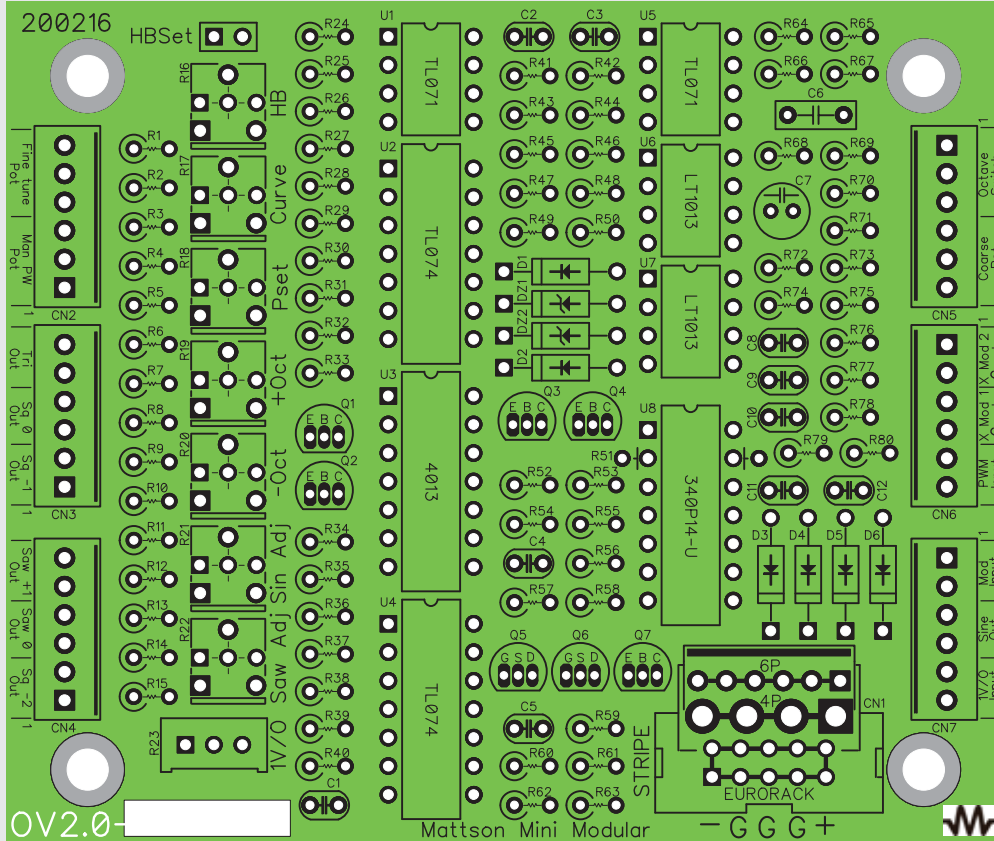


Mattson VCO 2 DIY Board assembly

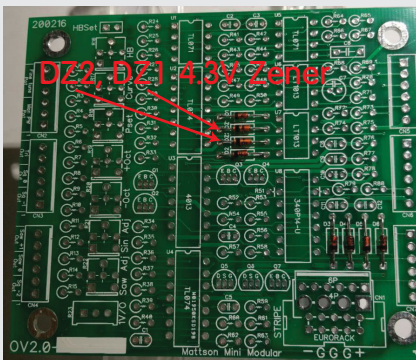
Page 1

I hereby swear that I have read and understand the Mattson Builders notes before starting this awesome project.



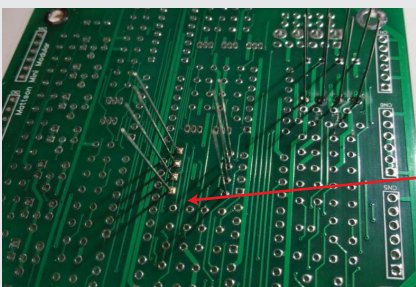
Refer to this graphic for parts placement

Diodes



Note that diodes are directional devices and the striped band on one end of the diode has to be matched with the stripe on the diode graphic on the board.

Insert diodes **D1-D6** -1N914 Or 1N4148. Then, locate the two 4.3V Zener diodes **DZ1 and DZ2** - TZX4V3B and insert them into the board.



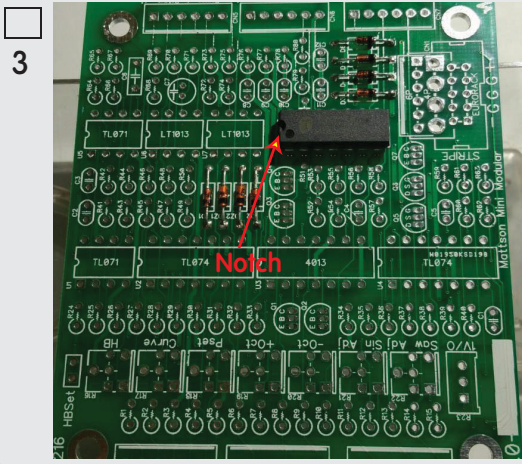
Once all of the diodes are placed in the proper locations in the proper orientation, solder them to the board.

I like to solder one side of each and check to make sure they're against the board. Then, solder the opposite leads.

Clip the excess leads when all of the leads are soldered.

Mattson VCO 2 DIY Board assembly

Page 2

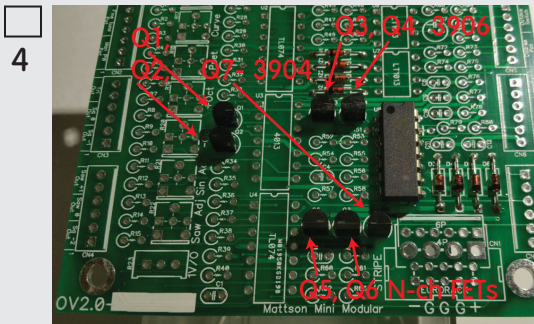


U8- THAT 340P14

Insert **IC U8** into the board at the U8 location. Pay attention to the location of the notch on the IC and verify that it is oriented with the notch on the U8 graphic.

When complete and orientation is verified, flip the board and solder all 14 pins. Verify before and while soldering that all pads have IC leads in them. A missing lead could indicate that it may have bent while inserting.

U8 is an important device for the VCO operation. It provides the linear to exponential amplifier to allow for proper 1V/O tracking. Temperature variations can make the pitch drift. Mounting this IC directly keeps the connections short and minimizes temperature and connection artifacts.



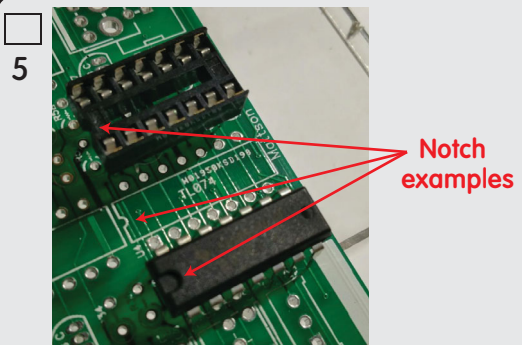
Transistors and FETs

Transistors and FETs are 3-legged devices with a round body that have a flat side. When inserting, **align the flat side with the flat on the graphic**. Place **Q1, Q2, and Q7**- 2N3904 NPN transistors onto the board. Place **Q3 and Q4**- 2N3906 PNP transistors onto the board.

Place **Q5 and Q6**- N-ch JFETs onto the board. Verify the correct component type and orientation. Flip the board and solder the pads.

Be very careful not to bridge the pads with solder. They won't work if you do. The pads are close together and minimal solder is required.

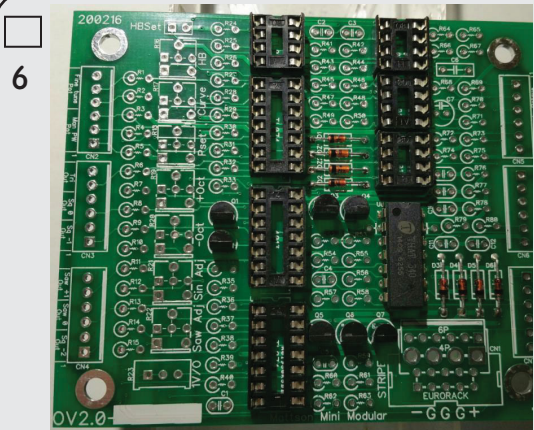
Clip the leads.



IC socket orientation

The IC sockets, IC graphics and ICs all have an orientation notch to indicate the proper placement position. Some ICs will have just a small circular indent off center in a corner near pin 1. That is the "notch" end of the IC. Some ICs have a big notch and a small, circular indent centered on the other end. Ignore the small indent and follow the large notch.

Please make sure they're lined up properly. A majority of ICs have symmetrically opposing power pins. If the IC is reversed, its power polarity is reversed and will kill the IC in an instant. Not good. Heads up!



IC socket install

Locate the **3, 16-pin** and the **4, 8-pin** IC sockets. Insert them into the board in the **U1-U7** locations. (align the notches...)

Make sure the pins fit in all of the holes and aren't bent.

Flip the board and verify that every IC socket pad has a pin in it before soldering. Then, solder the sockets. Verify that every socket pad is occupied with a pin while soldering.

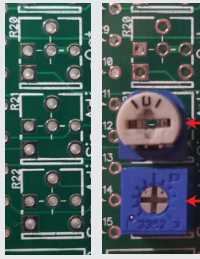
I usually solder opposing corners to hold them and check to see if they're seated before soldering the other pins. If not, putting a small bit of pressure on a raised corner while heating the pin will seat it. Don't burn your finger!

It's not necessary to clip the leads. They're short.

Mattson VCO 2 DIY Board assembly

Page 3

7



Bourns
3306 F
3362 F, U, P

A word about the trim pot pads

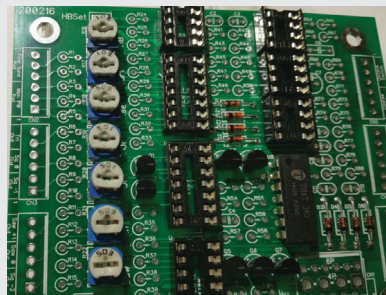
The trim pot pads each contain six pads. Only three will be used for each trim pot.

The pads were designed to accept either Bourns 3306 F series trim pots or Bourns 3362 F, U and P series trim pots.

Each have different pinout patterns. But, will fit properly within the trim pot outline. Just make sure that pin 1 is on the left as shown.

Note that the pin 1 pads are square.

8



Trim pots (single turn)

Insert Trim pots **R16-R22**. Verify the proper value of each before installing. Ensure that the trim pot Pin 1 is inserted into one of the square pads and that the trim pot is installed within the square component outline.

R16, 17- 10K (code 103)

R18, 21, 22 - 50K (code 503)

R19, 20 - 500 (code 501)

Do not install multi-turn trim pot R23 at this time.

Once all of the above listed trim pots are placed in the proper locations in the proper orientation, solder them to the board.

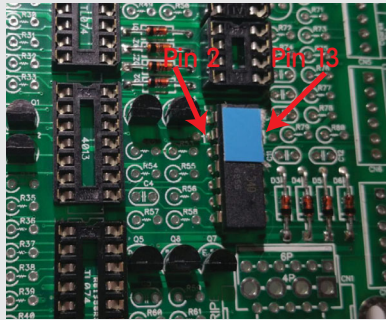
Clip the excess leads.

9

Initial trim pot settings

Center all of the trim pot settings. Set R18, Pset, CCW to around the 10:00 position. That should do it.

10

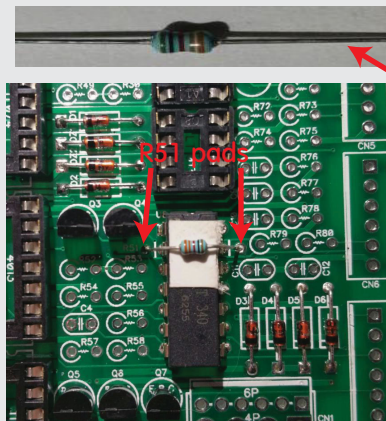


Thermal tape

Locate the **small square of thermal tape**. Peel one side and stick it on to U8, The THAT 340P14 that was installed earlier. The piece shown was too large. Trim it with a pair of scissors. It needs to go by the notch between the two pins second down from the end. (Pin 2 and 13)

If thermal tape isn't available, a small dab of thermal compound will be fine.

11



R51 Tempco

Locate **R51**. It's a small, bluish, 1/8W crappy 1K resistor.

It's crappy because it changes its resistance based on how hot or cold it is.

This is awesome. because we can use that property to counter the effects of changing temperatures. like in an oscillator whose pitch drifts with temperature changes....

Peel the remaining side off the thermal tape to expose the thermal compound.

Right **next to pins 2 and 13 on U8**, there is a pad next to each. Looking by pin 2, you'll see the screen marking for R51.

Place the R51 leads across U8 pins 2 and 13 into the R51 pads. Then, push R51 onto the top of U8 onto the thermal tape.

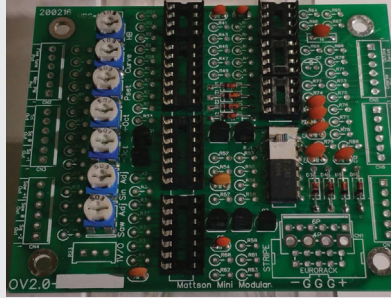
Pull the leads tight into the pads keeping R51 centered on U8. The less lead exposed, the better. R51 has to be touching the top of U8 and the thermal tape. Solder and clip the leads.



Mattson VCO 2 DIY Board assembly

Page 4

12



Capacitors- ceramic

Locate the following 11 ceramic capacitors. Insert them into the proper pads.

C1: 3.3pF (Code 3.3)

C2, C3: 100pF (Code 101)

C4: 470pF (Code 471)

C5: 10pF (Code 10)

C6, C8-C12 0.1uF (100nF) (Code 104). Six total of these.

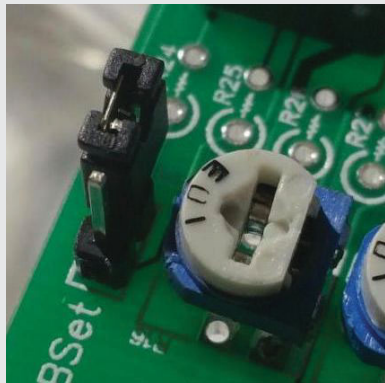
These caps aren't polarized. I like to orient them where it's easiest to see their value code when installed.

Solder the capacitors to the board.

Clip the leads.

Polystyrene capacitor C7 will be installed later

13



HBSet header and jumper

Locate the **2-pin header** and the **2-pin shorting jumper**.

Put the short leads of the header into the HBSet pad located at the top of the board above trim pot R16.

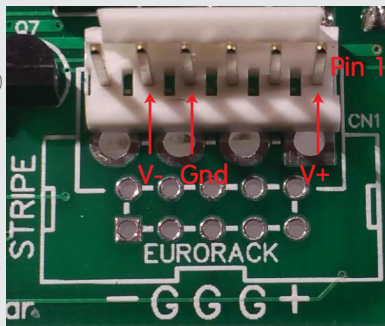
Solder the header to the board.

Place the 2-pin shorting jumper (it's called a shunt...really!) onto one of the header pins as shown for storage.

This will be used later during the VCO calibration procedure.

14

(maybe)



6-pin header

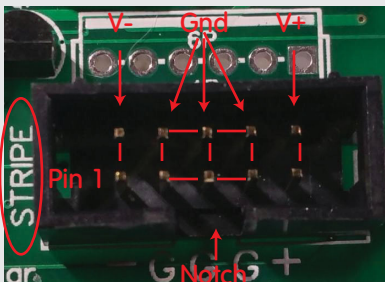
(6-pin or Euro power if using these options)

If you have chosen to use the **+/-15V, 6-pin power header (Dotcom or MMM)** or the **+/-12V, 10-pin (Eurorack)** power header, Locate the position of the chosen connector on the multi-power pad and install it as shown.

Pay attention to the orientation. Backward power is not good. However, there is a bridge rectifier (D3-D6) that sorts it all out if the power is reversed.

The circuit won't notice and carry on like nothing was wrong for the 10-pin or 4-pin headers. The 6-pin is designed so that if the power connector is reversed, the power pins connect to pins that don't connect to anything.

Trim pin 2 on the 6-pin if it will be used with a Dotcom system.



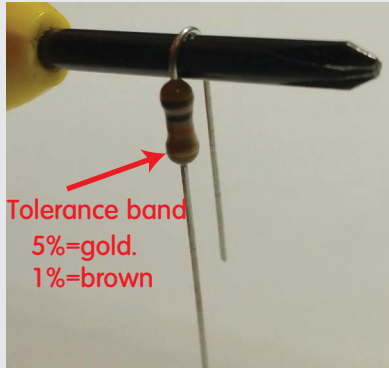
10-pin header

If you plan on using the **4-pin power header**, (most 5U), skip this step. It will be installed later.

Mattson VCO 2 DIY Board assembly

Page 5

15



A word about resistors

Because of the board density of this project, the resistors are all end mounted on the PC board. As mentioned in the builder notes, it helps to use a small screwdriver shaft or pen cartridge to use as a bending jig.

I like to bend the lead furthest from the tolerance band end so that all of the resistors face the same direction. When mounted tolerance-band-down, it makes it much easier after construction to scan the resistor values from the top-down. It really hurts trying to adjust to reading them when the orientations alter randomly. Of course, the electrons don't care what direction they face.



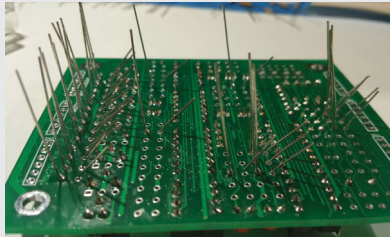
The resistor silkscreen has a circle where the base (tolerance band) is placed and a small resistor symbol pointing toward the associated pad for the bent lead.

The resistor reference number is usually above the silkscreen symbol.

There are 71 resistors in this project.

I have broken them down into 3 groups. Two groups of 24, 5% resistors and a group of 23, 1% resistors.

You may wish to break it into smaller groups prior to soldering if it makes the task easier for you.



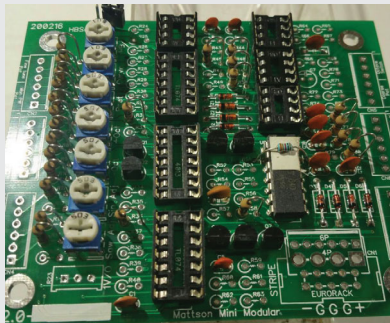
After stuffing a group of resistors, I bend the short leg at an angle to hold the resistors onto the board.

This also gets them out of your way, allowing you to solder all of the longer legs. It makes it easy since they're in neat rows.

After soldering the long legs, I clip the soldered leads, turn the board over and check that they're all seated against the board. (reflow while pushing on the resistor to re-seat).

Then, I line up the resistors neatly before soldering the short legs. Only because I'm OCD about it and it looks prettier...

16



Resistors 5% group 1

Look at the BOM and place the Group 1 resistors in their proper space. Solder as above. Or, however you usually do it.

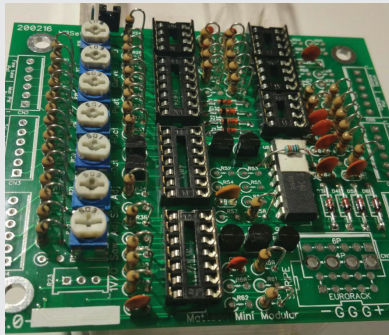
The picture shows the PC board with the Group 1 resistors installed.



Mattson VCO 2 DIY Board assembly

Page 6

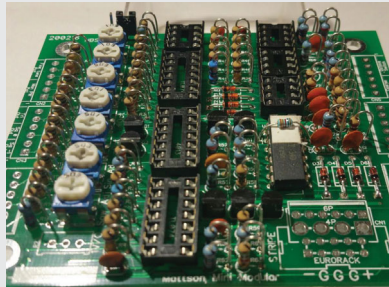
17



Resistors 5% group 2

Continue with the Group 2, 5% resistors.

18



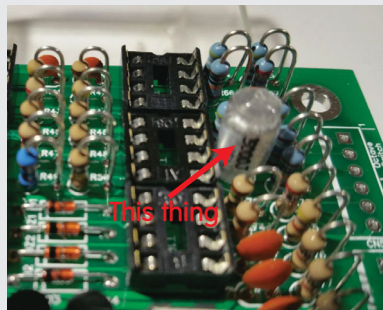
Resistors 1% group 3

Finish the resistors with the Group 3, 1% resistors
We'll wait..

The 1% resistors typically have a bluish-gray body and an extra color band. Instead of a first digit, second digit, multiplier and tolerance band, they add an extra band for a third digit. The tolerance band is brown...for 1...% So, they read: first digit, second digit, third digit, multiplier...and a brown stripe.

Phew! Done with the resistors.

19



C7: Polystyrene capacitor

C7: .005uF Polystyrene. Locate C7 and install it in its location next to U6.

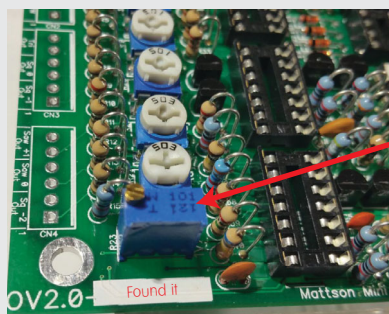
Before soldering the leads to the board, consider the fact that this capacitor is made out of styrofoam (R) with foil wrapped around it.

If you heat the leads too much, the styrofoam (R) melts and the capacitor is useless. the leads aren't physically tolerant either. so, go easy on bending or pulling on this.

Why use such a crappy capacitor? well, they're extremely stable and have minimum leak.

Since this is **THE** capacitor that makes the oscillator work, use minimum soldering iron contact time while soldering and don't pull on it.

20



R23: Multi-turn trim pot

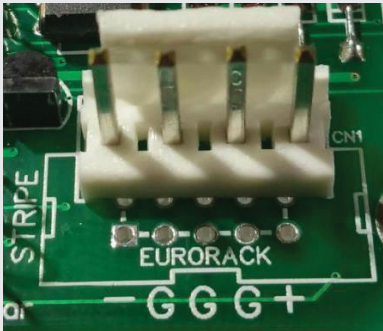
Locate **R23: 100K Multi-Turn trim pot** and install it in its location at the bottom of the trim pot column by the serial number.

The **adjustment screw is oriented to the left** as shown.

Mattson VCO 2 DIY Board assembly

Page 7

21
(maybe)



4-pin

(4-pin power connector if using this option)

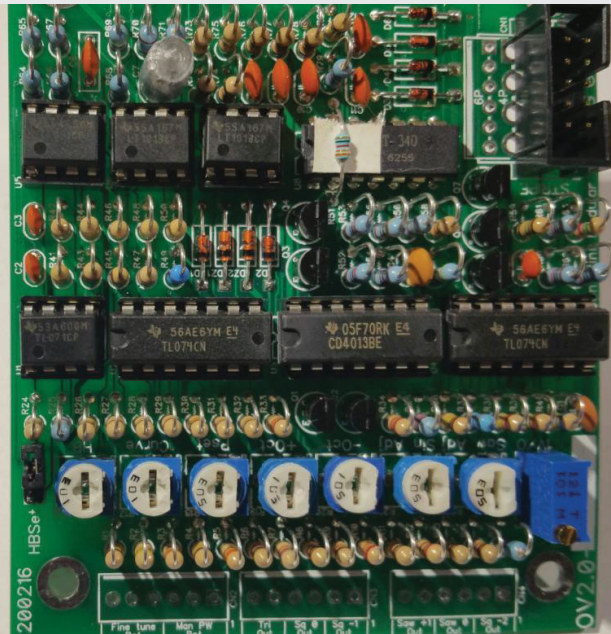
If you chose to install the **4-pin power header** instead of the 6-pin or 10-pin headers, install it now as shown.

Pay attention to the locking ramp position.
Solder it to the board.

If you chose none of these options, you can just solder your power leads directly to the proper pads.

If you have already installed a power connector, skip this step.

22



ICs

U1-U7: ICs.

Now it's time to install the Integrated Circuits. Or, ICs. All of the notches/pin-1 indents point away from the power connector pad.

If you don't have an IC inserter, you may have to bend the pins inward slightly. I do it by holding the IC at each end, putting the leads flat on the work bench and gently rock the IC to bend the pins in just a touch. Then, repeat with the other side.

Make sure the pins line up and fit in the socket prior to seating the IC into the socket.

VERIFY after seating that the pins all socketed and didn't bend flush to the bottom of the IC.

No connection=it won't work.....

U1, U5: TL071, 8-pin.

U2, U4: TL074, 14-pin.

U3: CD4013, 14-pin. (**Static sensitive**- don't touch unless grounded)

U6, U7: LT1013, 8-pin.

Congratulations, you have finished installing all of the board components.

23

Now, double check your work, component orientation, part values, look for solder connections that may be messed up, raise a toast to the good solder connections and.....

Go to Panel Component wiring