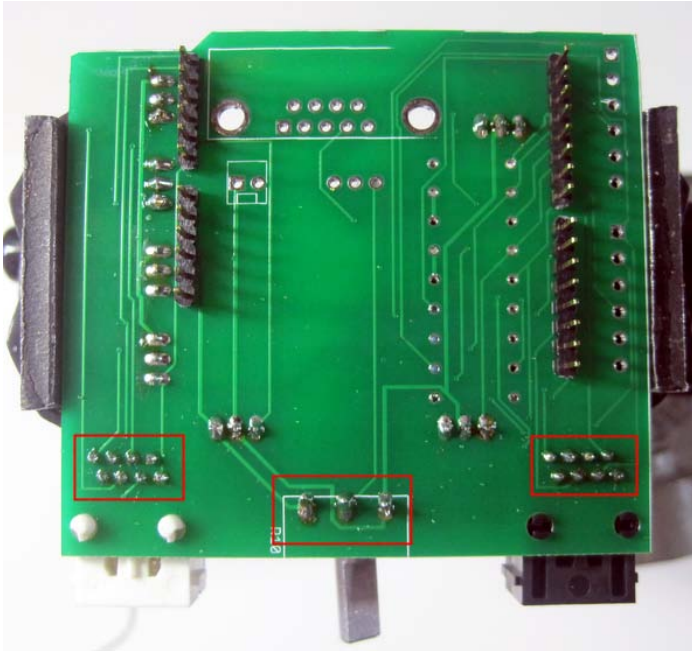
Secure with adhesive puddy so they do not move when the board is flipped over for soldering. Also ensure the connectors are flush to the board. Flip board and solder.



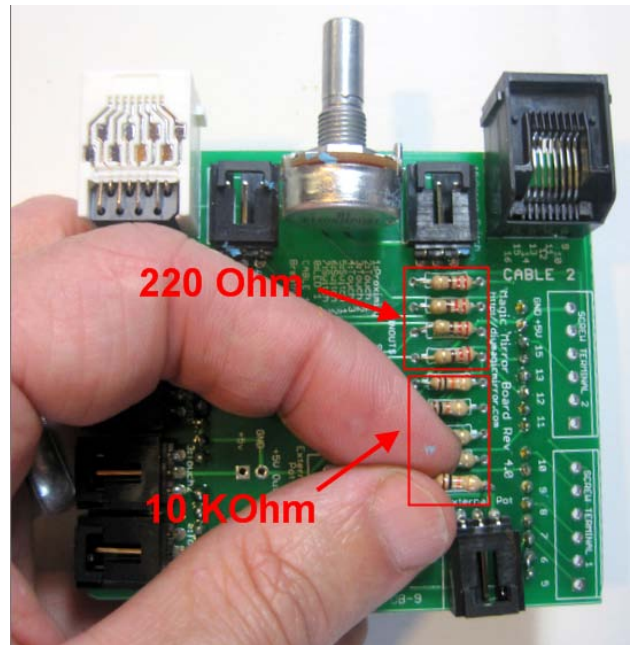
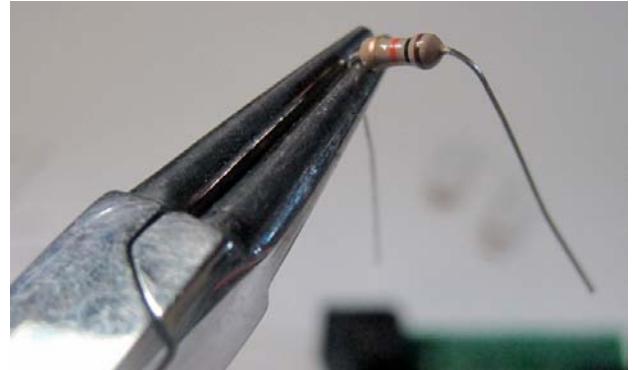
Snap in the CAT5 jacks (these do not need to be secured with puddy).



Insert the Potentiometer and secure in place with adhesive puddy.

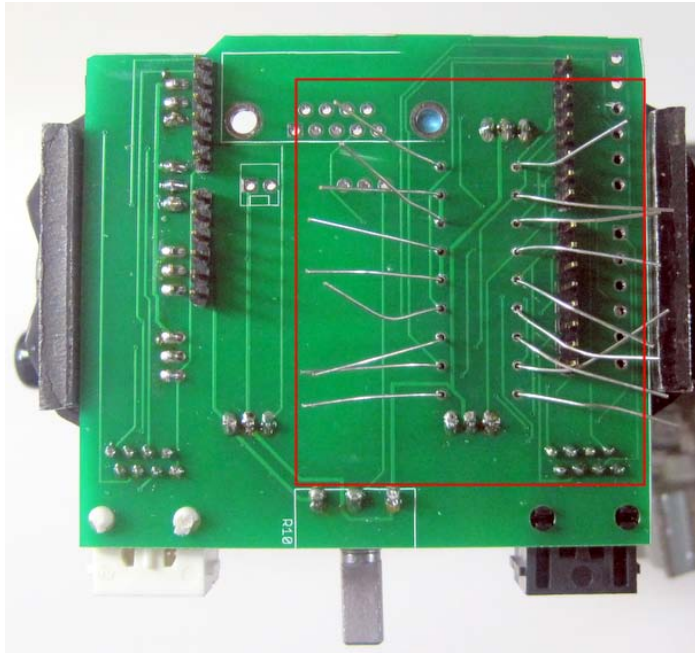


Flip over and solder

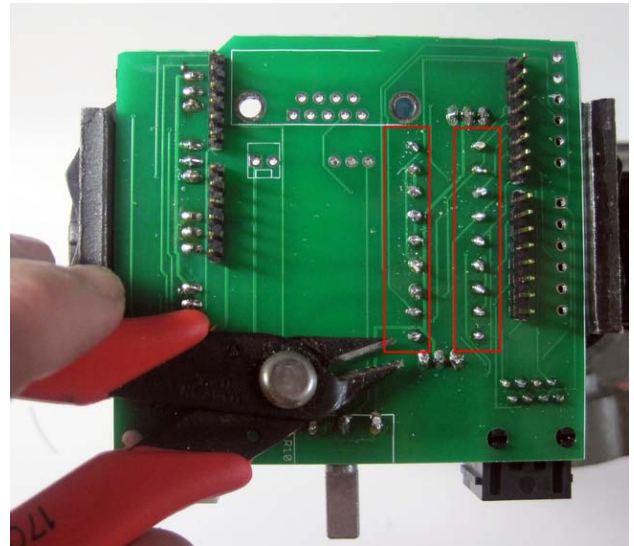


Using your round nose pliers, bend the resistors. You can also bend them by hand if you don't have round nose pliers.

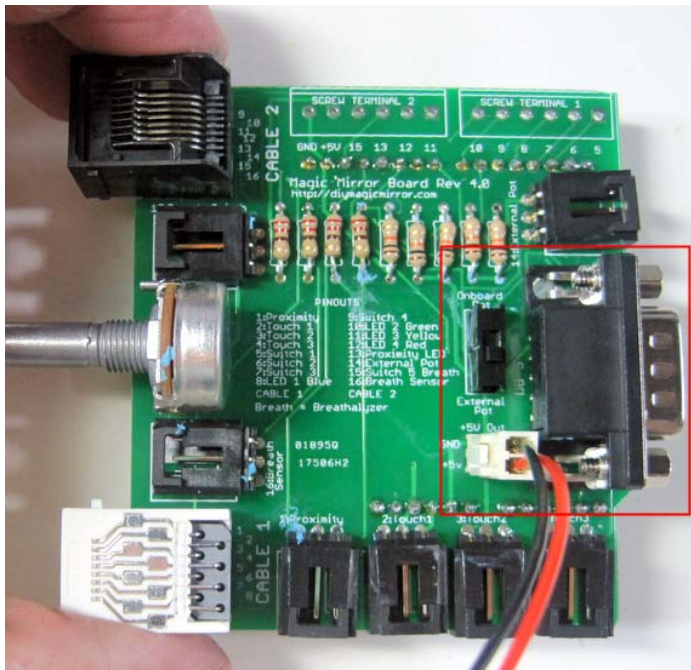
Insert resistors noting on the board where to place the 220 ohm resistors (4) and the 10K ohm resistors (5).



Flip board and solder.



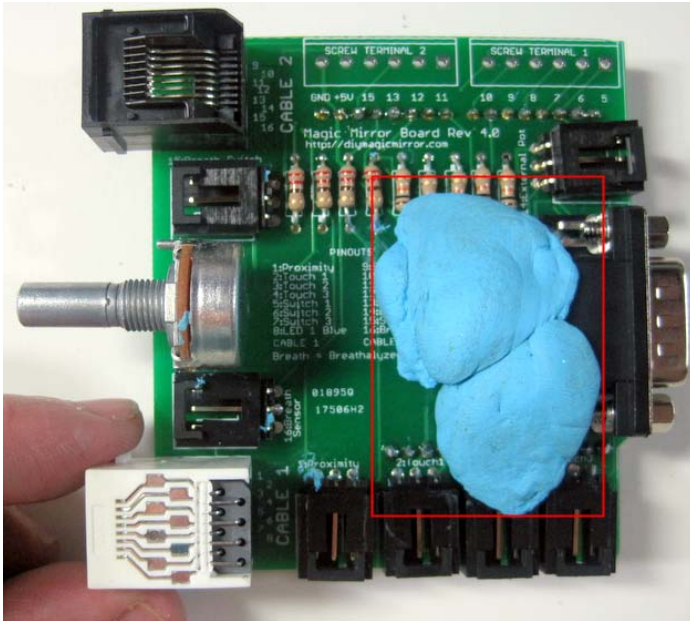
Put on your safety goggles before clipping the resistor leads.



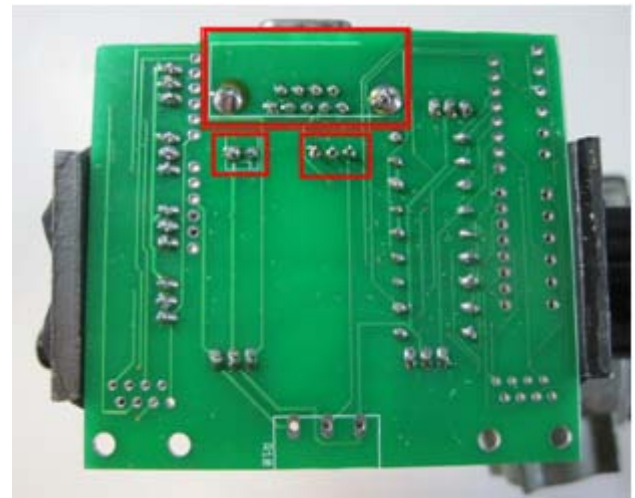
Snap in the DB-9 and insert the slide switch and power header.



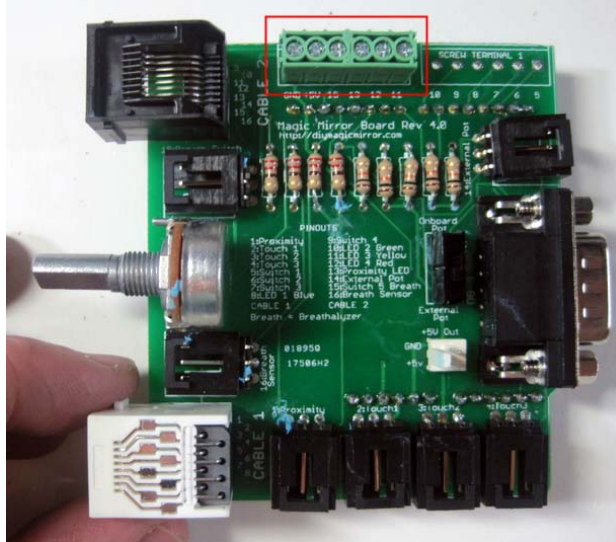
Ensure the power header has the correct polarity such that when the power cord is plugged in, the red wire goes with the +5v label on the board.



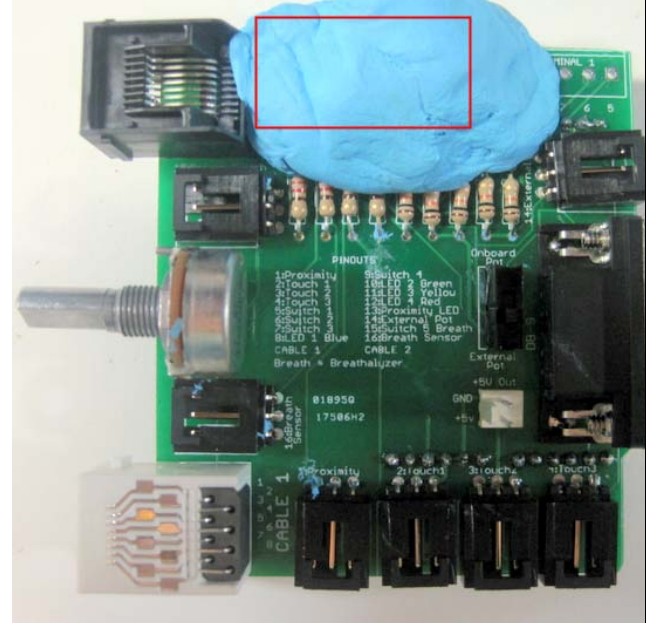
Secure the slide switch and power header with adhesive puddy. The DB-9 snaps in and does not need to be secured with puddy.



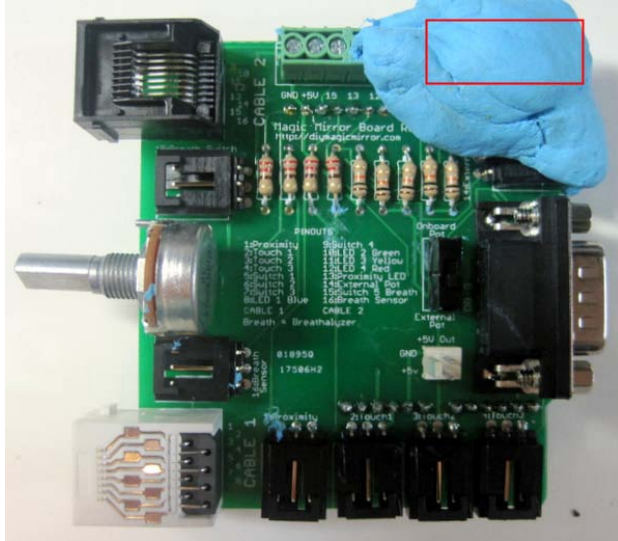
Flip board and solder. Add extra solder to the DB-9 snap-in holes for extra strength.



Insert the first screw terminal noting the orientation so the entry point of the screw terminal is facing out



Secure screw terminal with adhesive puddy. Flip board and solder.

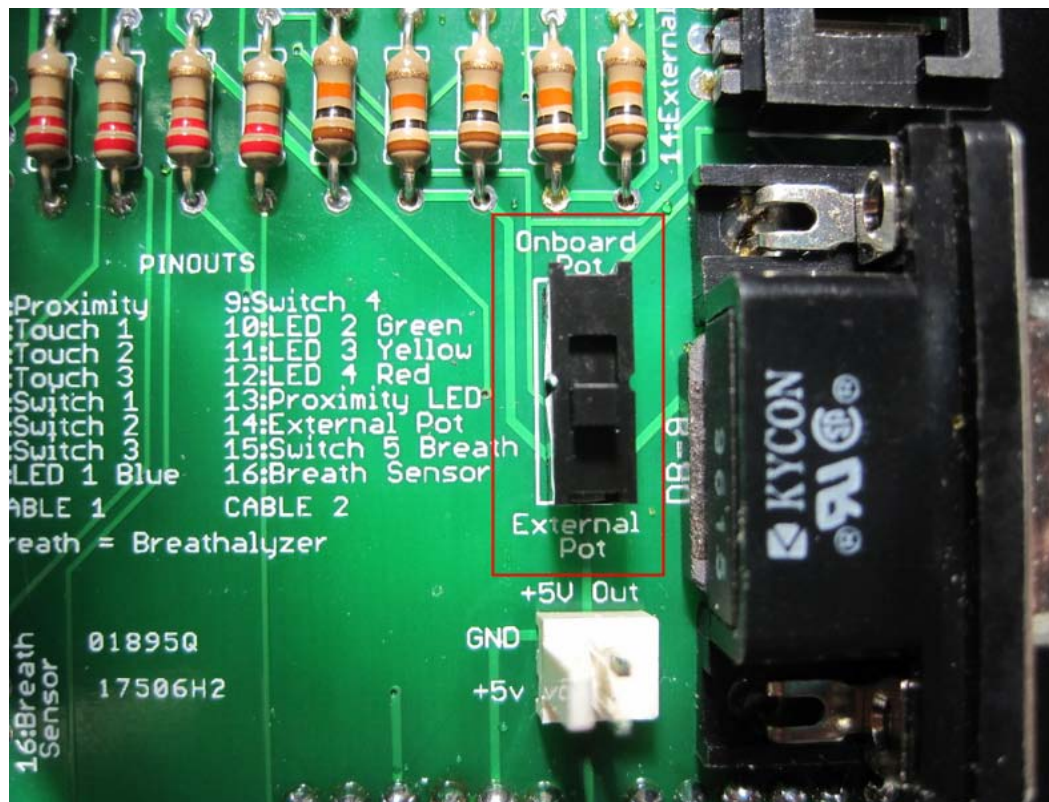


Insert the second screw terminal and secure with adhesive puddy. Flip board and solder.



All Done!

If using an externally mounted potentiometer to change the Magic Mirror character as opposed to the onboard potentiometer, move the slide switch on the Magic Mirror board towards the “External Pot” position as shown in the picture below.



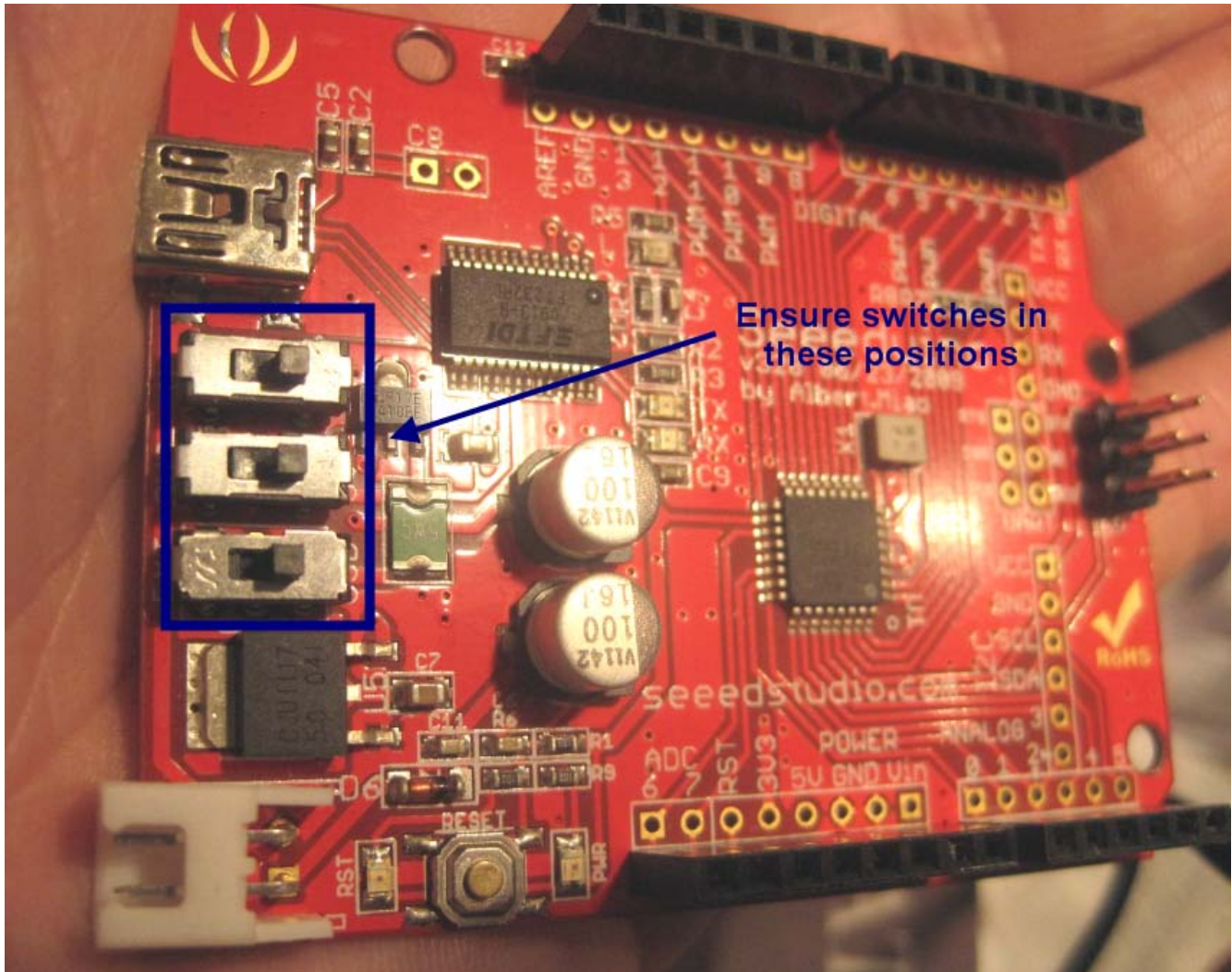
Important: If using CAT5 for wiring the sensors, be sure your CAT5 cable uses the T568B wiring convention (as opposed to the T568A convention).

RJ45 Pin #	Wire Color (T568B)	Wire Diagram (T568B)
1	White/Orange	
2	Orange	
3	White/Green	
4	Blue	
5	White/Blue	
6	Green	
7	White/Brown	
8	Brown	

T568B Wiring Convention

You will now need to upload custom firmware to the Arduino called Firmata. Refer to the software installation manual for instructions on how to upload Firmata to the Arduino. Use the Firmata that comes with the DIY Magic Mirror software installation and not the Firmata that comes with the Arduino IDE.

If using the Seeeduno (Arduino Clone), you must set the three switches in the positions below to ensure proper operation.



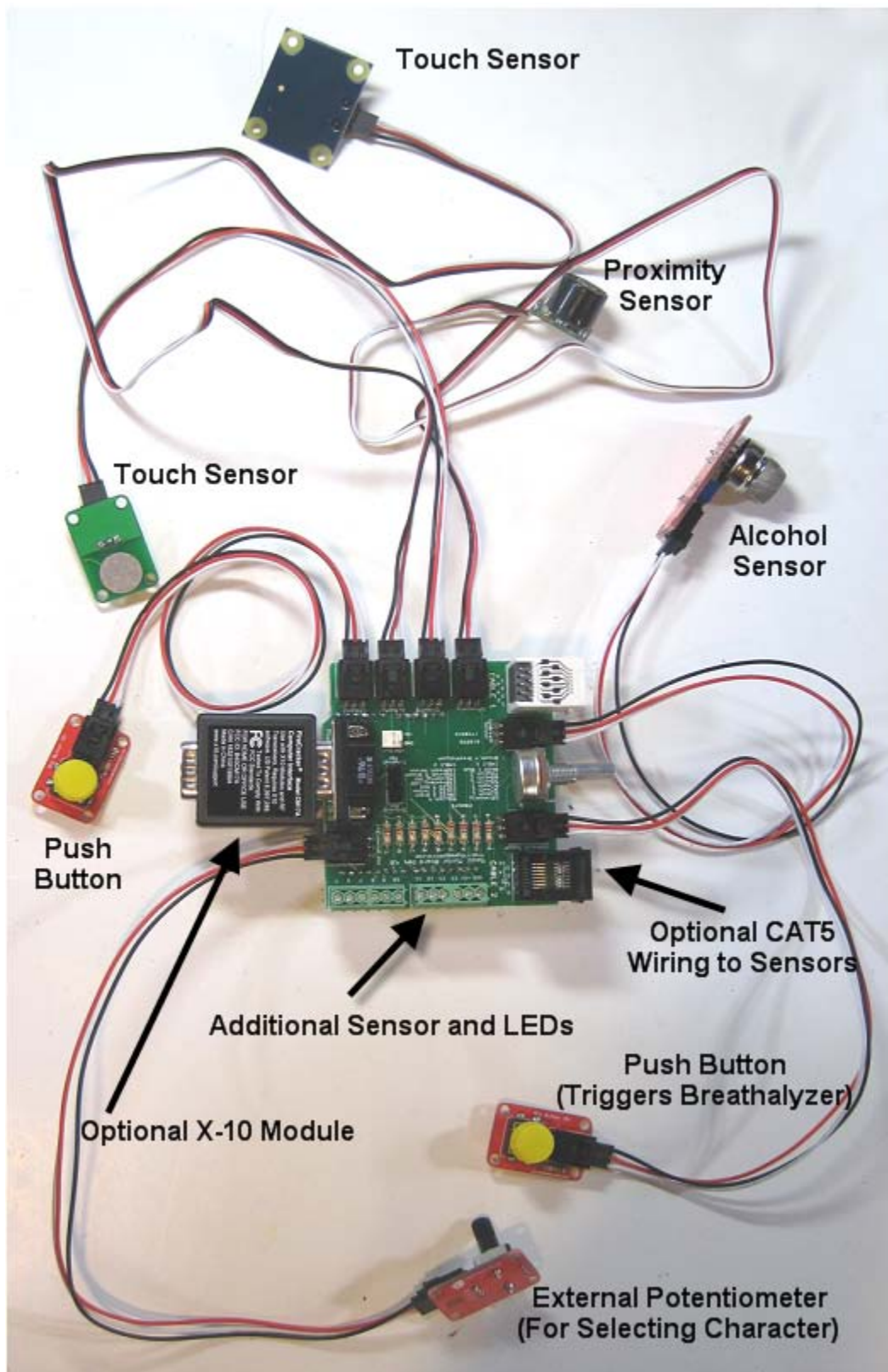
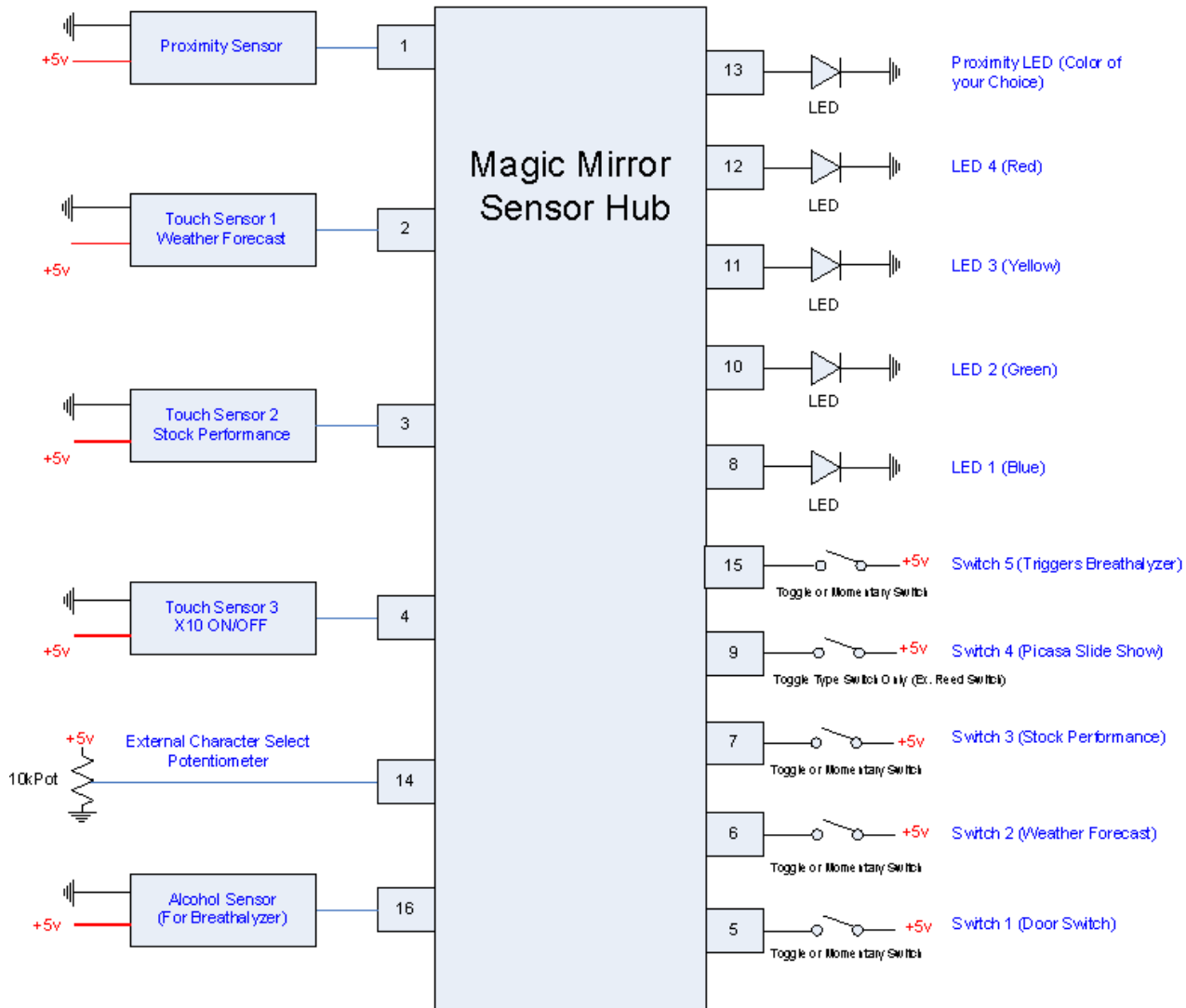


Figure 6 – Magic Mirror Sensor Hub with Plug and Play Sensors

Magic Mirror Sensor Hub Pin Outs

Connect all common +5v connections to the red wire coming out of the Sensor Hub

Connect all common GND connections to the black wire coming out of the Sensor Hub



Pin	Cat5e Cable 1 (White)
1 - Proximity	Cable 1 - White w/ Orange
2 - Touch 1	Cable 1 - Orange
3 - Touch 2	Cable 1 - White w/ Green
4 - Touch 3	Cable 1 - Blue
5 - Switch 1	Cable 1 - White w/ Blue
6 - Switch 2	Cable 1 - Green
7 - Switch 3	Cable 1 - White w/ Brown
8 - LED 1	Cable 1 - Brown

Pin	Cat5e Cable 2 (Black)
9 - Switch 4	Cable 2 - White w/ Orange
10 - LED 2	Cable 2 - Orange
11 - LED 3	Cable 2 - White w/ Green
12 - LED 4	Cable 2 - Blue
13 - Proximity LED	Cable 2 - White w/ Blue
14 - External Pot	Cable 2 - Green
15 - Switch 5 - Triggers Breathalyzer	Cable 2 - White w/ Brown
16 - Alcohol Sensor (For Breathalyzer)	Cable 2 - Brown

IMPORTANT: Cat5e cables must use the T-568B wiring color convention and not T-568A

Once completed, refer to the DIY Magic Mirror Wiring and Operations manual for instructions on how to wire up the sensors to the Magic Mirror Sensor Hub and how to configure the Magic Mirror software.