

Kits: Voice of Saturn Filter

--- building instructions ---



Introduction:

This guide will walk through the assembly of the "Everything" version of the kit.

Note: Some pictures are from other kits that illustrate general construction techniques.

1. Recommended 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. 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 some 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 make sure voltages are OK before inserting chips, and also to debug later.
- **Wire Strippers:** ([buy](#))
- **Screwdriver:** A large phillips for the case screws and an eyeglass phillips for the joystick screws. Some wrenches might also be helpful for mounting the jacks, pots and switches.

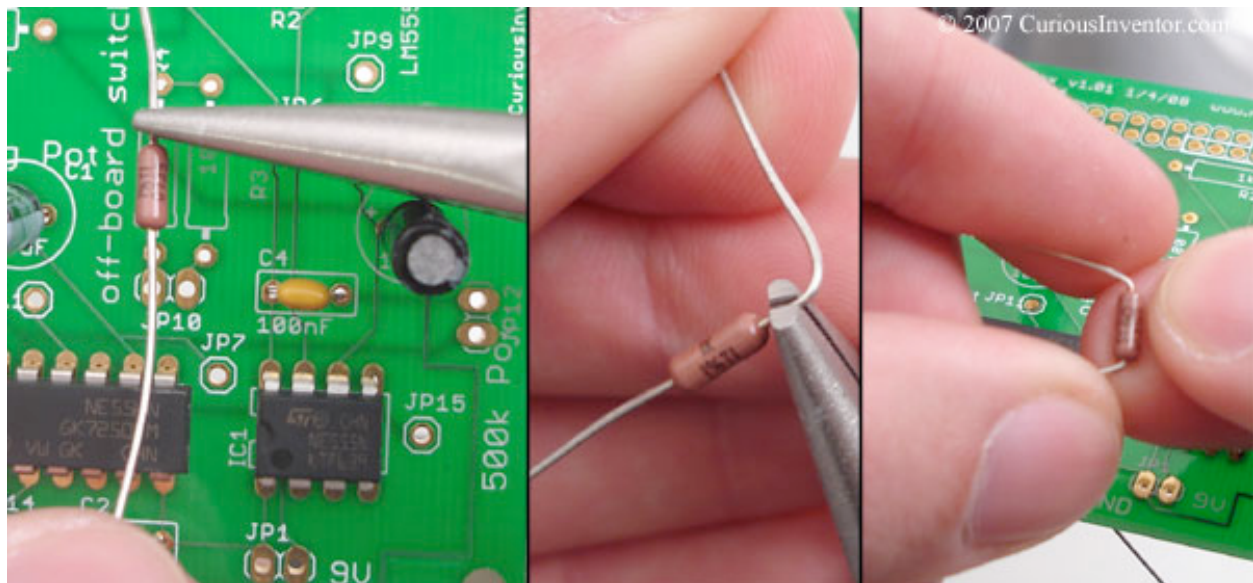
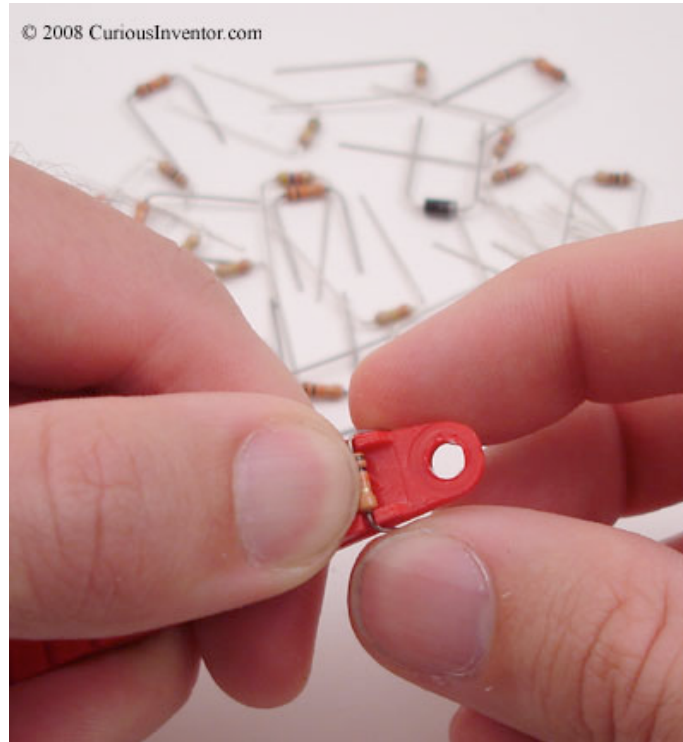
2. Add components to the PCB (Printed Circuit Board):

First, start with the resistors. Prebend the resistors beforehand using pliers or a resistor bending tool to keep from damaging the PCB while inserting them. Go in order of height, from shortest components to taller ones. This order lets you use the table to help hold things in place by resting the board upside-down while you solder them. It's convention to install resistors so their code can be read left to right in the same direction as the silk screen (tolerance band on the right).

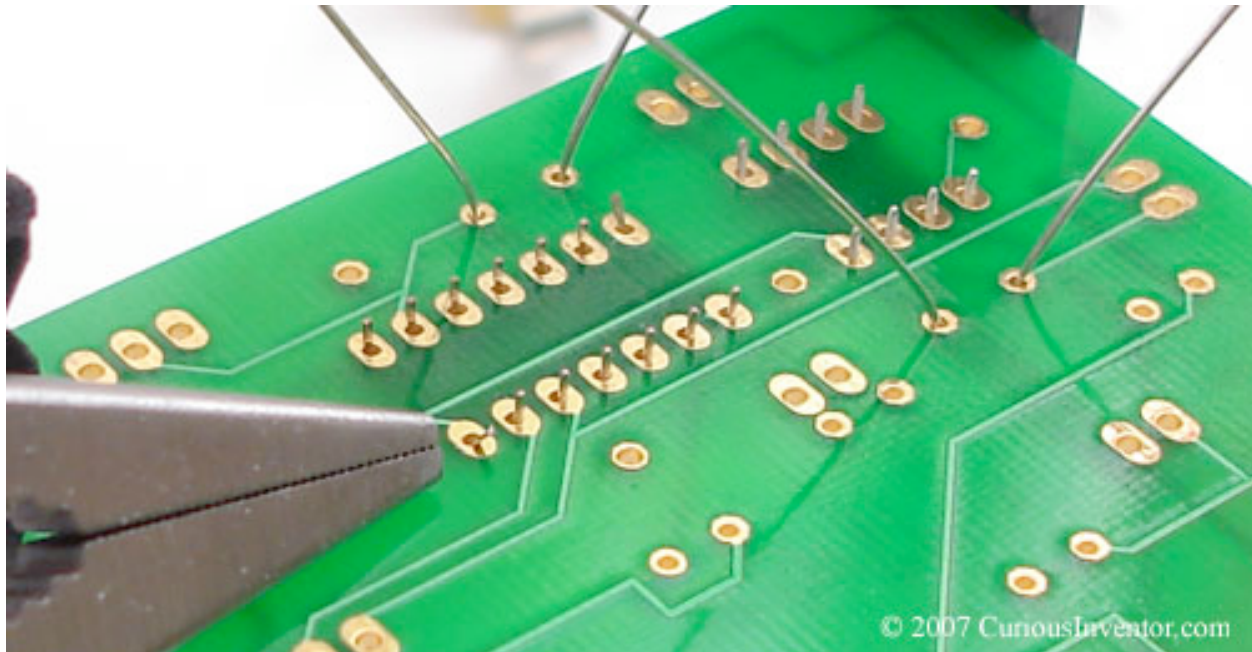
Use the list of names and values below to match each resistor value to the corresponding position on the pcb (R1, R4, etc).

- C9,C11,C12,C14: .1uF ceramic
- C1: 330pf
- C7, C8, C10, C13: 10uF electrolytic
- C2,C3,C4: .033uF
- U1: MC7805CTG
- U4: MC7905CTG
- U3: CEM3372 (filter)
- IC1,IC2,IC3: quad opamp TL084CN
- C6: 4.7uF electrolytic
- C5: 2.2uF electrolytic
- D1,D2: schottky diode, 1A
- R1-4,7-10,13-14,25,27,30-33,36-39,,42,44,45,47,48: 10k 1/4W resistor
- R17-19,22,96: 1k
- R21,23,26: 22k
- R20: 33k 1/4W
- R24: 47k
- R40,41,49,50,51: 510k
- R5,6,11,12,28,29,34,35,43,46: 5.1k

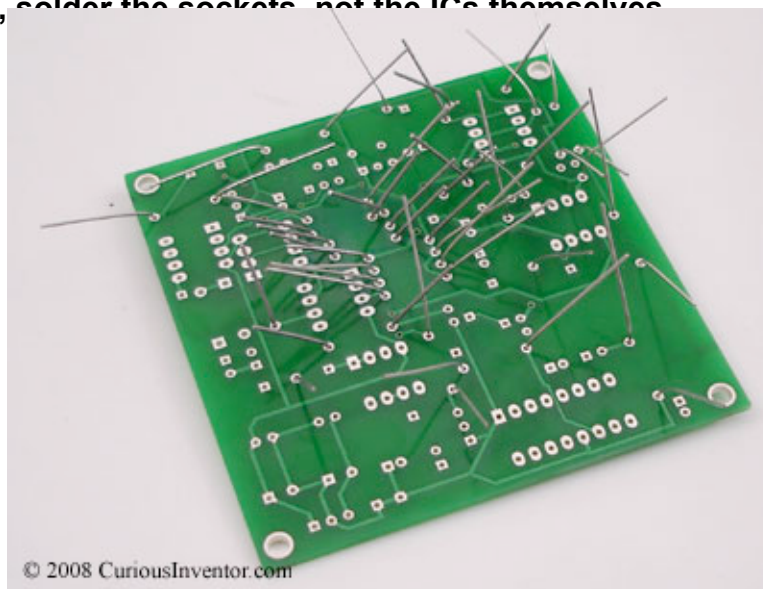
- R15,16: 68k
- R91-95: 100k linear pot
- 18 pin DIP socket (for op amps)
- (3) 14 pin DIP socket (for filter chip)
- Molex 4 Position KK Crimp Housing
- 3 Crimp pins



The below picture shows all the resistors' leads splayed out so that they hold in place. It's probably easier to only put a few in at a time. On the IC, do this for two opposite corners. This is actually what automated machines do to keep chips in place while the boards are run over fountains of liquid solder (wave soldering).



Note: in this kit, solder the sockets, not the ICs themselves



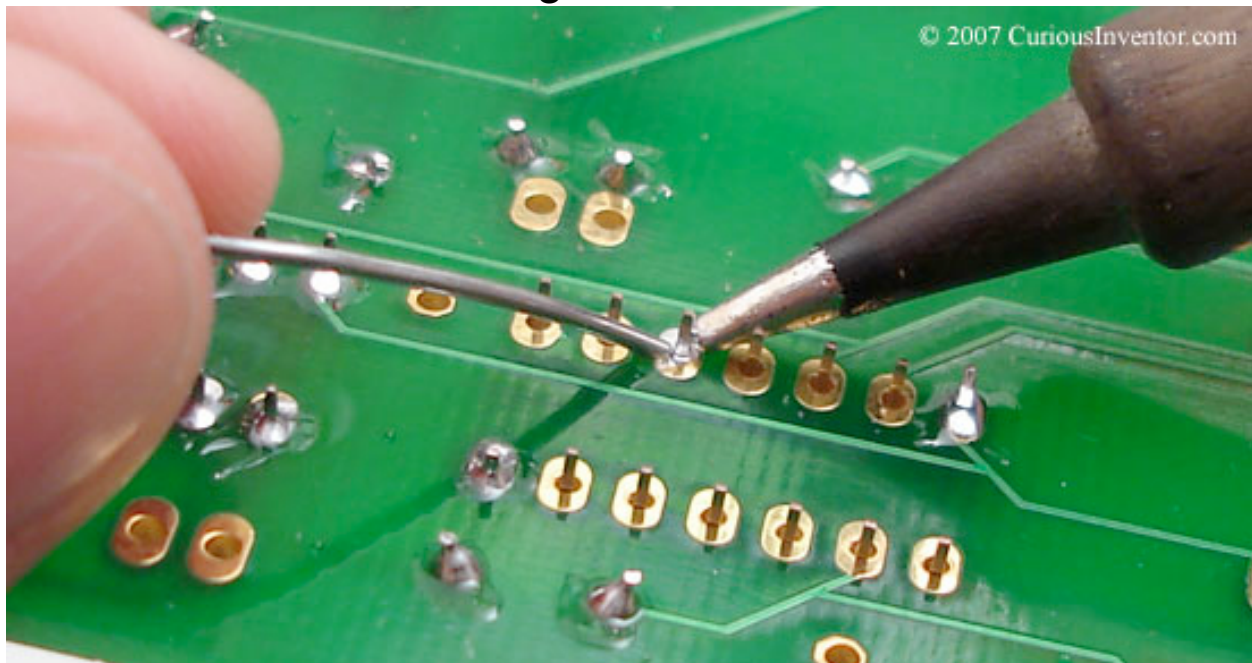
Trim the resistor leads with flush cutters after soldering them.

Now add the diodes and the disc (orange / flat) shaped capacitors. Orientation doesn't matter for the caps, but it does for the diodes. Match the stripe on the diode (white on black) with the stripe on the board.

Add the electrolytic caps (the cylindrical ones). For these caps, the polarity (which pin goes in which hole) matters. The square pads on the PCB indicate pin 1, which in this kit is positive (longer lead). See the picture on the next page.

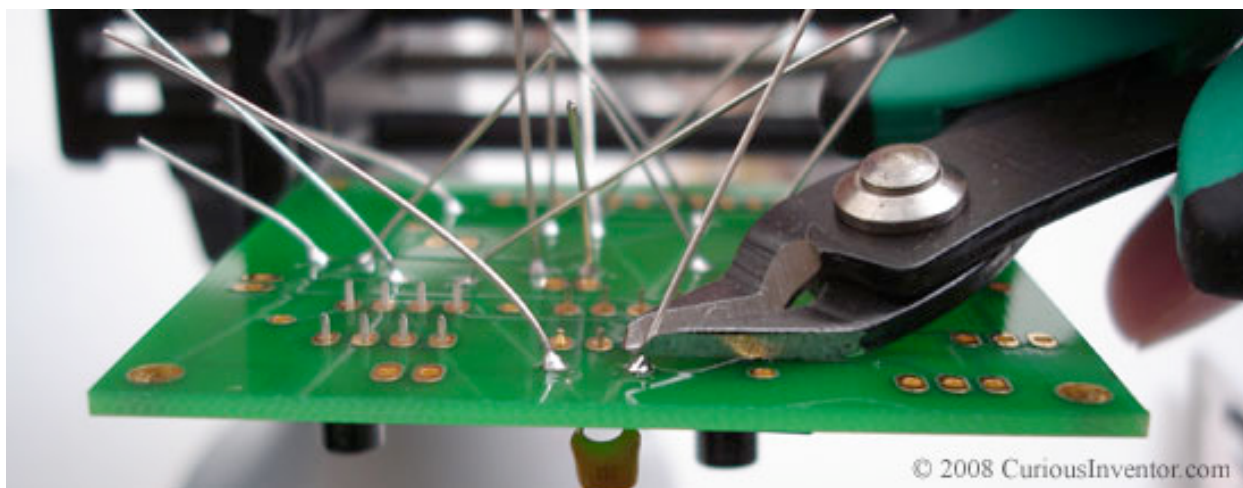
Finish up with the transistors and ICs, being sure to align the notch on the end of the IC with pin 1 (the square pin).

2.5 A little Bit on Soldering:



Tin the tip, or in other words, add a bit of solder to the tip, first. This small amount of solder forms a "heat bridge" to help conduct heat from the tip to the pad and component lead. When you first contact the parts with the iron tip, it's helpful to first place some solder in between the iron and components, then melt solder on the the side opposite from the iron tip. This ensures that the component is hot enough to bond to the solder, and also helps to spread out the solder as it will run towards the heat source.

On ICs, it's a good idea to solder every other pin (and then fill in the gaps) to reduce the risk of overheating the component.

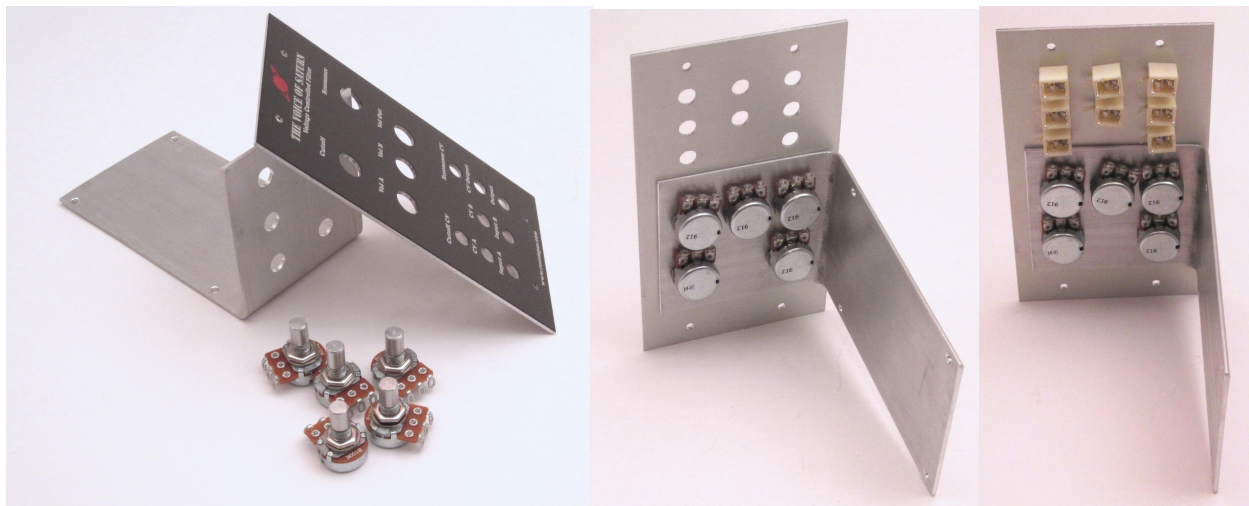


Cut off the leads as you go with flush cutters. Watch out for flying leads; safety glasses are actually not over-precautious for this, although we generally just hold the lead with fingers to keep it from flying off.



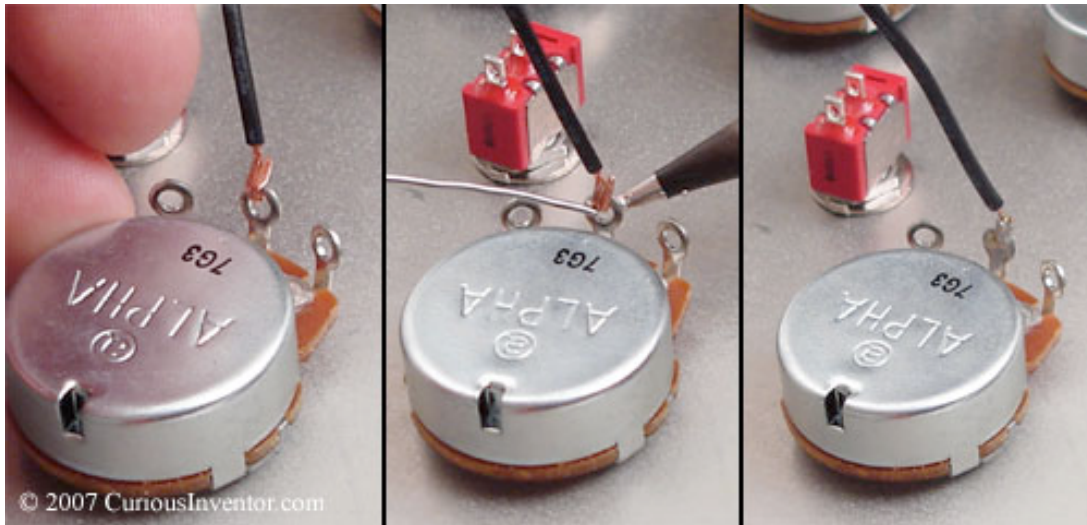
3. Installing Pots and Audio Jacks:

First break off the anti-rotation tab with pliers, then install like the following picture shows. The pots actually hold the angle bracket to the front panel.



5. Wiring:

Once you have all the components in place, we recommend pre-cutting and stripping a bunch of wires. Small gauge (24+) [colored wire](#) is highly recommended along with some zip ties.



First loop the wire through and bend it to hold it in place, then heat the joint from one side and apply solder to the other. Again, it will help to put a bit of solder between the iron tip and connection to act as a heat bridge.

Before wiring, it's a good idea to tighten everything down to reduce the risk of breaking solder joints later.

Use the connection diagram at the end of this document and the listing from above to wire each part. The grounds don't have to be connected exactly as shown, just make sure each ground pin (green line) is connected somehow.

Note the jumper wires at the bottom of the diagram between the 2nd and 3rd pins of K12, K2, K3, K7 and K9. If you like, you can replace these with potentiometers to provide attenuation.

Connect the power wire and Molex connector to the K10 header as shown in the wiring diagram.

6. Add knobs on front.

Use a small flat-head screwdriver to install the knobs on the front.

7. First Turn-On and Trouble Shooting

Before putting the ICs in their sockets, turn on the power and check a few of the IC power pins to make sure voltages are OK. Pin 4 of the opamps should be V+ and pin 11 should be V-. **It's a good idea to check this before installing any of the chips.**

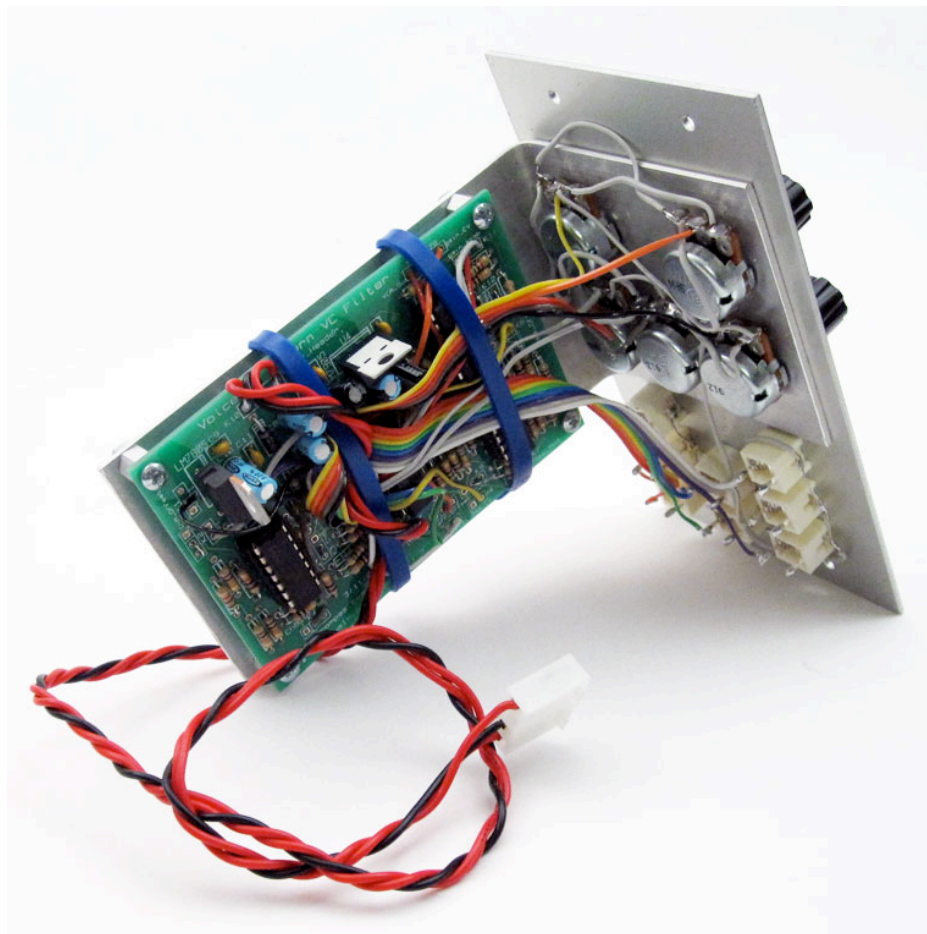


8. Turn on and Trouble Shooting

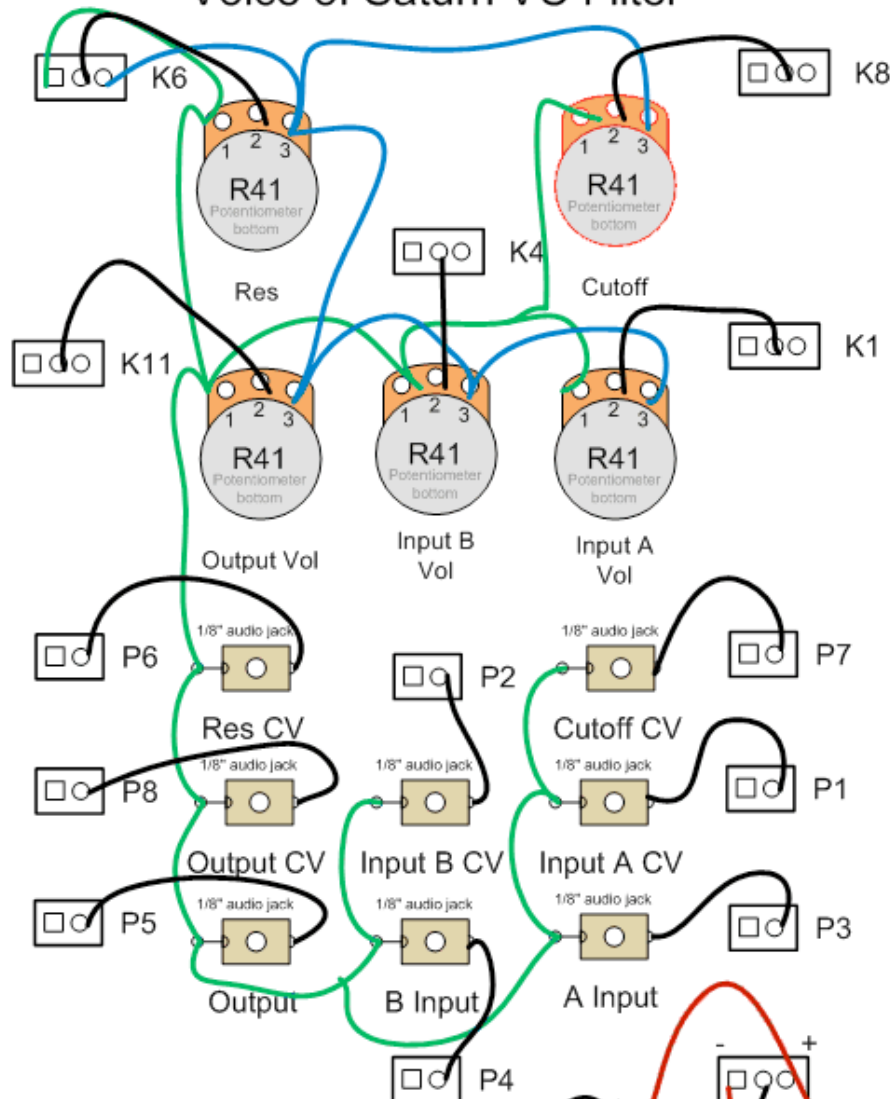
The knob settings add to the voltage input signals, so if the knob is all the way clockwise, the input voltage won't have any effect. Similarly, if the voltage level is all the way up, the knob will have no effect.

Also, make sure the input and the output volume are up.

Visit our [VOS forum](#) if you run into any trouble.



Looking at the back of the Voice of Saturn VC Filter



Note that the
tabs are on
top.

These jumpers are in place of optional attenuation pots



V 1.4 4-5-2010

Don't forget the jumpers!
(won't work without
jumpers)