

# Voice of Saturn Sequencer Assembly Instructions

For PCB v1.04 11/18/2009

Assembly instructions v1.3 3/26/10

## 1. Recommend Tools and Supplies:

•**Soldering Iron and Solder:** A 15 Watt iron will may get the job done, but it'll be easier with a 25 or 35 Watt iron. The larger pot and switch connections can draw a lot of heat. Don't lose sleep purchasing your first iron; any cheap RadioShack one will do. We like small chisel or screw driver shaped tips (say 1/16th of an inch wide), but personal preference plays a big role. The goal is to use a tip that's about the same size as the pad you're soldering. This way you get you get as much surface area contact as possible (better for heat transfer) but are still small enough to avoid touching neighboring pads. For solder, we recommend .02 or .031" diameter, rosin cored flux, tin-lead solder, either 63/37 or 60/40, whatever's cheaper. See our [soldering guide](#) for explanations. Lead-free solder is a little bit harder to use since it "wets" metal somewhat slower and has a slightly higher melting point. If your kit has sat on the shelf for a while (a year), some steel wool or a pink eraser is useful to remove oxidation from the components and board before starting.

•**Wire:** This kit involves a *lot* of wiring, we recommend you use 22 to 28 gauge stranded wire because solid wire is less flexible and can break as wires shift around. Colored ribbon cable is very helpful. Some [colored ribbon cable](#) can be bought here.

•**Needle Nose Pliers:** Used to clinch or bend component leads, help remove components, and in this kit, remove metals stubs from the pots and also tighten nuts. ([buy](#))

•**Helping Hands:** Two alligator clips on a heavy base that are useful for holding wires while you solder them. ([buy](#))

•**Flush Cutters:** Used to trim leads close ("flush") to the board. ([buy](#))

•**Solder Sucker or Solder Wick:** Used to remove solder. ([buy](#))

•**Clamp:** A table top will be fine for most of the job, but a clamp can be handy, especially when removing components. ([buy](#))

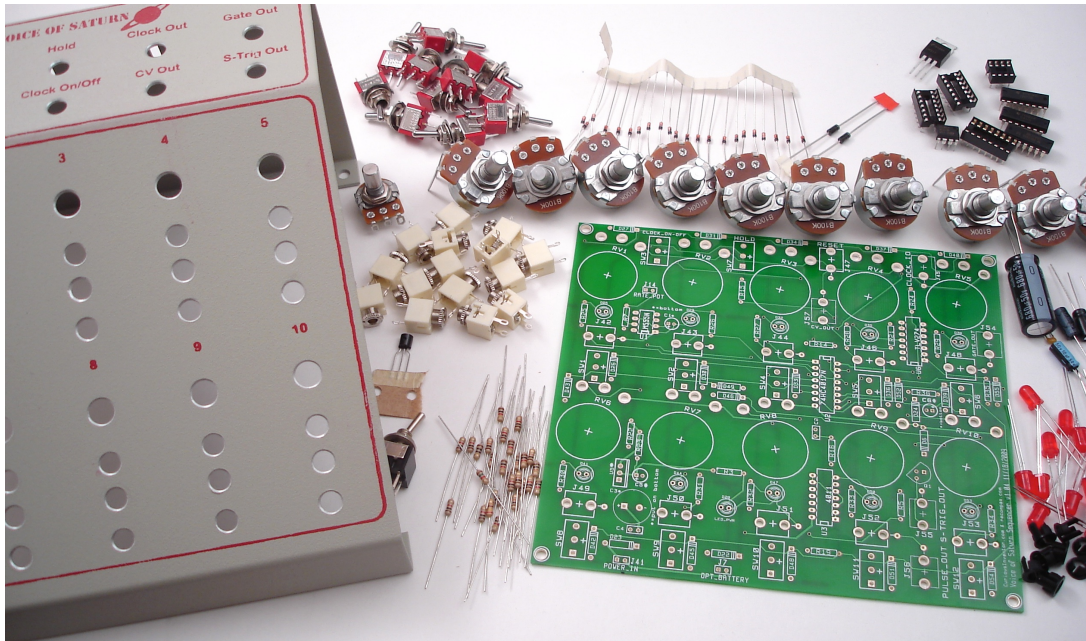
•**Multimeter:** To check your work.

•**Wire Strippers:** ([buy](#)) **Screwdriver:** Either phillips or regular will do for putting together the case.

**Parts List:**

| Name                         | No. | PCB Indicator   |
|------------------------------|-----|---|
| 555 Timer IC                 | 1   | U1  |
| 4017 Decade Timer IC         | 1   | U2  |
| 4011 Quad-NAND IC            | 1   | U3  |
| TLV2741N Rail to Rail op-amp | 1   | U6  |
| LM317 Voltage Regulator      | 1   | U5  |
| .1uF Ceramic Capacitor       | 1   | C4  |
| 10uF Electrolytic Capacitor  | 1   | C1  |
| 1uF Electrolytic Capacitor   | 3   | C2,C5,C6  |
| 680uF Electrolytic Capacitor | 1   | C3  |
| Small Signal Diode           | 22  | D6, D24, D26, D27, D30, D31, D33, D34, D36, D37, D39, D40, D42, D43, D45, D46, D48, D49, D51, D52, D54, D55 |
| 1A Schottky Rectifier        | 2   | D22, D23  |
| 1/8" 3.5mm phone jacks       | 15  | J42, J43, J44, J45, J46, J47, J48, J49, J50, J51, J52, J53, J54, J55, J56                                   |
| SPDT switch                  | 12  | SW0 (power, off board), SW1, SW2, SW3, SW4, SW5, SW6, SW8, SW9, SW10, SW11, SW12                            |
| DPDT switch                  | 1   | SW7   |
| 1k ohms Resistor (1/4W)      | 14  | R3, R7, R15, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34  |
| 10k ohms Resistor (1/4W)     | 5   | R5, R14, R16, R19, R37  |
| 10 ohms Resistor (1/4W)      | 3   | R21,R35,R36   |

| Name                         | No. | PCB Indicator  |
|------------------------------|-----|--|
| 240 ohm Resistor (1/4W)      | 1   | R23  |
| 1.5k ohms Resistor (1/4W)    | 1   | R22  |
| 2N3904 transistor            | 1   | Q1   |
| 100k Linear Pot: Panel Mount | 10  | RV1, RV2, RV3, RV4, RV5, RV6, RV7, RV8, RV9, RV10                |
| 100k Linear Pot              | 1   | J14  |
| Red LED                      | 11  | D25,D53,D29,D32,D35,D38,D41,D44,D47,D50,(D28 wires go off board) |
| LED holder                   | 11  |  |
| Dip 14 socket                | 2   | U6,U3  |
| Dip 16 socket                | 1   | U2   |
| Dip 8 socket                 | 1   | U1   |
| PCB                          | 1   |  |



## 2. Add the sockets and diodes to the PCB

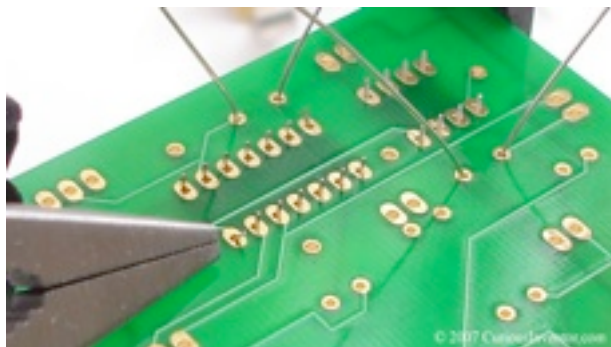
Diodes: D6, D24, D26, D27, D30, D31, D33, D34, D36, D37, D39, D40, D42, D43, D45, D46, D48, D49, D51, D52, D54, D55

Schottky Rectifier: D22, D23

Dip Sockets: U1, U2, U3, U6

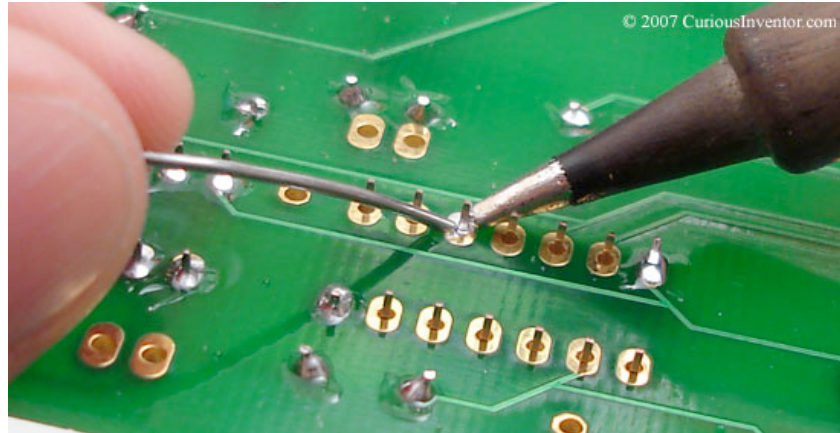
When using IC sockets and diodes, make sure they are placed correctly. The sockets have notches which must align with the notches on the PCB. The diodes have a line on one side which must align with the diagram on the PCB.

In order to keep the components from falling out before you solder them, bend the leads a bit to the side.









As you are soldering, cut off the leads as you go with flush cutters. Watch out for flying leads; safety glass are actually not over-precocious for this, although we generally just hold the lead with fingers to keep it from flying off.

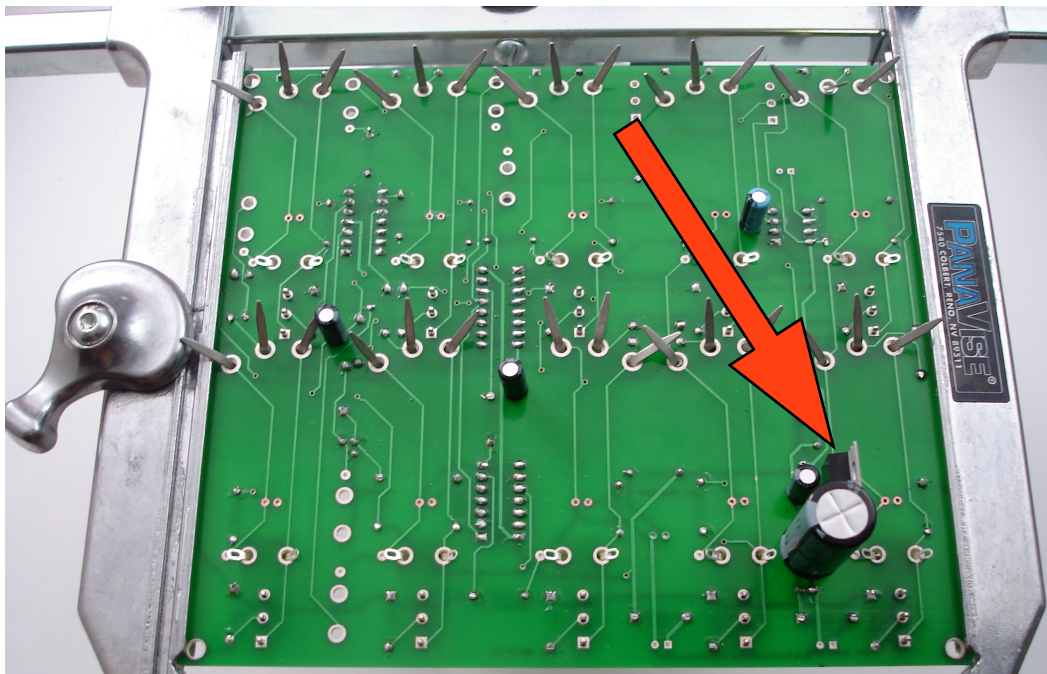
## 5. Solder components on back of board

Some of the components are too tall to fit between the panel and board, so they have to go on the back. To align the components with the correct polarity, use the same holes from the top on the bottom. ie, the big legs on the capacitors still go in the square hole on the back.

**Note: make sure the regulator has the heat sink towards the close edge. This is opposite from the marking on the opposite side.**

Capacitors: C1,C2,C3,C5,C6 (C2's stripe should be towards the 4017)

LM317 Voltage Regulator: U5



## 6. Place the potentiometers, switches and 1/8" jacks

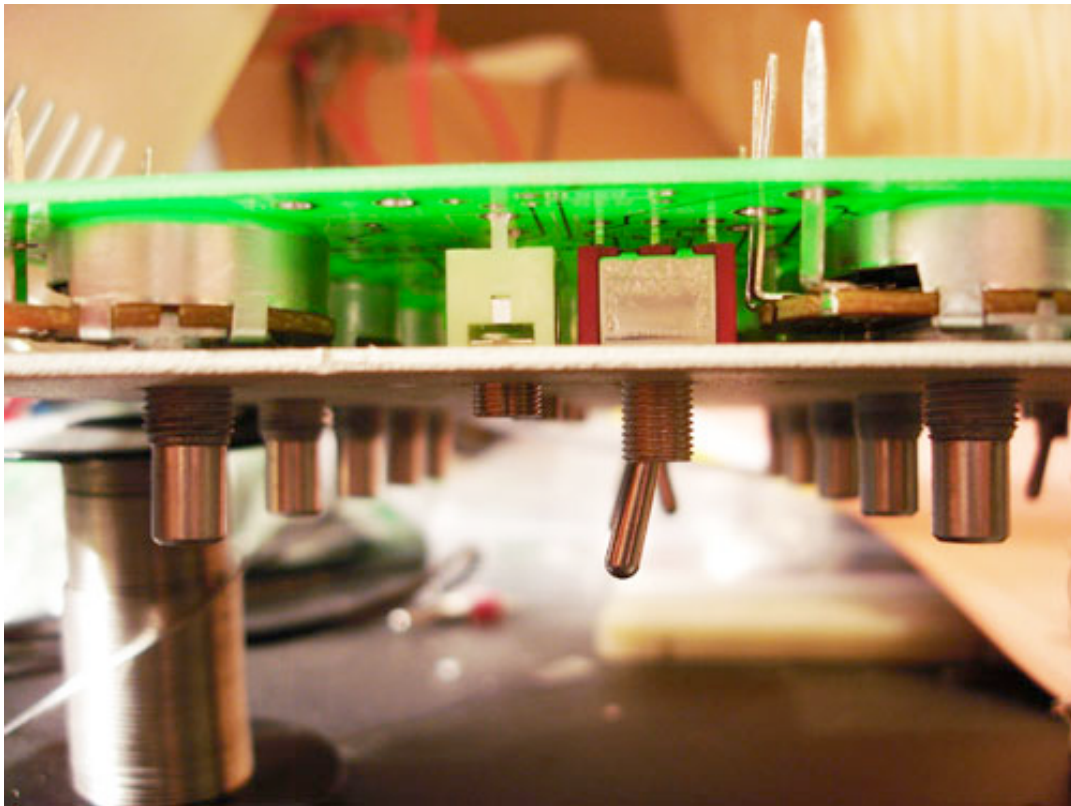
After placing the components on the board, you may want to bend the potentiometer legs, but the case top will hold them in place. It is not necessary to bend the legs of the switches.



## 7. Insert board with components into the case.

Using the case as a jig, place the board with the components into the proper holes, which will help align the parts correctly. After placing the components through the hole, fasten all the sockets and switches with the nuts. It is important to note that the sockets, switches, and potentiometers are supposed to be **flush with the case**, not the board.

You can get away with only installing the 4 corner nuts for the pots, but all the switches and jacks need to be loosely tightened.



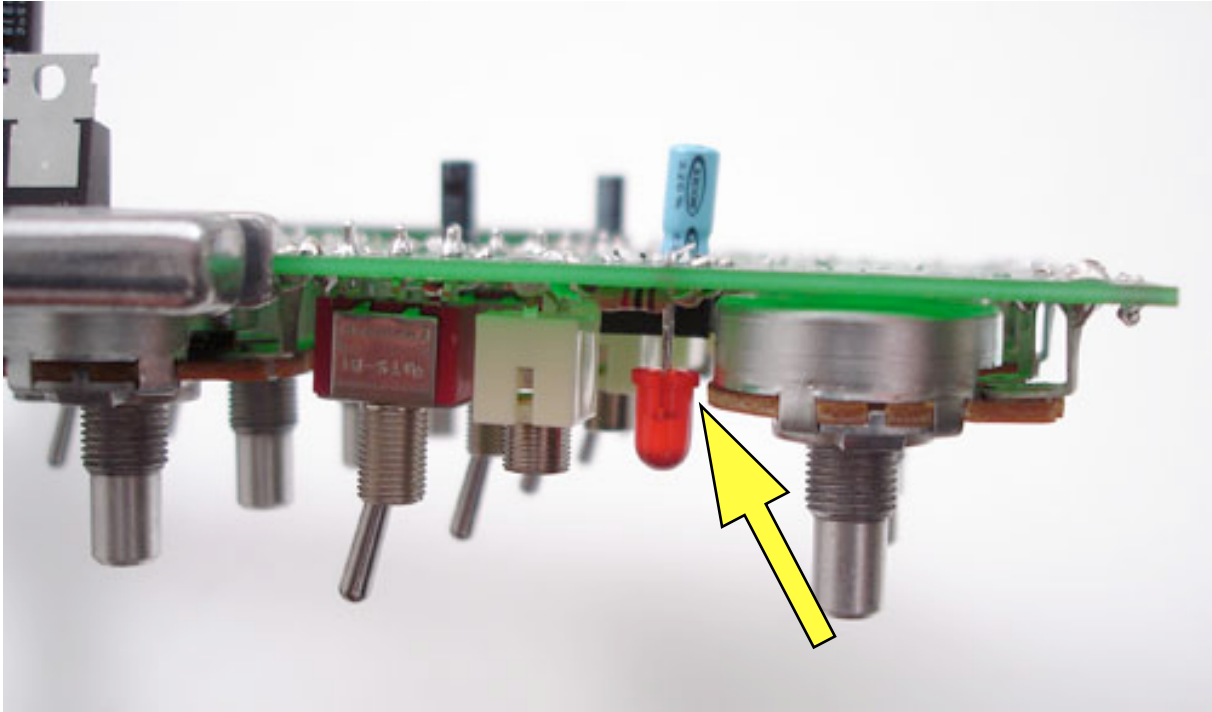
Note the gap between the bottom of the jack and switch and the pcb.



8.Remove board and trim the leads from the components

## 9.Insert the LEDs

The LEDs should be soldered in place so that they poke through the black LED panel holders, but don't snap in place. This way, the board can be removed from the panel.

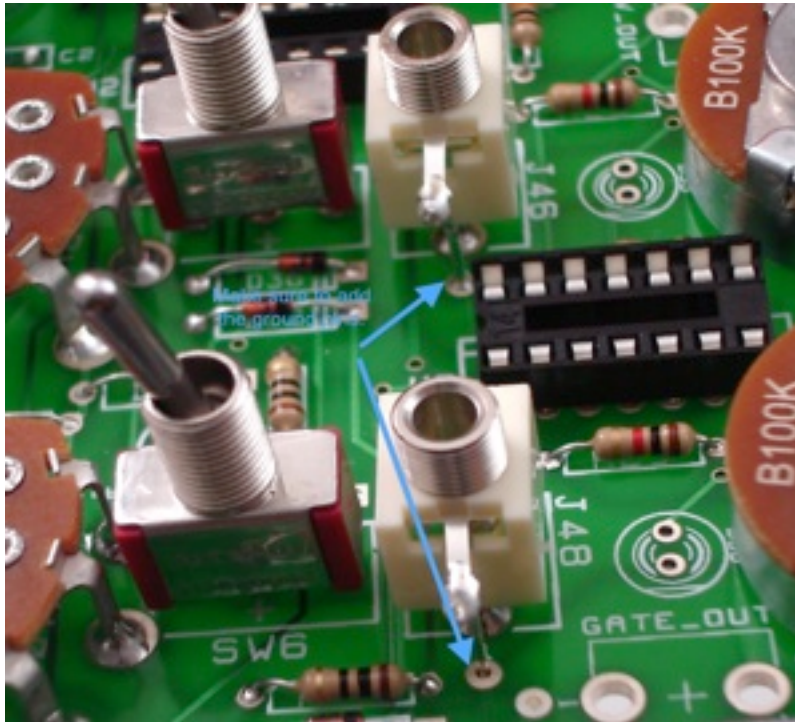


**If you look at the top of the LED, you'll notice its bottom rim forms a D shape. Make sure this aligns with the D shape on the pcb.**

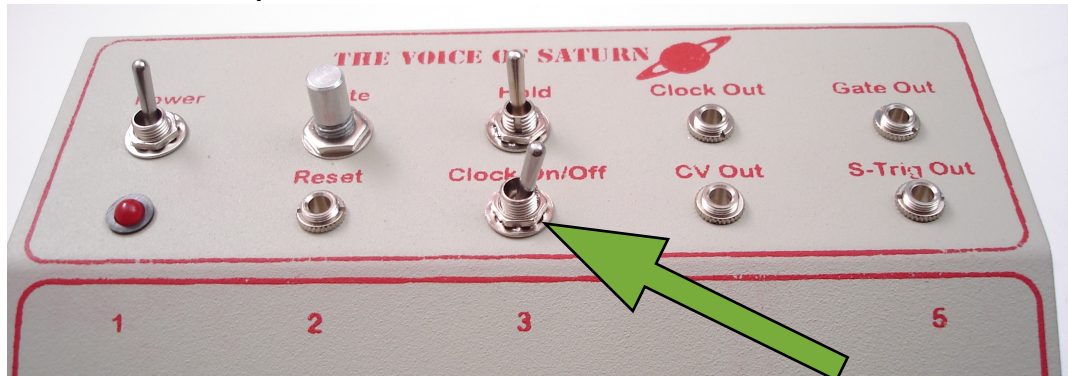
Install the LEDs so that **the bottom rim of the LED lines up with the bottom of the brown part of the pots**. There should be a little over a 1/4" between the pcb and bottom of the LEDs. Bend the legs out to hold them in place while soldering.

## 10. Wire the sockets to ground

Using the left over clippings from the resistor and capacitor leads, solder the socket's to ground.

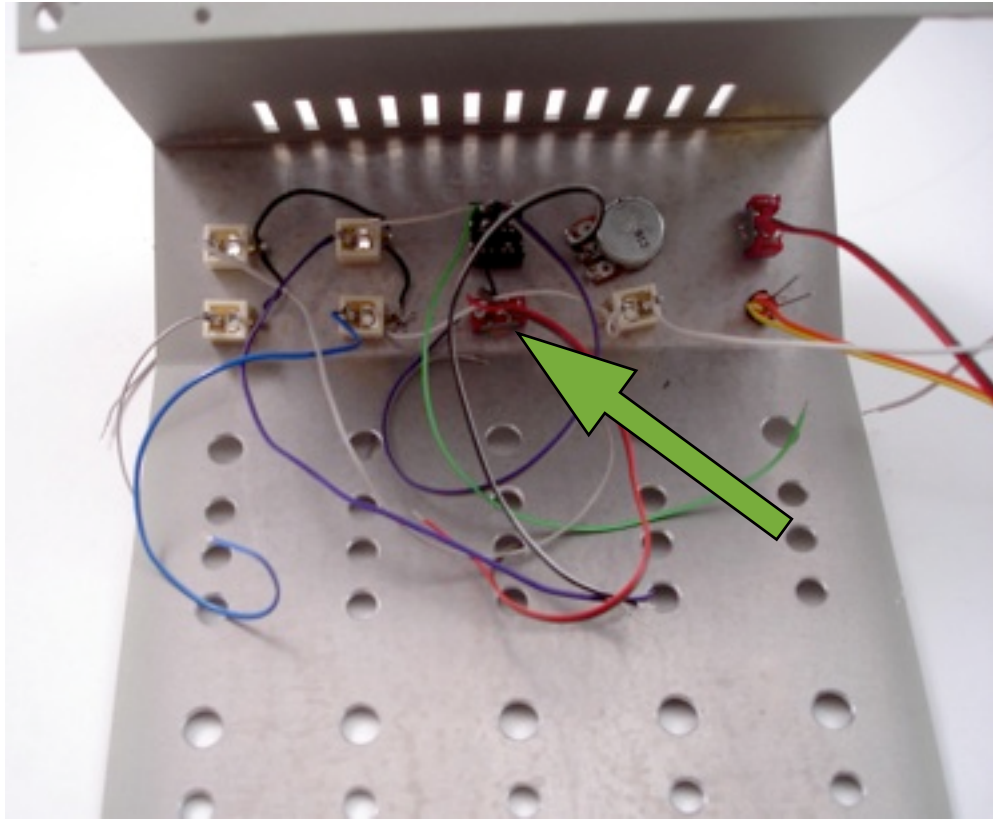


## 11. Attach extra pots, sockets, and switches to the board

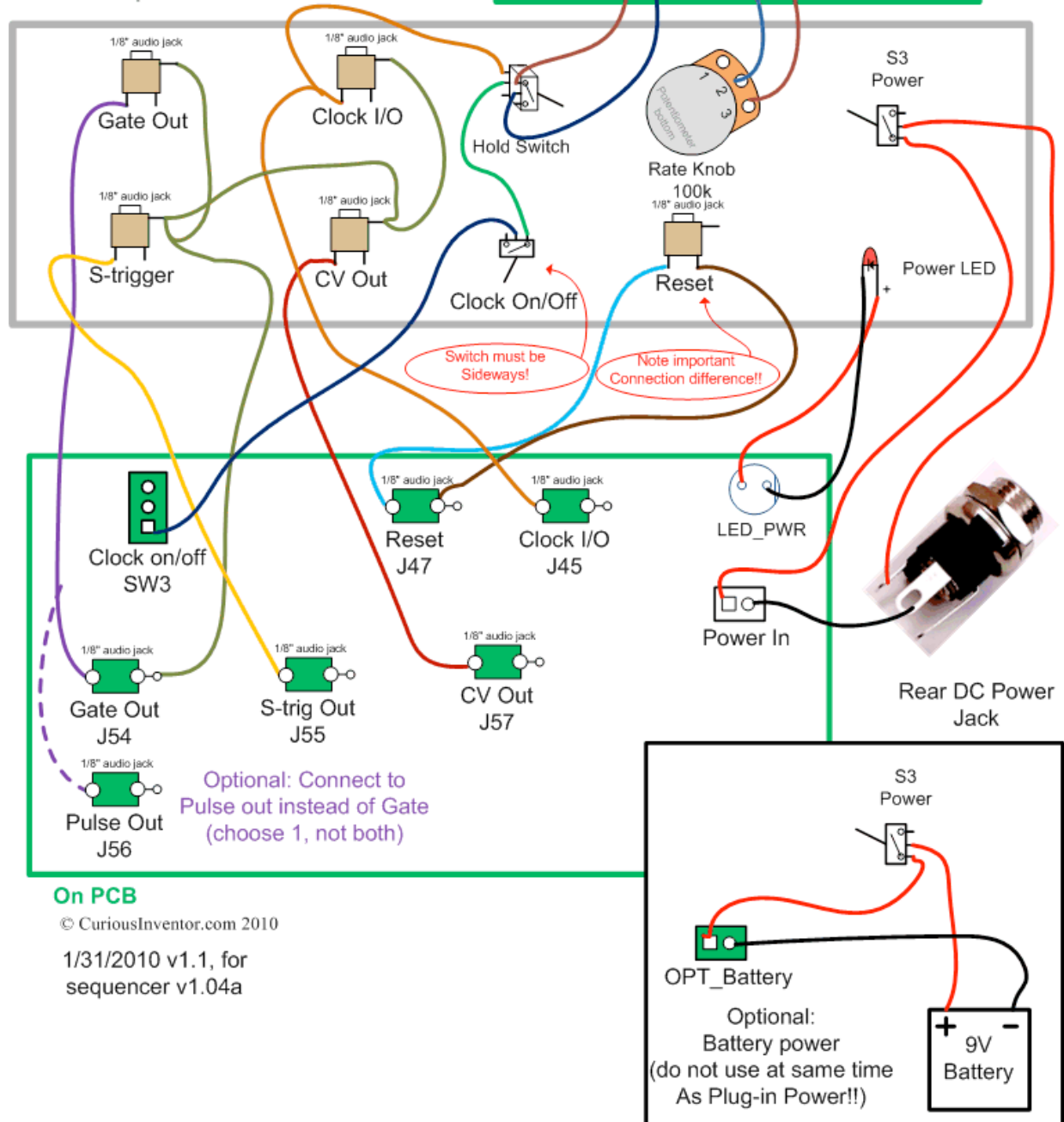


Note the clock switch is installed Left/Right, not up down to accommodate the PCB.

12. Attach wire to components (see diagram below)



We recommend 14" wires to allow enough room between the pcb and panel for troubleshooting. The green arrow points out the horizontal Clock on/off switch orientation. The other switches are vertical.





## 14. Before inserting ICs, plug the sequencer in and check the voltages at the ICs

In order to check the voltages at the sockets, place the positive lead on pin 7 for a 14 pin IC, and the negative lead on pin 14. The voltage should be around 9 volts. Pin 8 of the 555 (U1) should also be around 9V.

If the voltage is too high or too low, first check the voltage going into the power supply. It should be above 12V, either AC or DC.

## 15. Test the Sequencer

Plug in the ICs finally and test everything out. The first thing you should check is the voltage on pin 8 of the 555 to make sure it's still 9V. If it's lower, quickly touch the voltage regulator to see if it's hot. If it is, there might be a short, or one of the ICs might be installed backwards.

Also check the 4017 counter chip to see if it's not. If it is, it could be that a diode is installed backwards.

Begin troubleshooting by removing all but the 555, and make sure a square wave is coming out of pin 3 when the rate knob is at its slowest setting (all the way counter clockwise).

## 16. Insert Completed PCB into Panel

This will take some jiggling and nudging to get all the LEDs to fit into their respective black holders. You may need to resolder an LED if it's position or height is too far off. Remember, the LEDs should only rest inside the holders, not snap into place.

## 17. Install all the washers and nuts again, you're Done!

## 18. Support: [CuriousInventor.com/forums](https://www.curiousinventor.com/forums)

## 19. Optional Battery Operation

Next to the power header, there is a header called opt\_battery, which can be used to run the sequencer off battery power. This input skips the voltage regulation section, but still has a polarity protection diode.