



## INSTRUCTION MANUAL

Shift Light V3.1  
09/17/2017  
Rev1

## DISCLAIMER

Install at your own risk. By purchasing and assembling this kit, you agree to hold Chippernut, LLC, it's owners, affiliates, members, and users harmless from any and all damages or harm that may result from the purchase, use, and/or installation of this product in any capacity. Please do research for the specific installation on your vehicle, engine, car, or motorcycle. Chippernut, LLC does not guarantee this product will work with all makes and/or models. We make no claims as to the legal use of this device - please check with your local regulations and laws.

## Parts List

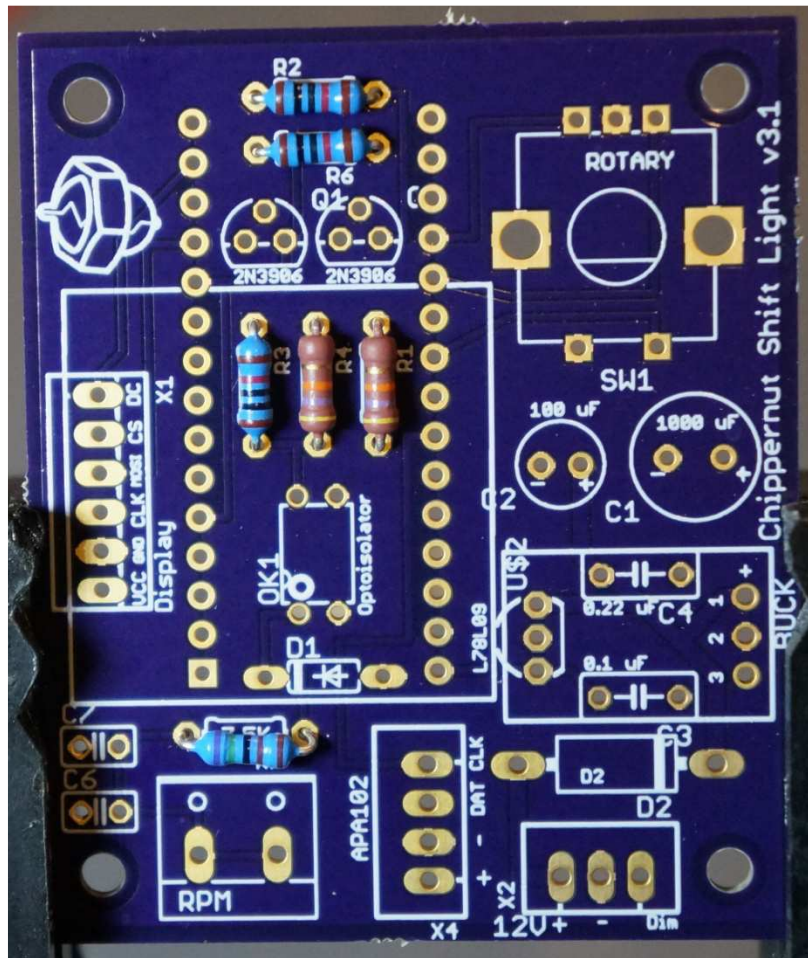
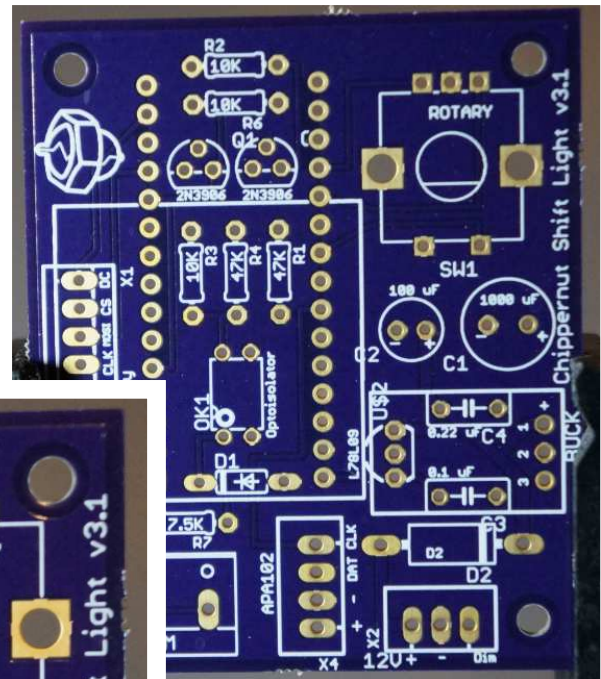
Number	Qty	Name
0002	1	Shift Light PCB v3.1
1001	1	Nano
2001	2	Transistor, 2N3906
2102	3	Resistor, 10K Ohm
2103	2	Resistor, 47K Ohm
2104	1	Resistor, 7.5K Ohm
2201	1	Capacitor, 1000uF 6.3v
2202	1	Capacitor, 100uF 25v
2250	1	Capacitor, Ceramic 0.1uF 50v
2251	1	Capacitor, Ceramic 0.22uF 50v
2301	1	Diode, 1N4148
2302	1	Diode, Schottky 2.0A 100V
3002	1	OLED Display
3101	1	Power Regulator, Buck 5v, 1.5A
3102	1	Power Regulator, Linear L78L09
3201	1	Optoisolator PS2501-1
4002	1	Rotary Encoder, 30mm
4101	1	Aluminum Knob
5002	16	LED, Black, Flex, 144/M APA102
6001	1	Project Box
7006	1	3pin JST Red, Black, Yellow (LOCK)
7001	1	4pin JST Red, Black, Yellow, White
7101	1	2 Pin 5mm Screw Terminal
7103	1	Wire, 26 AWG, Green 12"
7104	1	6-PIN HEADER 2.5MM
7105	1	3-PIN HEADER 2.5MM
7201	1	4.8mm Shrink Tube
7202	1	2.4mm Shrink Tube
8001	4	Black Nylon Phillips Screw 94735A150 (McMaster)
8005	4	Aluminum Male-Female Hex Stand-off Screw 93505A460 (McMaster)
9301	1	Zip tie




## IMPORTANT NOTES

Several parts in this kit are polarized and require specific orientation to work as intended. Please pay careful attention to the instructions and the markings on the printed circuit board (PCB). Improper installation of components may irreparably damage one or more parts in this kit.

Begin by installing the resistors.

Match the value to the number printed on the circuit board.



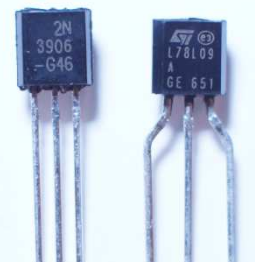
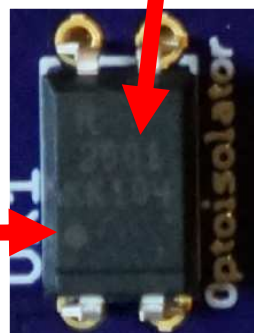
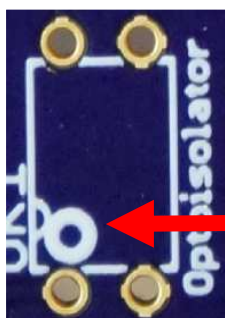
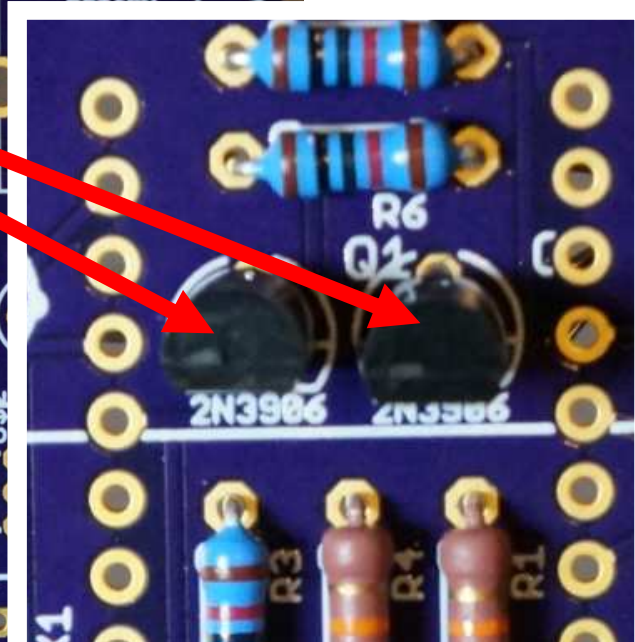
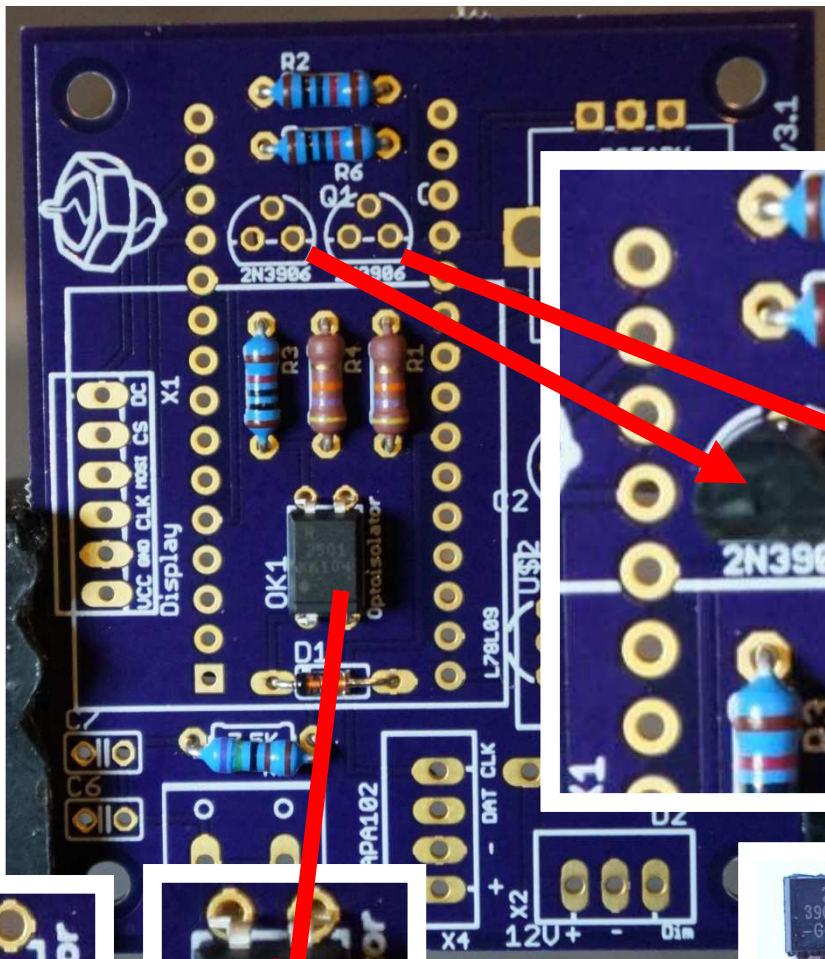
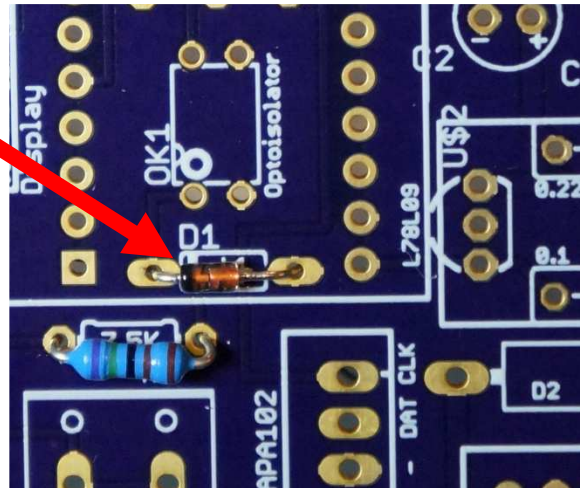
-  — 7.5k ohm – Violet, Green, Black, Brown, Brown
-  — 10k ohm – Brown, Black, Black, Red, Brown
-  — 47k ohm – Yellow, Violet, Orange, Gold



Install the 1N4148. **BE CAREFUL!**  
**This part is polarized.** Match the black band on the diode with the white line on the circuit board.

Install the Optoisolator. **BE CAREFUL!**  
**This part is polarized.** Match the white dot on the part package with the white dot on the circuit board.

Install the transistors. Match the profile of the transistor to the shape indicated on the circuit board. You may need to bend the legs.



Transistor

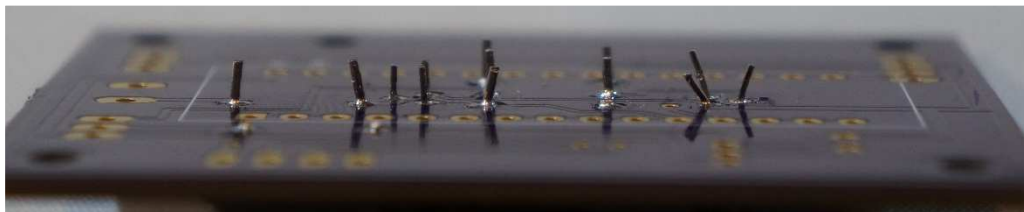
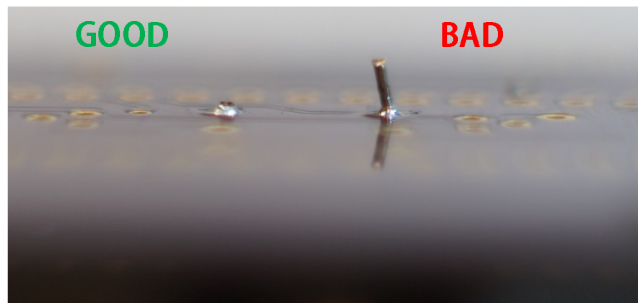
Regulator

Trim the pins on the underside of the board when you are finished soldering.

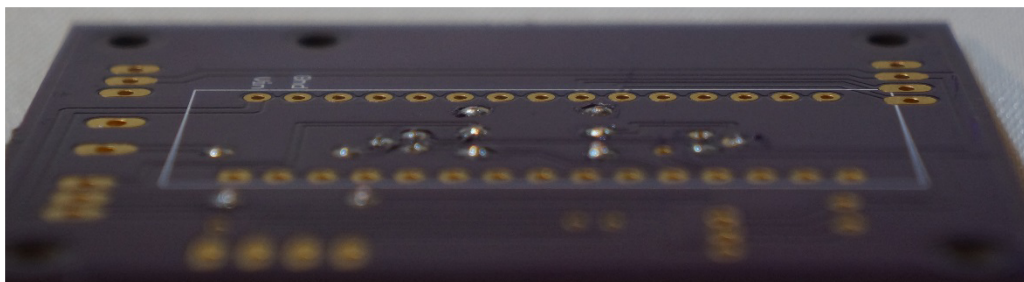
**This is very important.**

Trim the pins as close to the board as possible. The Nano will mount to the bottom of the board, and we do not want any pins hitting the Nano board which may cause a short-circuit.

Carefully inspect all joints to ensure there are no missed connections, short circuits, or solder bridges.



**BAD**

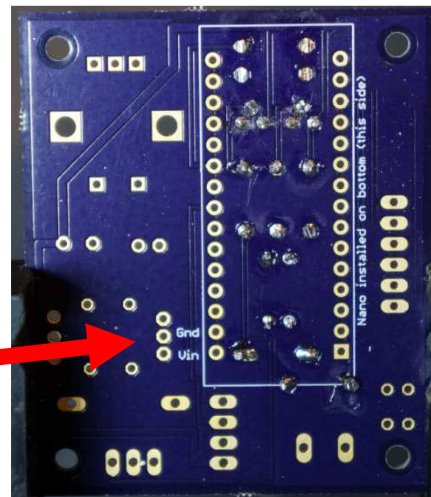


**GOOD**

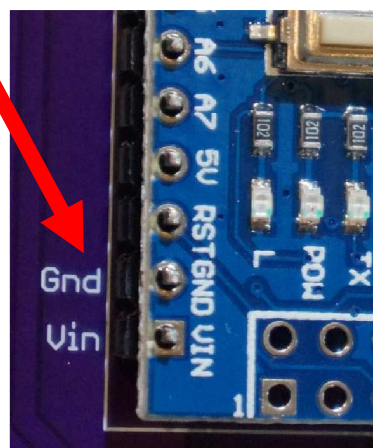
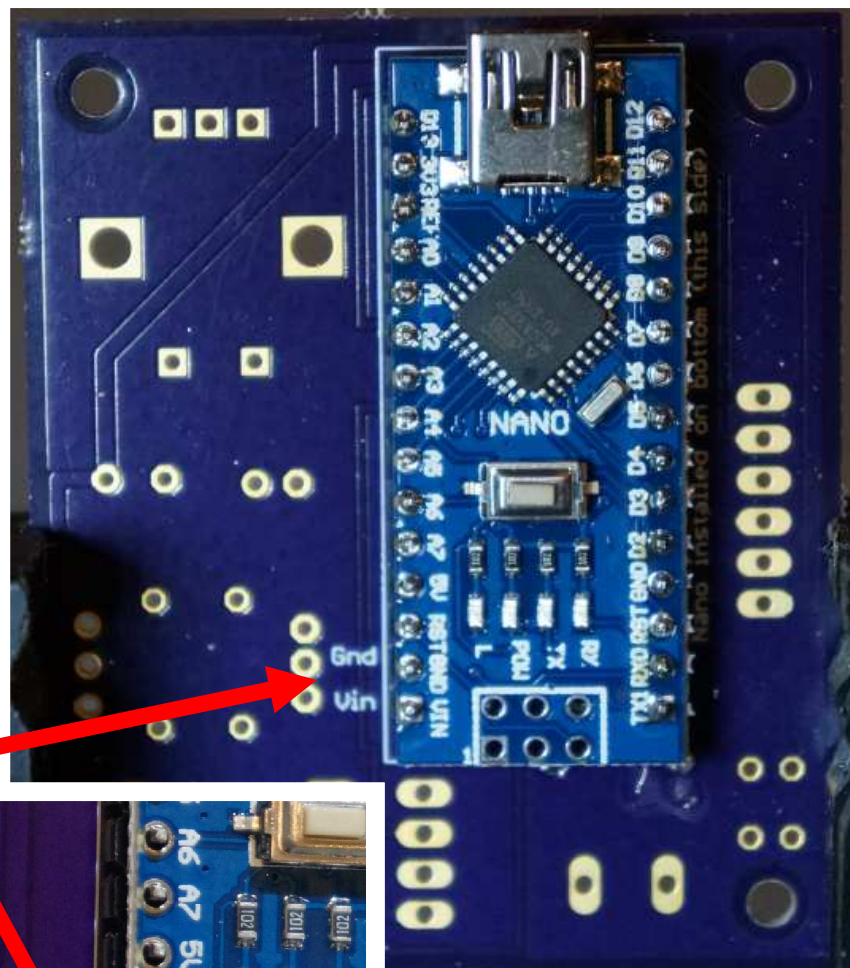
Match the GND and VIN pins on the Nano to the labels on the circuit board.

Install the nano and fully seat against the PCB.

**DO NOT SOLDER YET!**

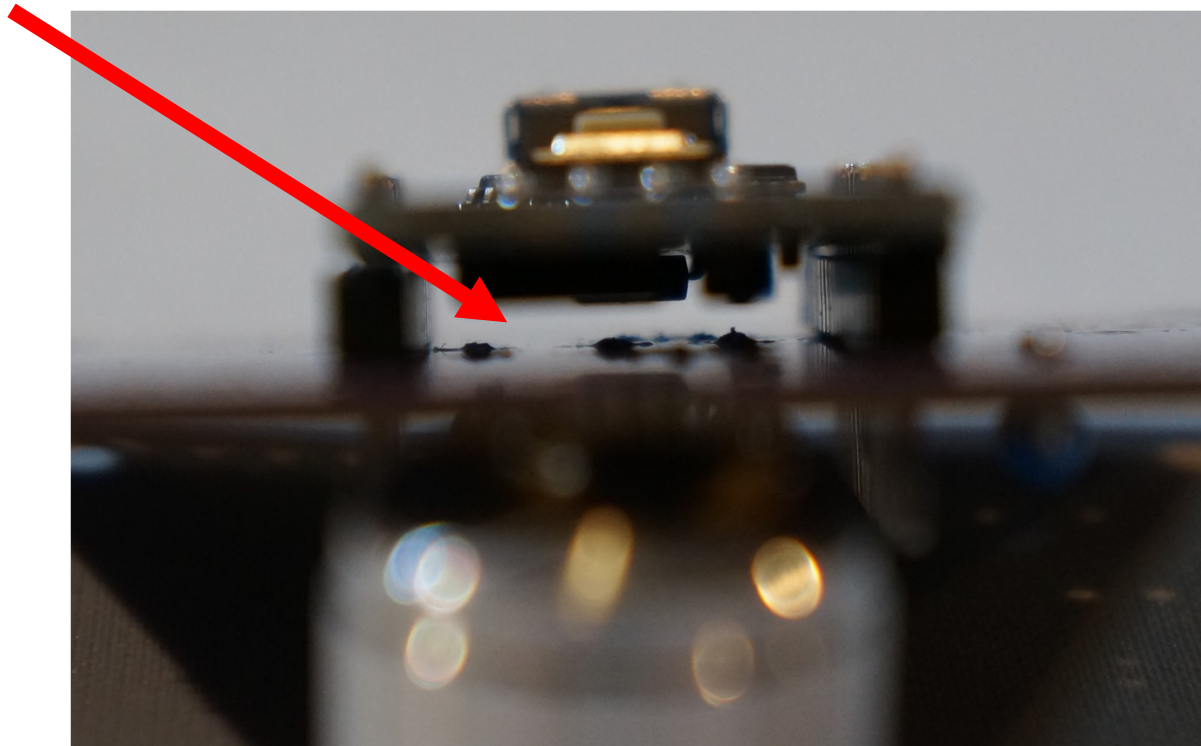


Match the GND and VIN pins on the Nano to the labels on the circuit board.



Holding the Nano to the shift-light circuit board snugly, turn the assembly on end and look down the space between the Nano and the shift-light circuit board.

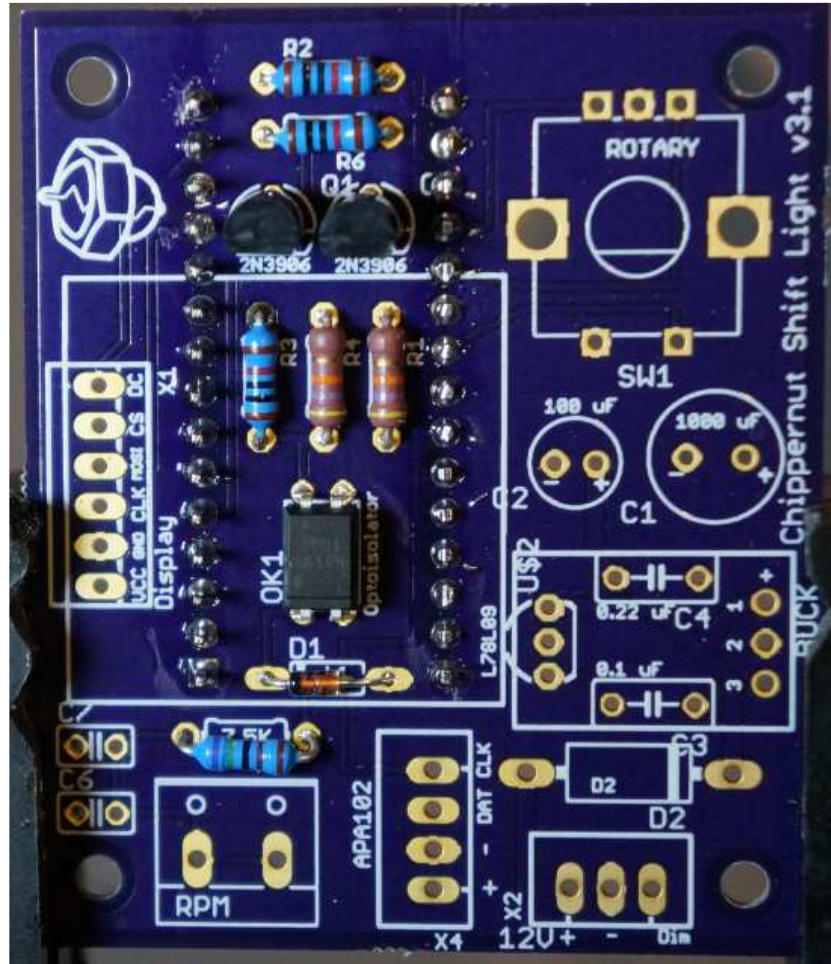
Verify none of the pins from the circuit board (resistors and transistors) are contacting the Nano. **If there are any touching, remove the Nano and snip the pins shorter.**



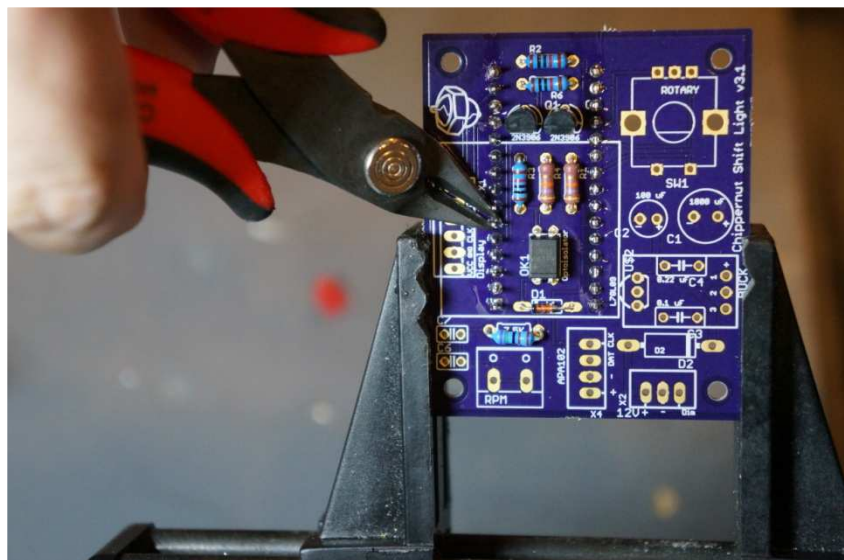
Now you may begin to solder the Nano.

Place the Nano snugly against the shift-light circuit board to ensure a good fit.

It may be helpful to solder the corners first, then solder the remaining pins.



When complete, snip the remaining pins on the top-side of the board.

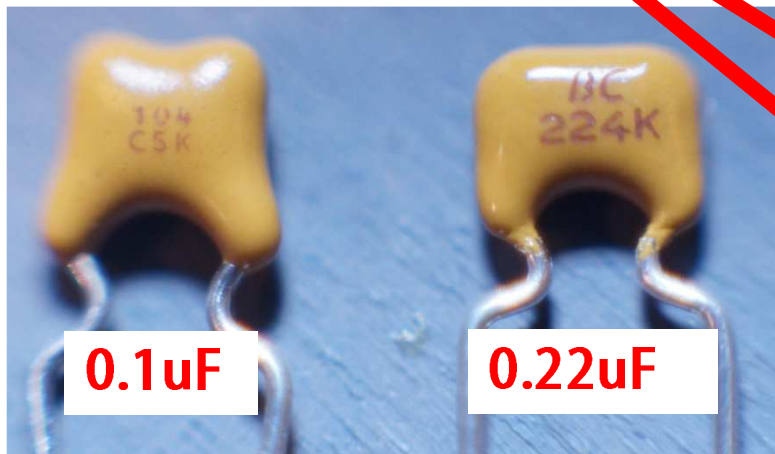
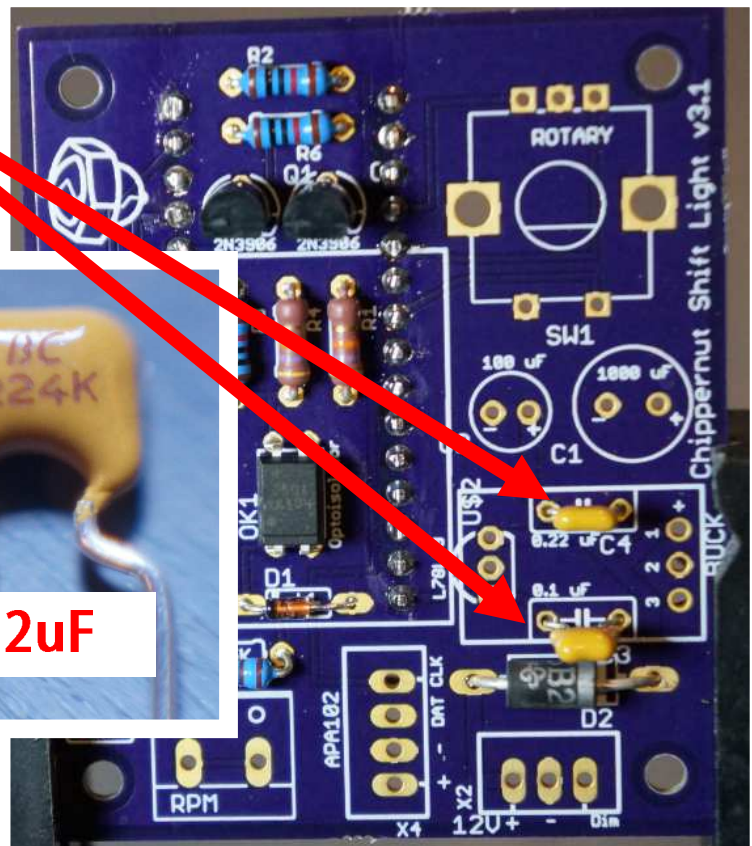
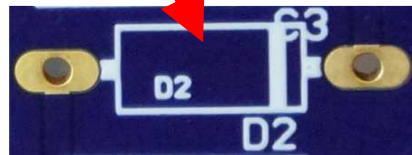
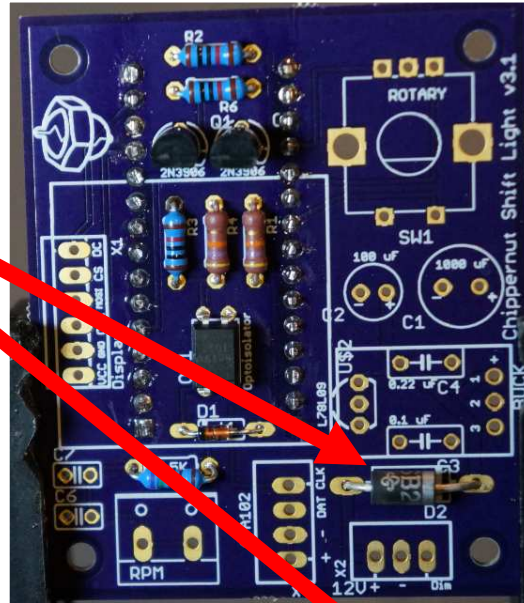


Install the large Schottky diode.  
**BE CAREFUL! This part is polarized.**  
Match the white band on the diode with the white band on the PCB.

Install the ceramic capacitors. These are not polarized, but have very small printed labels.

The capacitor with "104" printed is 0.1uF.

The capacitor with "224" printed is the 0.22uF

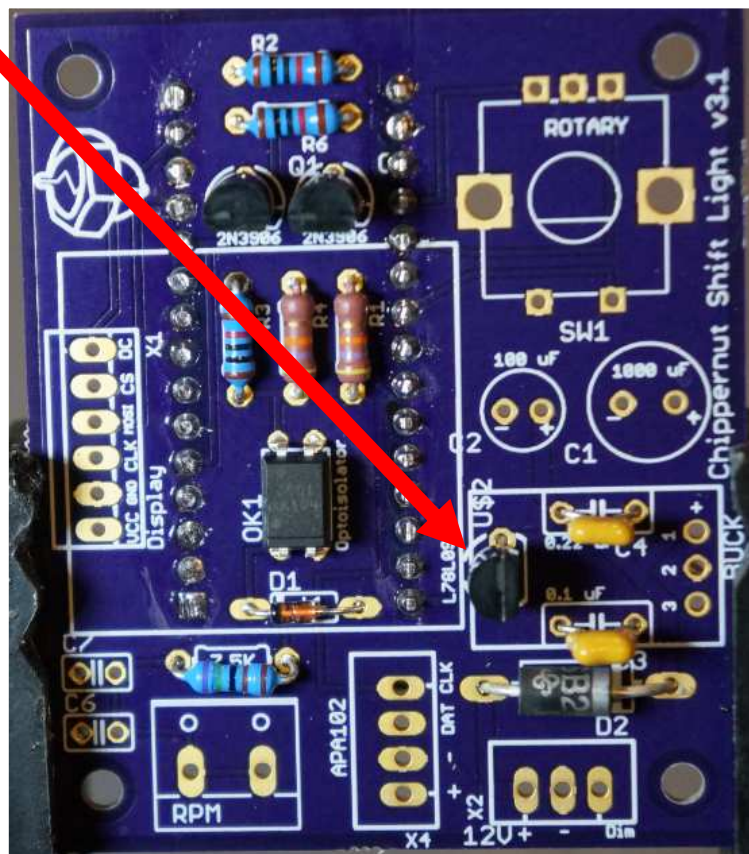
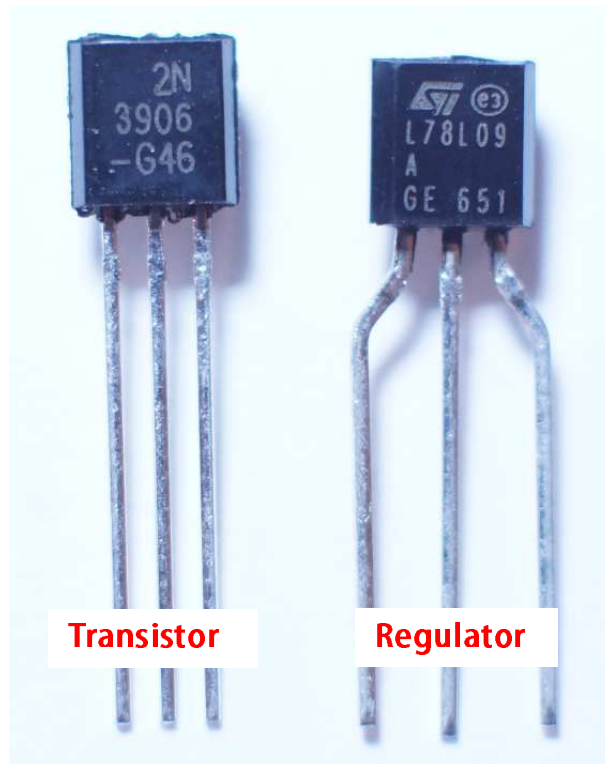


**0.1uF**

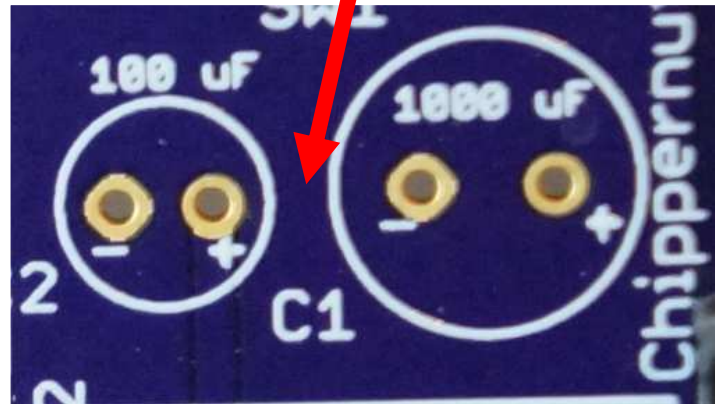
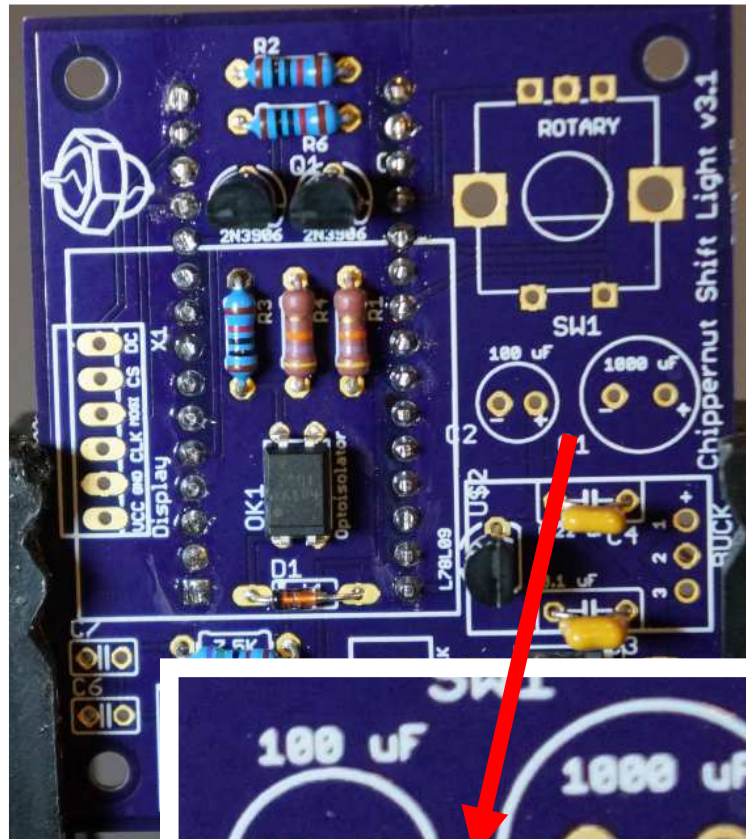
**0.22uF**

Install the L78L09 Voltage Regulator. Match the profile printed on the PCB.

The regulator looks a lot like a transistor, but the legs are arranged in a straight line that only fits the socket on the circuit board.



Install the electrolytic capacitors. **BE CAREFUL! This part is polarized.** Match the white band on the capacitor with the minus (-) negative sign on the PCB.

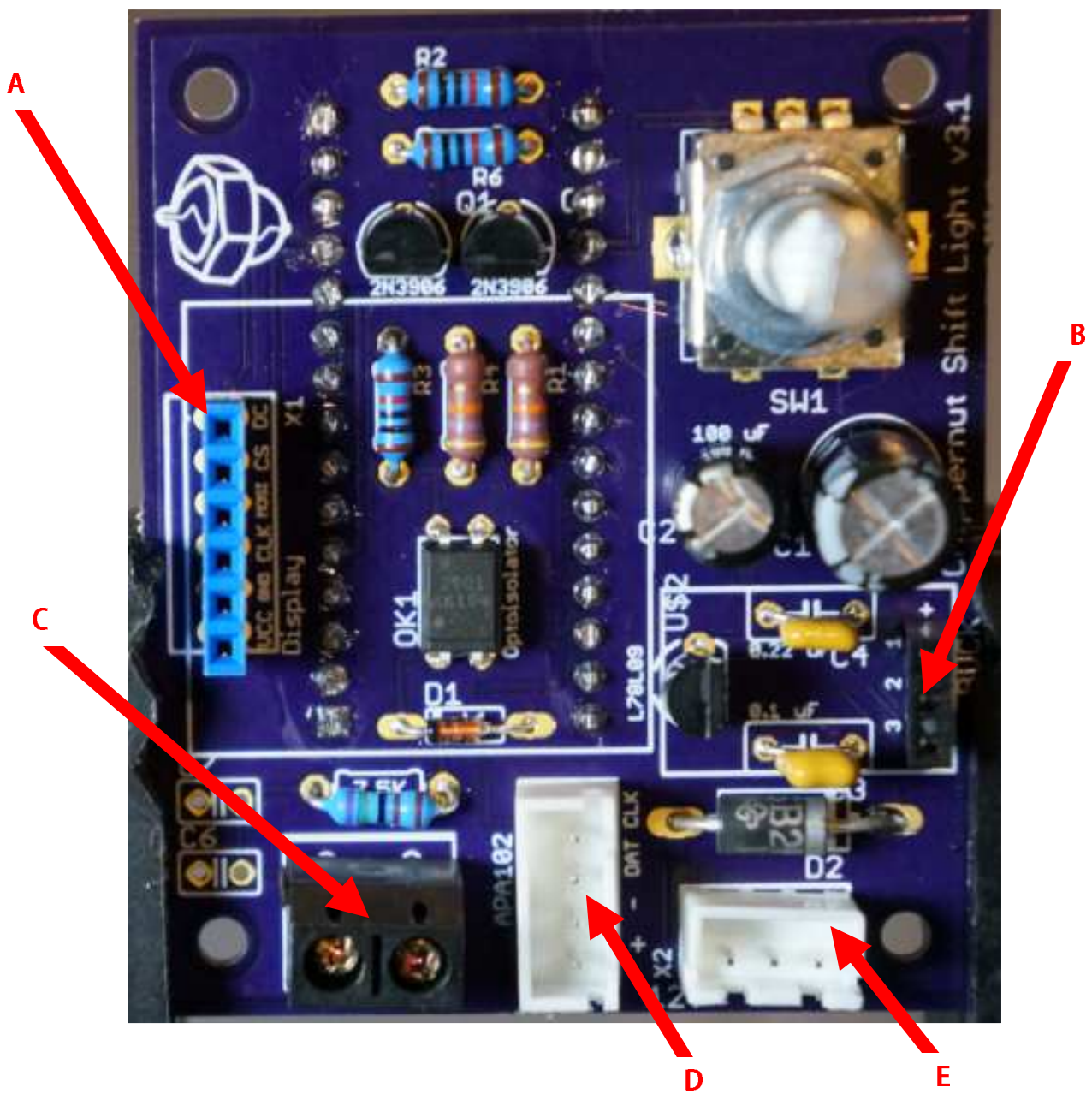


Install the rotary encoder. The support pins may require a little pressure to snap into the PCB. These pins will engage so the rotary encoder sits on the PCB.

Solder the support pins for added strength.

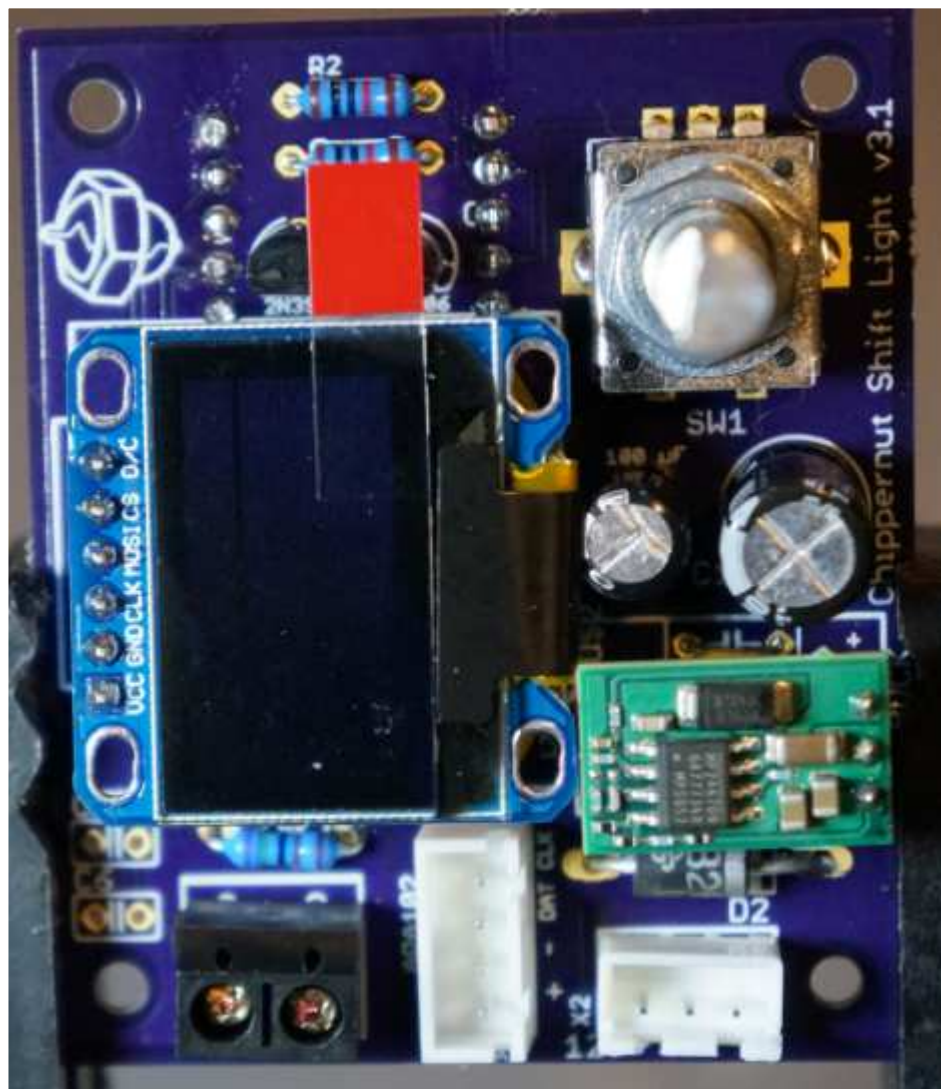
Install headers and terminals on PCB.

- A) 6-pin female header
- B) 3-pin female header
- C) 2-pin screw terminal
- D) 4-pin wire socket
- E) 3-pin wire socket



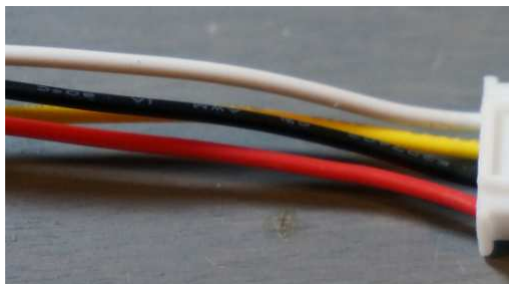
Install the display by inserting pins in the 6-pin header.

Install the Buck regulator by inserting pins in the 3-pin header.



Now prepare the connectors. **Each connector has a unique color combination and a specific place on the board.** See images and chart below.

Connector Name	Pin/Color	Purpose
4 RBYW	1 (Red)	VCC +5VDC
	2 ( Black)	Ground
	3 (Yellow)	Display Data
	4 (White)	Display Clock
3 RBY	1 (Red)	+12 Volts Input
	2 (Black)	Vehicle Ground
	3 (Yellow)	Dimmer Input



**4 RBYW LED Strip**



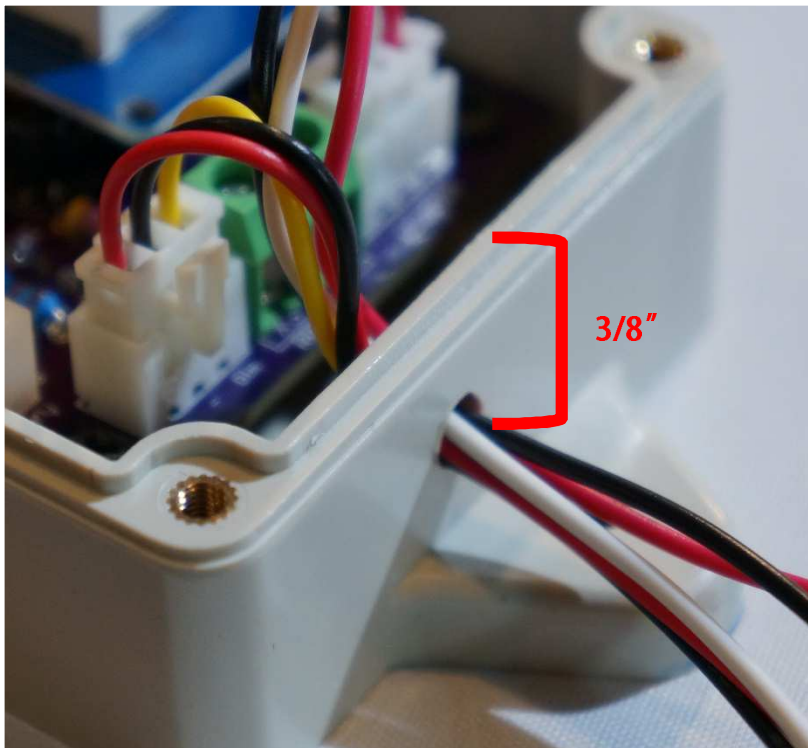
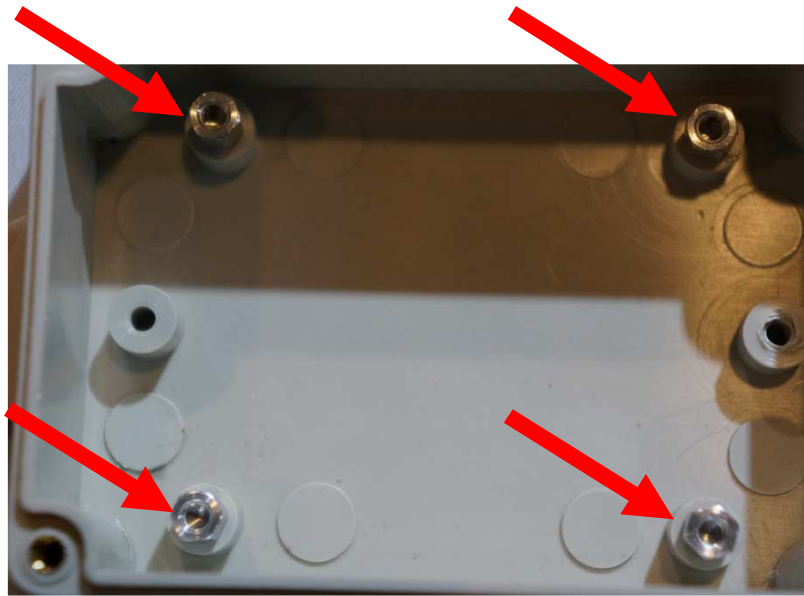
**3 RBY Vehicle Power**

Install the (4) metal stand-offs into the base of the enclosure.

Use a socket driver or a pair of pliers to grip the outside of the stand-off.

**DO NOT** use the plastic screws to drive the stand-offs.

**DO NOT** force the pliers inside the stand-off hole, thread damage will occur.



Next, we will drill a wire passage hole.

Drill a  $1/16$ " pilot hole on the short side of the enclosure base, roughly in the middle, about  $3/8$ " down from the top edge.

Then drill a  $3/16$ " hole in this pilot hole.

**Do not drill holes with circuit board inside enclosure.**  
Pictures are reference only.

Drill a hole for the rotary encoder.

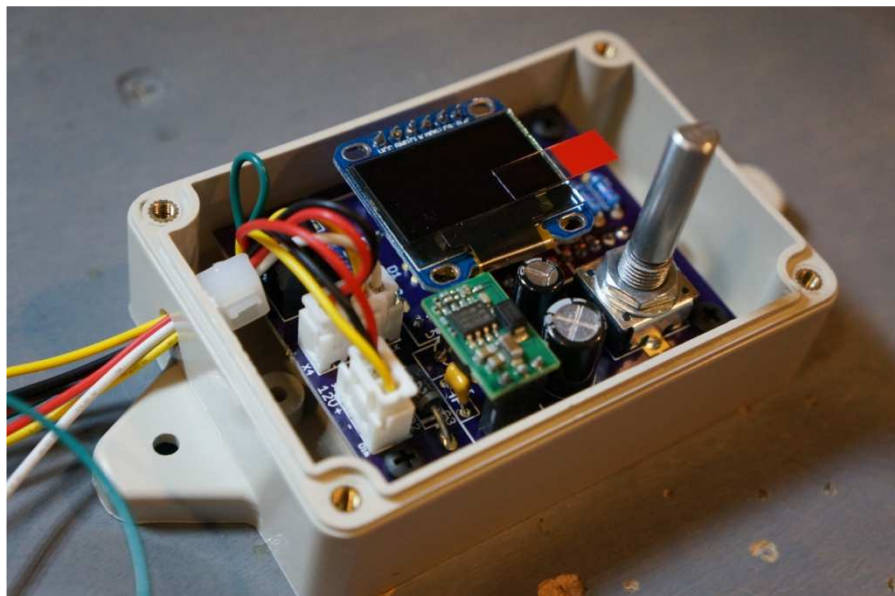
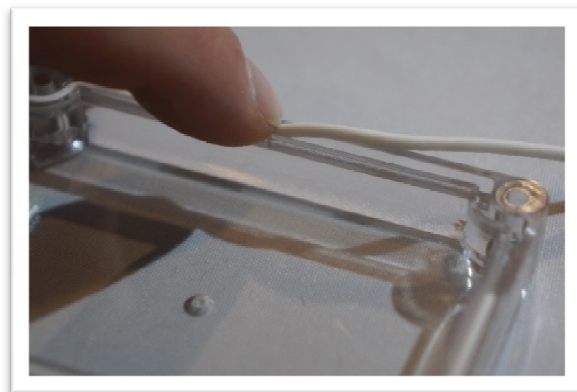
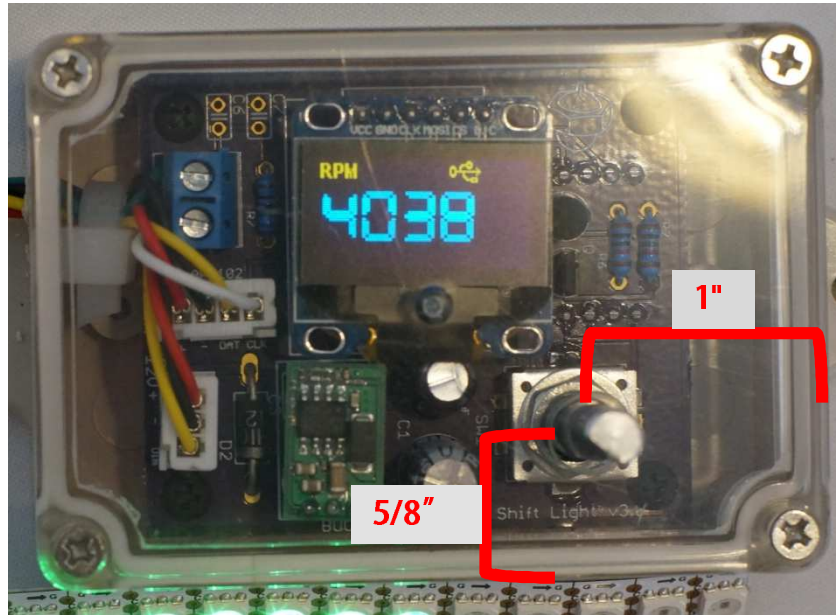
Drill a 1/16" pilot hole at 5/8" from the bottom, and 1" from the side.

Then enlarge this hole with a 9/32" drill bit.

**DO NOT** drill these holes with the circuit board inside the enclosure. Picture is for reference only.

You may need to use a larger drill bit if the encoder rubs after install of the clear box cover.

Press the white gasket into the groove in the clear top.

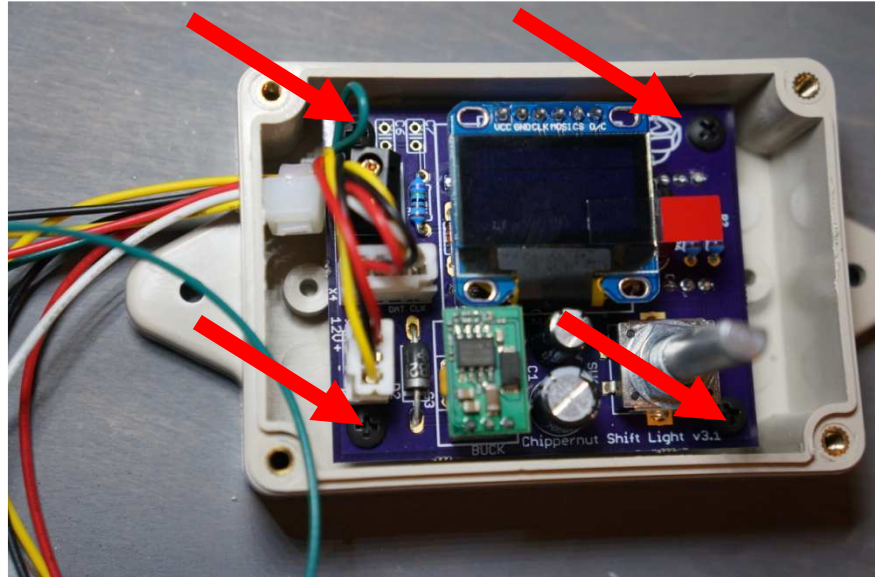


Install the wires in the connectors on the circuit board. Using the wire provided, strip an end of the wire and insert into the 2-pin screw terminal on the circuit board. Make sure the wire leads to the pin labeled "RPM"

Feed the wires through the wire hole you drilled. Leave some slack for future PCB removal.

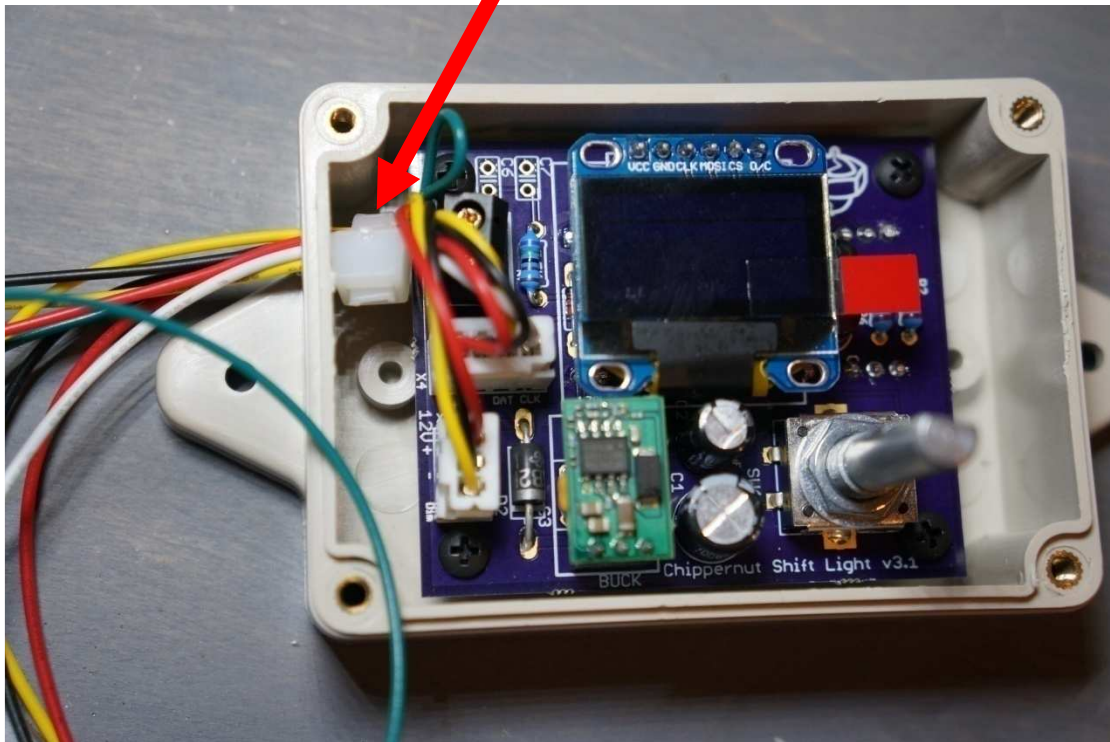
Seat the circuit board on the metal stand-offs.

Secure the board using the (4) Black nylon screws.



Adjust wire slack inside the enclosure.

Use the provided Zip-Tie as a strain relief on the wires.



Fasten the clear top to the base of the enclosure.

Install the rotary encoder knob.

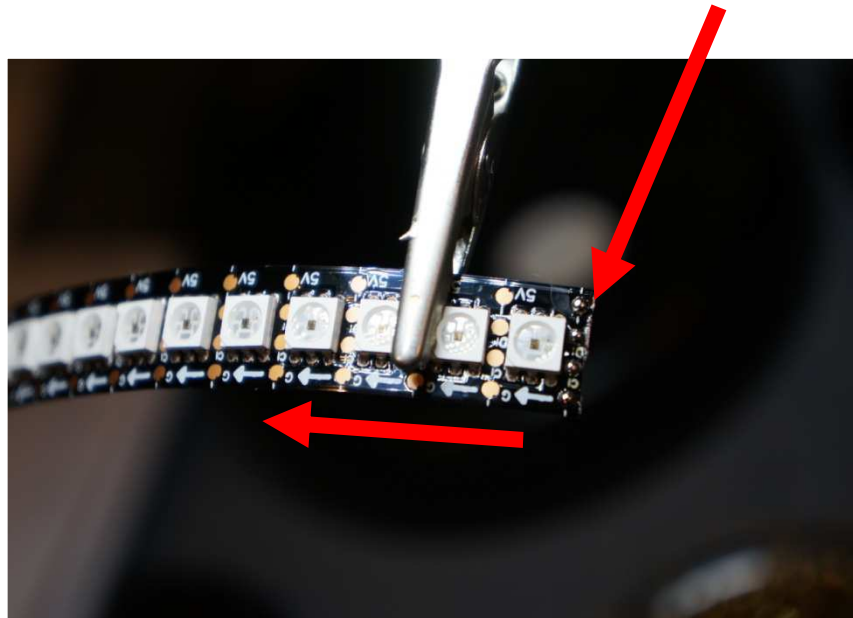


Prepare the APA102 LED strip for wiring.

The LED strip has very small pads located on the very end of the flexible black strip.

**First, orientate the strip correctly.** The power and data should flow in the same direction as the arrow.

**LED strip will not work if wired backwards.**

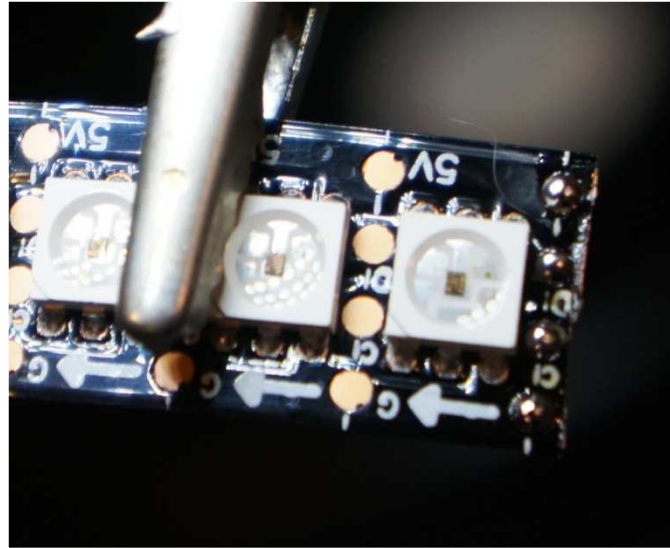


Using a small amount of solder, "tin" the small copper pads on the LED strip.

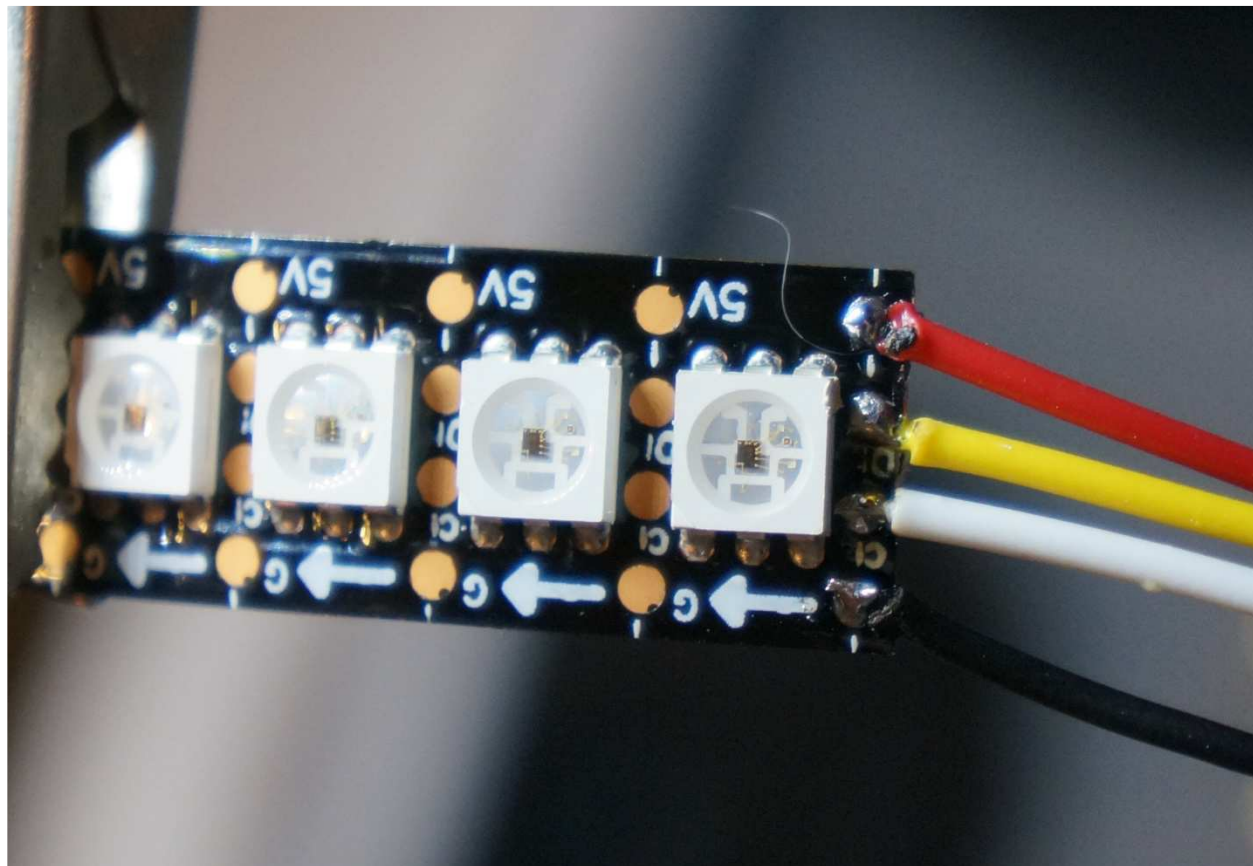
Strip the wire on the 4 RBYW wire connector. Trim the leads very short, and tin the ends.

Match the colors exactly. Using just the soldering iron and the solder already applied, gently solder the wires to the LED strip.

You may need to add some epoxy, hot glue, and/or heat shrink tube to add strength to this connection point.



+ 5V	→ RED
D	→ YELLOW
C	→ WHITE
-- G	→ BLACK



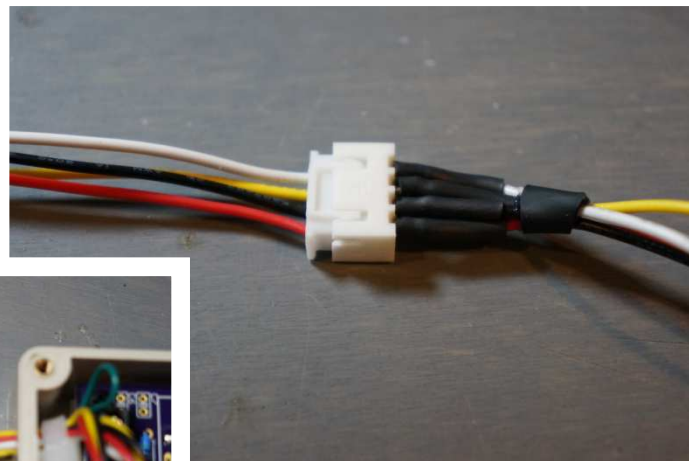
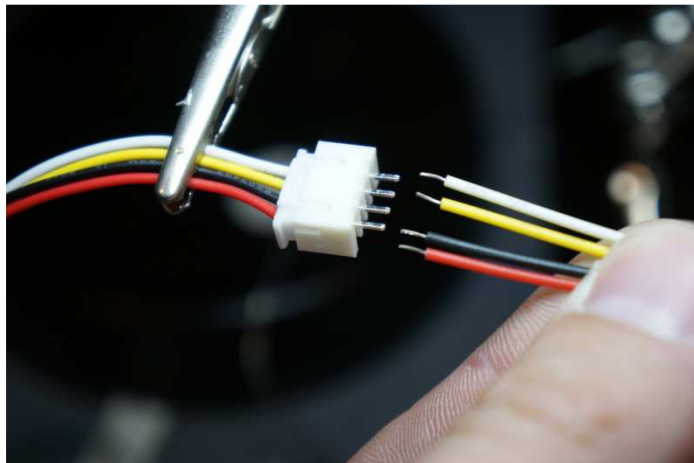
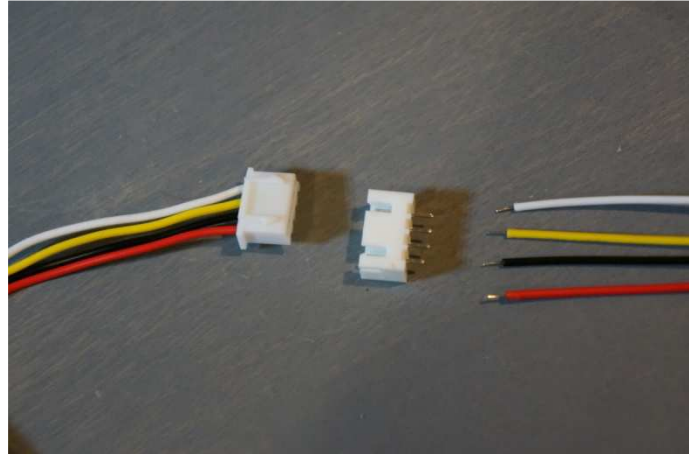
Now we need to connect the 4-pin socket to the four LED wires coming from the enclosure.

Get the same 4 RBYW 4-pin socket and plug it into the APA102 connector you just wired on the previous page.

Cut four equal lengths of small diameter shrink tube. Place the shrink tube over the wires. **Make sure you have the correct wires!**

Then carefully match the wire colors and solder in place.

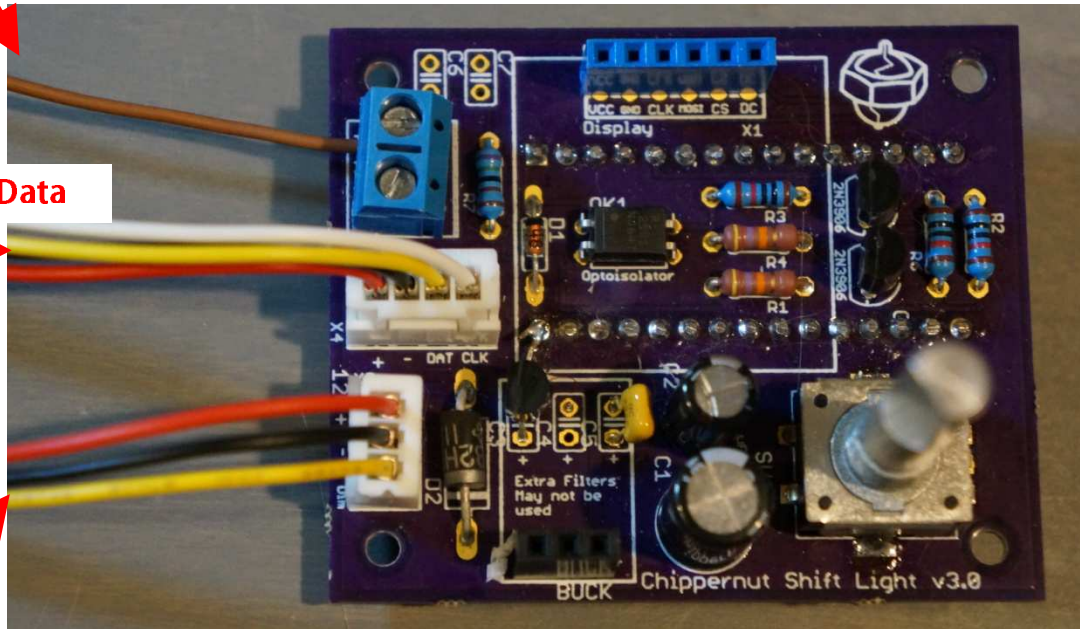
You may group the wires with additional shrink tube to keep the wires organized.



## Overall Wiring Diagram

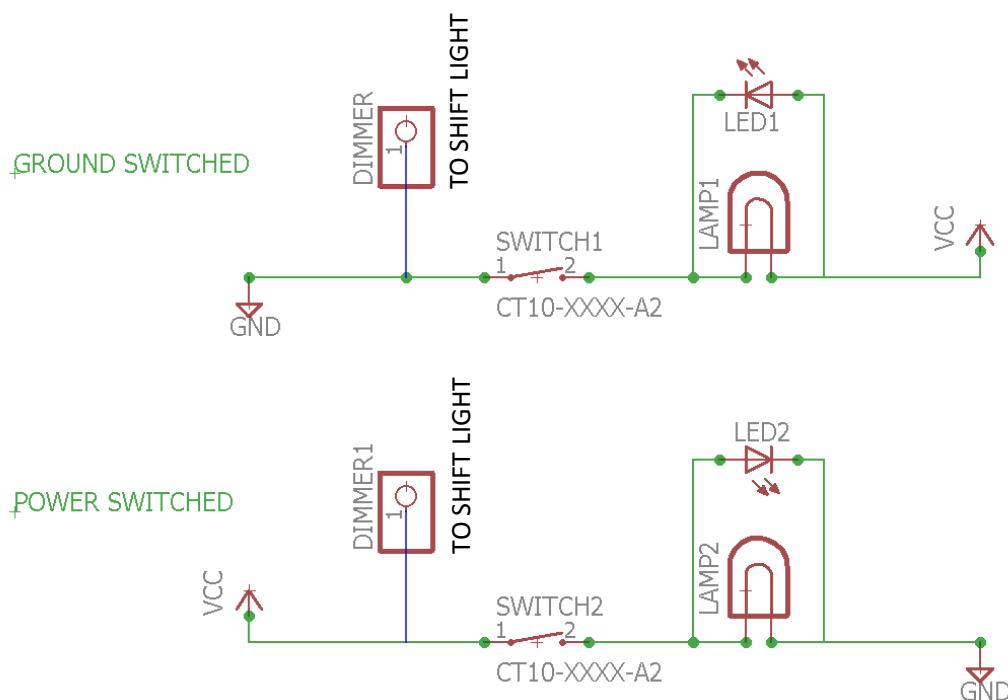
RPM SIGNAL IN

LED Power / Data



RED = +12 VDC Power  
BLACK = Vehicle Ground  
YELLOW = Dimmer

Yellow dimmer wire should be tapped into vehicle lighting system on the switch-side of the circuit. There are two typical types of lighting circuits; ground switched and power switched.



Dimmer functions may not work with all types of LED bulbs.