EFM Synthesizers

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The SBM Assembly Manual

The Single Board Modular (SBM) is a collection of favourite EFM modules all on a single low cost pcboard. The following assembly instructions are written with "SMB (C) EFM" in the top left hand corner.

The SBM is a complicated synthesiser. I suggest that it be assembled is small steps and will address it in that manor. There are a few modifications and changes to make.

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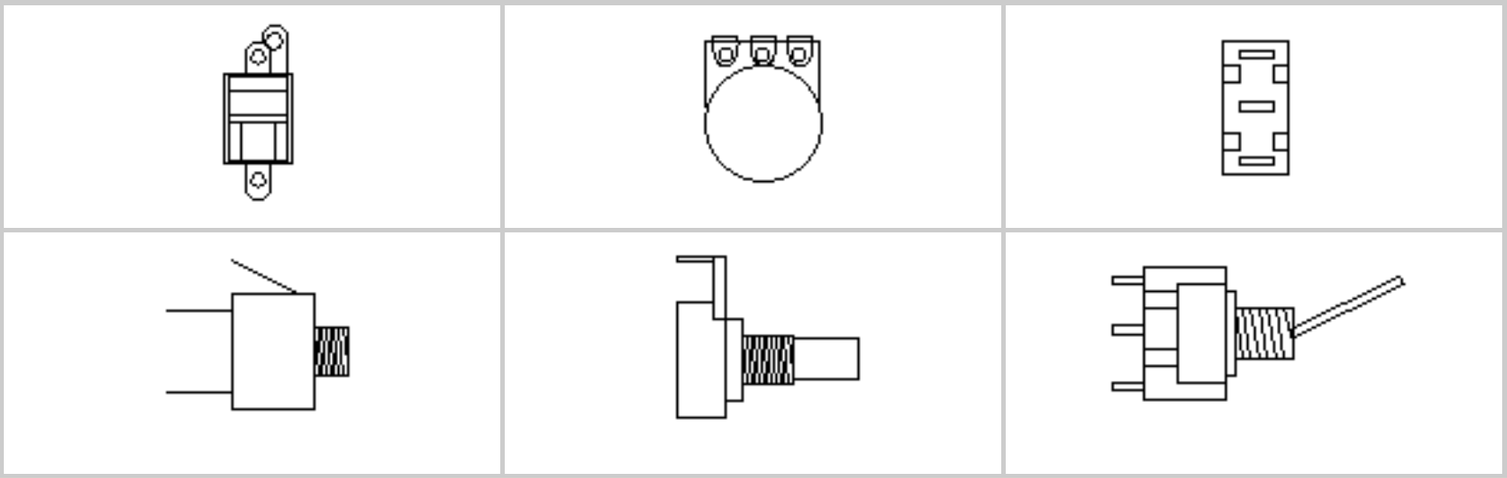
This "manual" is more of a wiring diagram than a proper assembly manual. This is due to the way the SBM is laid out. There are no referance numbers to deal with. Except for a few changes you basically put the part in the place labled for that part....IE....the 10K resistor goes in the place labled 10K.

Changes are noted by using a red arrow. Usually with some instruction...like replace the 22K resistor with a 10K resistor.

All diagrams are shown looking down on the pbboard and at the back of panel mounted parts.

1/8th Mini Jack | Pot | Switch



The module assembly instructions show how to complete a module and wire it to it's controls and jacks. I suggest that the power supply be completed and tested then the remaining componants be placed on the board before testing the rest of the modules. If you are new to DIY-synthesizers use sockets for all ics.

Assembly

There are 37 jumpers marked by a white line from pad to pad on the board. Install these first. If you are using sockets install them also. Then proceed to the power supply section.

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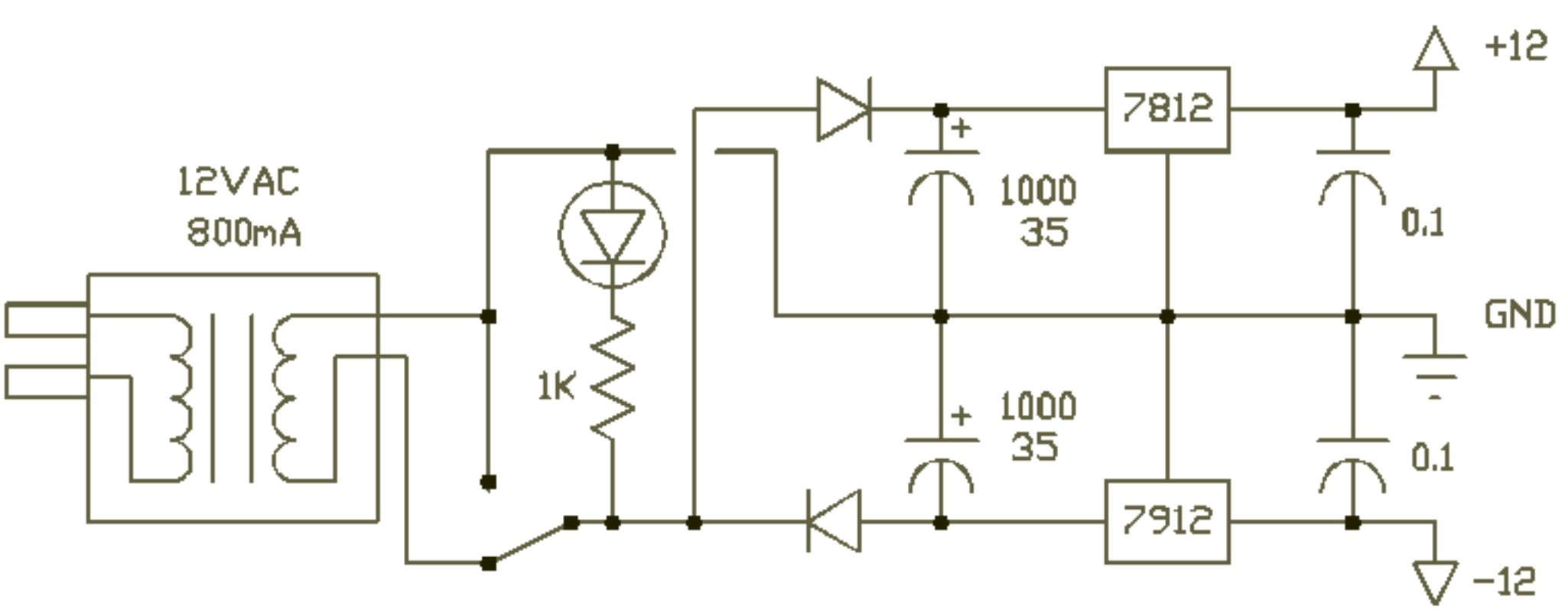
The Power Supply

The SBM has it's own power supply. It is a standard half wave type using TO220 1.5A voltage regulators to supply the +/- 12V needed. It is powered by a 12VAC 800mA wall transformer. I chose to use a wall transformer because it requires no panel space for mounting and 120VAC is not exposed.

CAUTION! If you would prefer a full wave rectifier and internal transformer over a "wall wart". We assume that you know what you are doing and that you take responsibility for exposing yourself to120VAC !! You can use a 24VCT 1A standard transformer. The pads for the additional diodes are on the board.



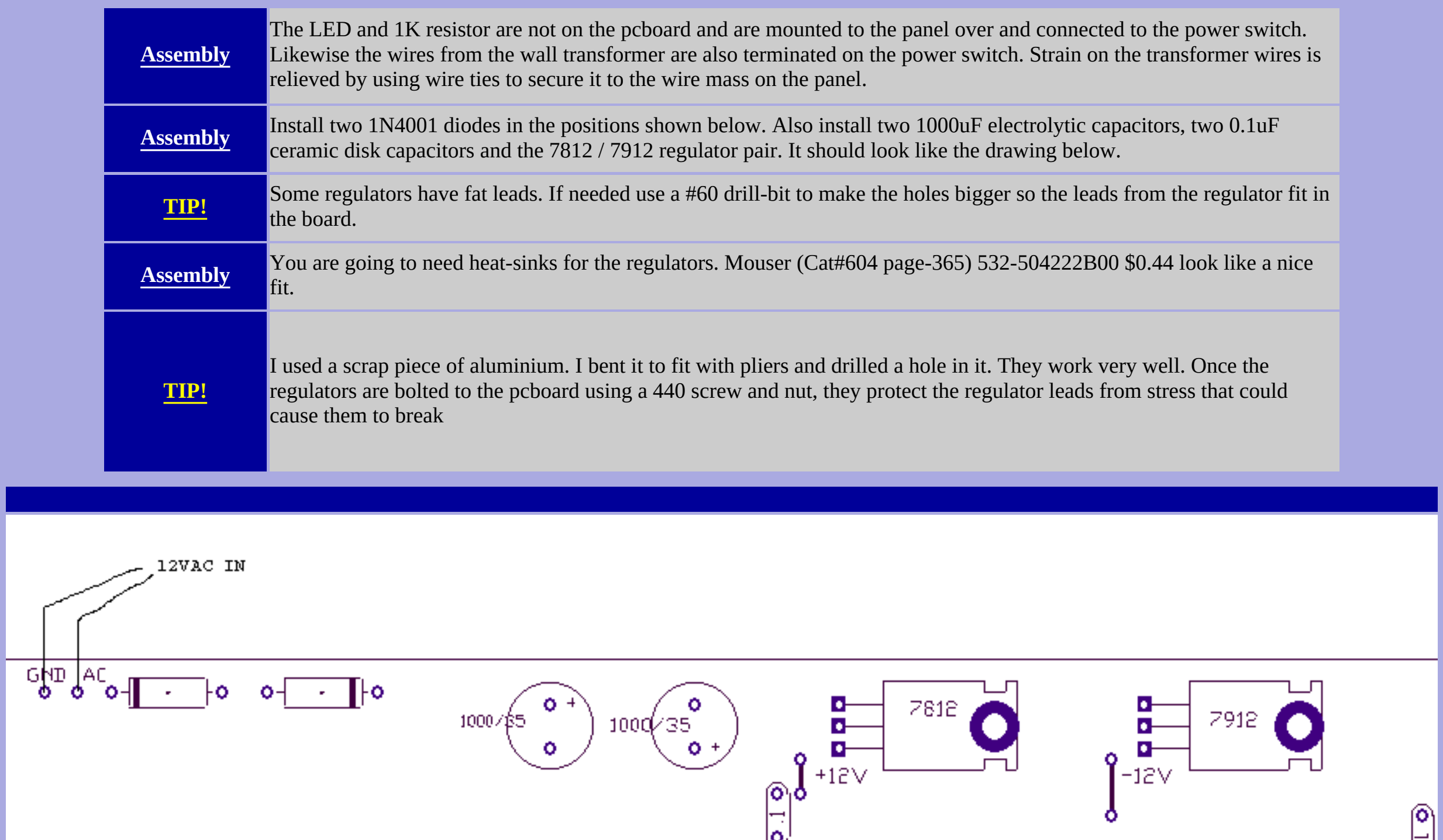
Assembly The LED and 1K resistor are not on the pcboard and are mounted to the panel over and connected to the power switch. Likewise the wires from the wall transformer are also terminated on the power switch. Strain on the transformer wires is relieved by using wire ties to secure it to the wire mass on the panel.

Assembly Install two 1N4001 diodes in the positions shown below. Also install two 1000uF electrolytic capacitors, two 0.1uF ceramic disk capacitors and the 7812 / 7912 regulator pair. It should look like the drawing below.

TIP! Some regulators have fat leads. If needed use a #60 drill-bit to make the holes bigger so the leads from the regulator fit in the board.

Assembly You are going to need heat-sinks for the regulators. Mouser (Cat#604 page-365) 532-504222B00 $0.44 look like a nice fit.

TIP! I used a scrap piece of aluminium. I bent it to fit with pliers and drilled a hole in it. They work very well. Once the regulators are bolted to the pcboard using a 440 screw and nut, they protect the regulator leads from stress that could cause them to break



Testing The Power Supply

For testing purposes connect the wall transformer directly to the pads labelled "12VAC IN" in the picture above.

Connect the black lead (negative) of a digital multi meter to the 440 screw (ground) used to secure the positive regulator (7812) to the pcboard.

Connect the red lead (positive) of a digital multi meter to jumper labelled "+12V"

Smoke Test! - Be ready to unplug the transformer if something goes wrong!

Plug the transformer in. Nothing should smoke or be hot to the touch.

The meter should read about +12V.

Connect the red lead (positive) of a digital multi meter to jumper labelled "-12V"

The meter should read about -12V.

If not, unplug the transformer and go over your wiring. Look for shorts on the board and make sure the transformer is actually delivering 12-16 VAC to the board.

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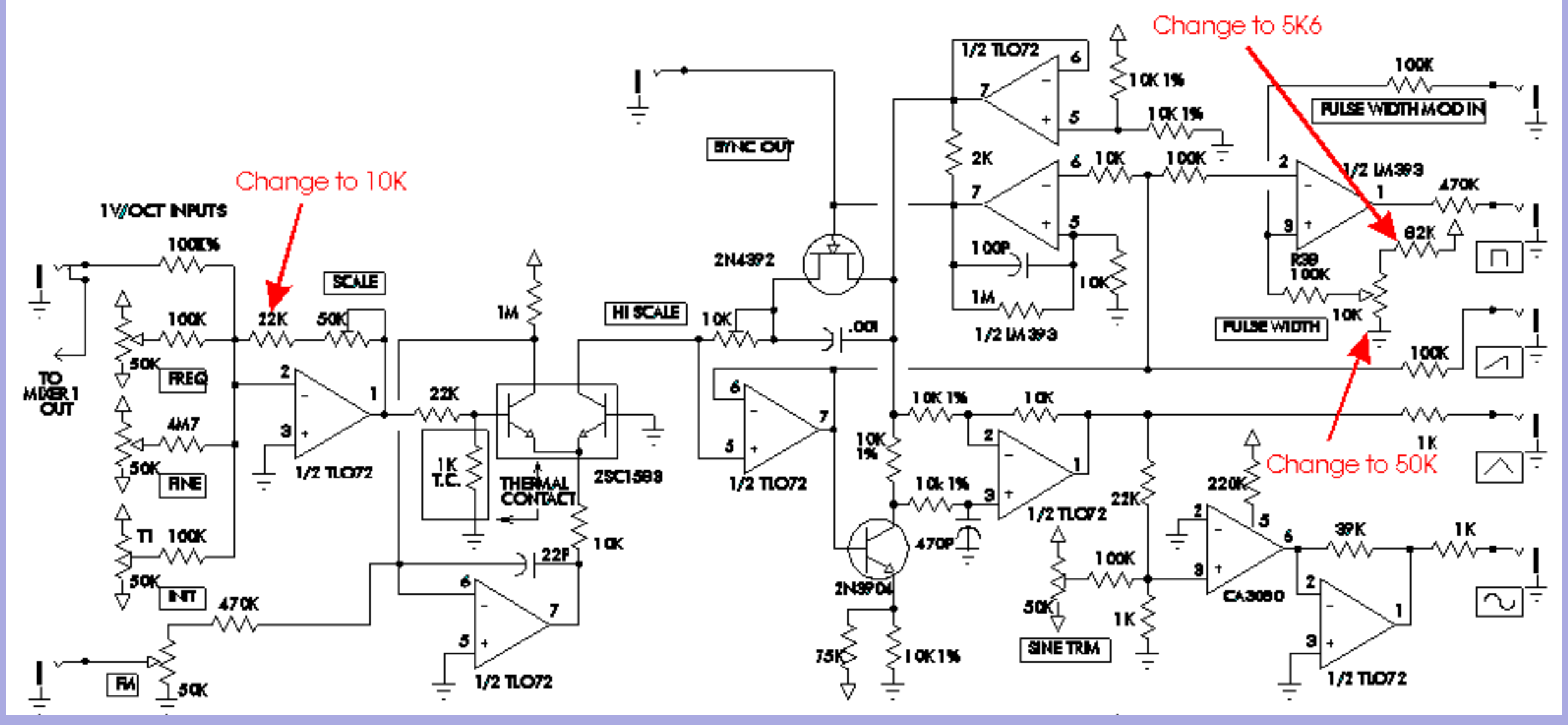
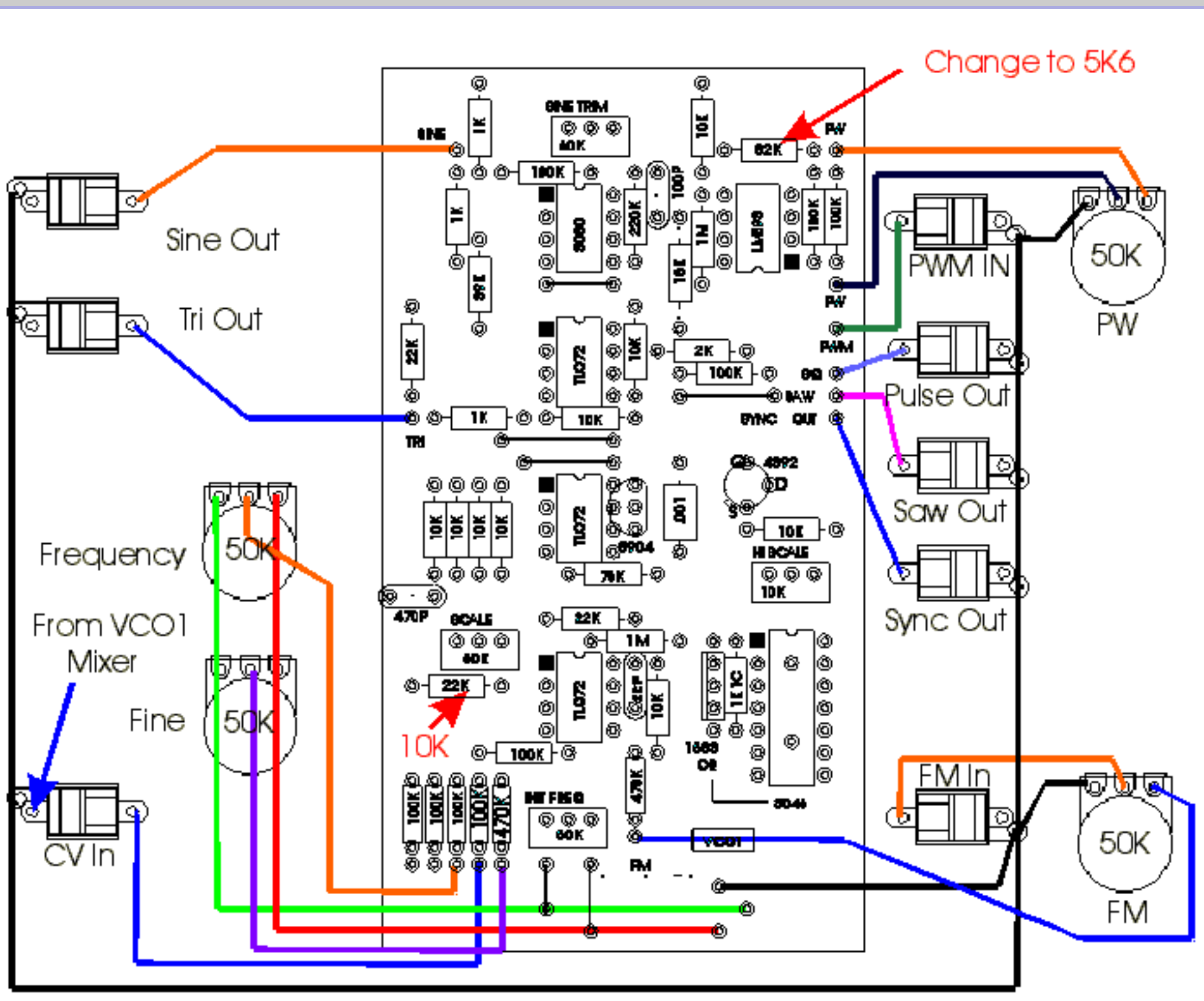
VCO1

Changes Unplug the transformer and install the parts for VCO1. Take note of the 22K resistor that has been changed to 10K. Also change the "Pulse Width" pot from 10K to 50K and the 82K resistor to 5.6K.



The PCBoard

TIP! This diagram shows how to fit a J112 on the pcboard in the place of a 2N4392



Testing The VCOs

You will need a audio amplifier and a 1-volt per octave voltage source (midi to CV or CV keyboard)

Connect the audio amplifier to the saw out, adjust the amplifier and the "INIT-FREQ" trimmer to about 1/3 of a turn. Connect the CV out from your source to any of the 100K input resistors and plug the transformer in.

You should hear the VCO through the monitor amp. If not check over your work. Adjust the "INIT-FREQ" trimmer to a comfortable pitch.

Play a middle C on your source and then the C above middle C.

Adjust the "SCALE" trimmer until they are an octave apart.

Play the high C on your source and then the C below.

Adjust the "HI SCALE" trimmer until they are an octave apart.

These two adjustment interact so you will have to go back and forth between them to get the VCO tuned.

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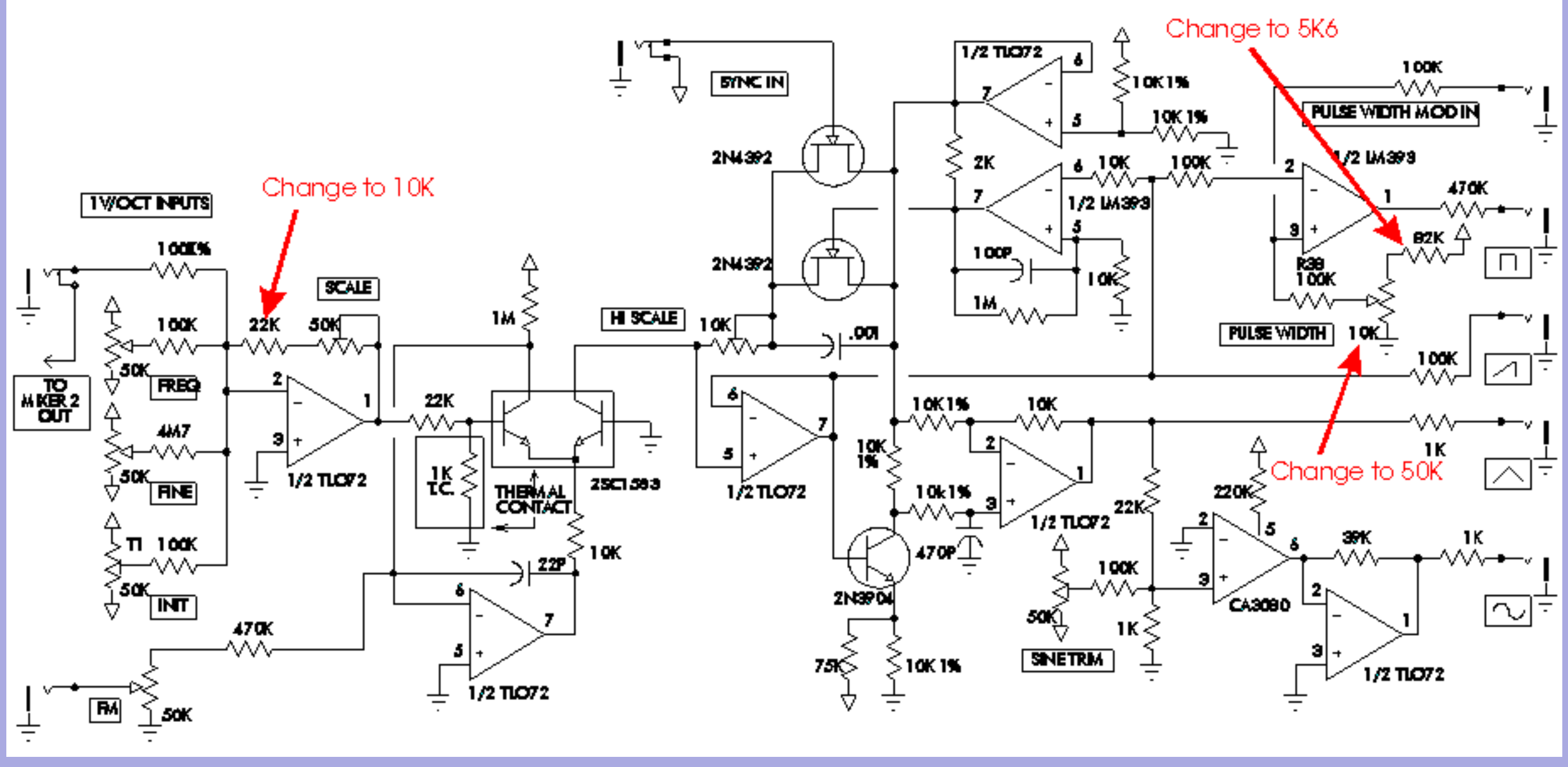
VCO2

Changes Unplug the transformer and install the parts for VCO2. Take note of the 22K resistor that has been changed to 10K. Also change the "Pulse Width" pot from 10K to 50K and the 82K resistor to 5.6K.



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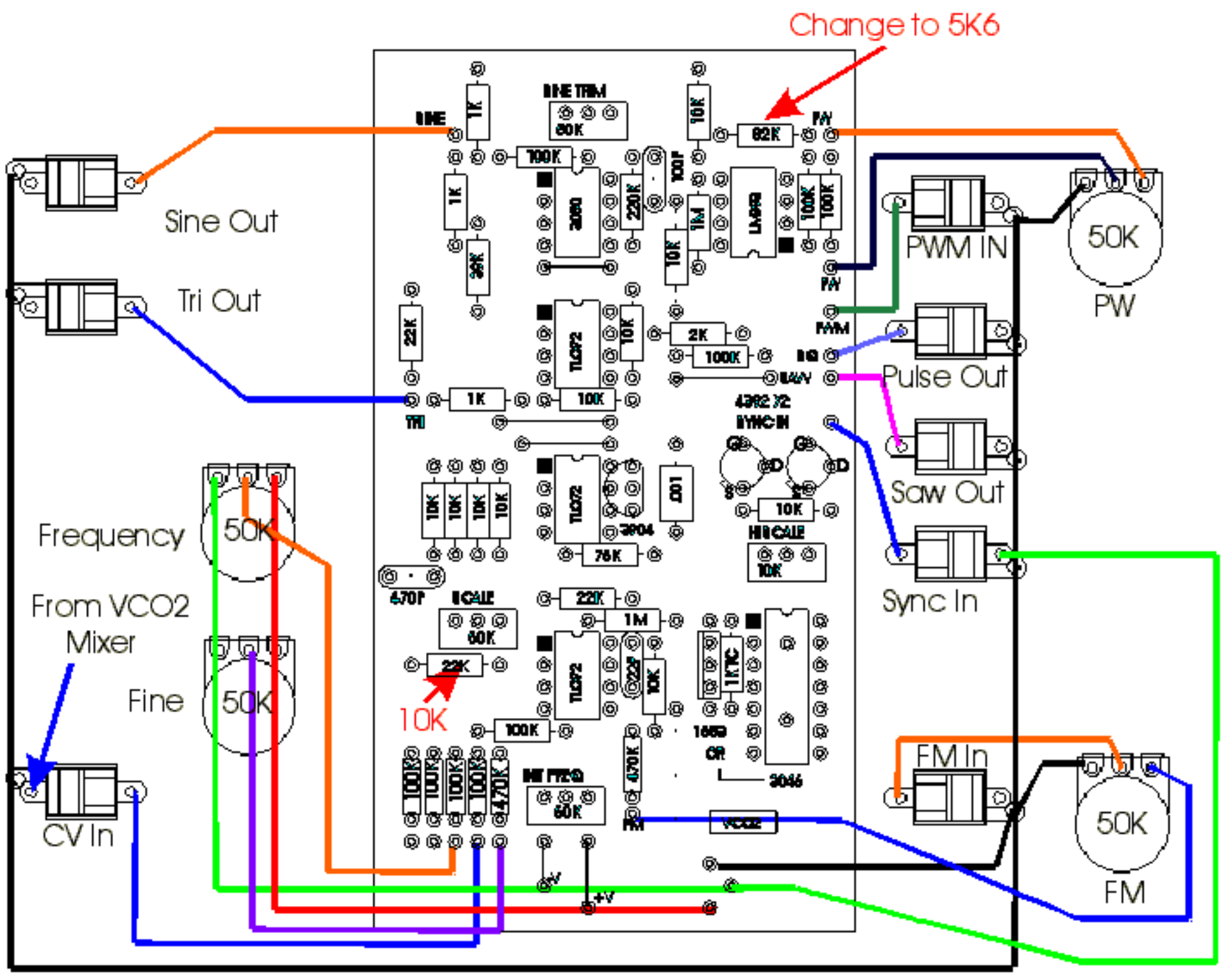

Testing The VCOs

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You should hear the VCO through the monitor amp. If not check over your work. Adjust the "INIT-FREQ" trimmer to a comfortable pitch.
Play a middle C on your source and then the C above middle C.
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Play the high C on your source and then the C below.
Adjust the "HI SCALE" trimmer until they are an octave apart.
These two adjustment interact so you will have to go back and forth between them to get the VCO tuned.

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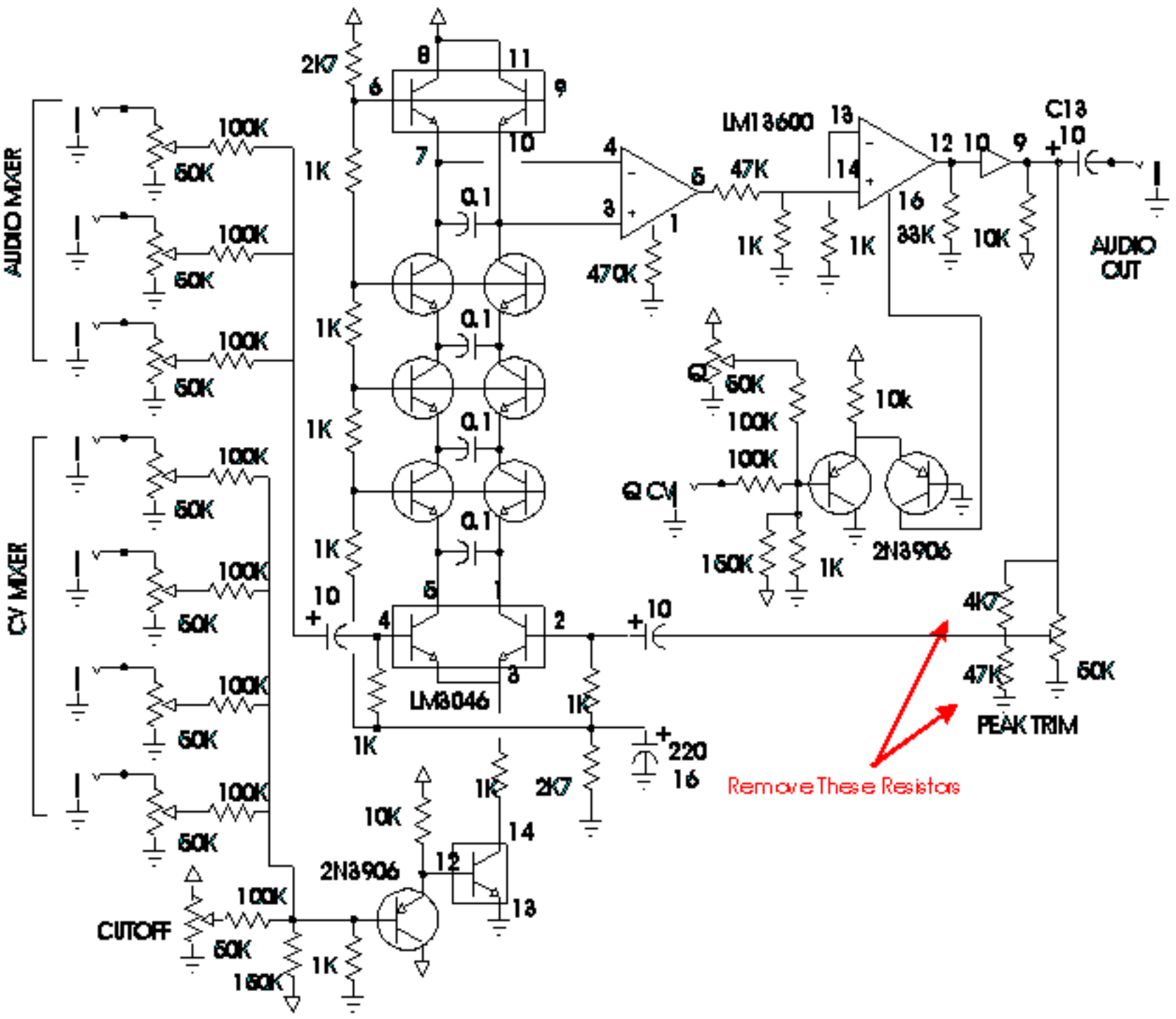
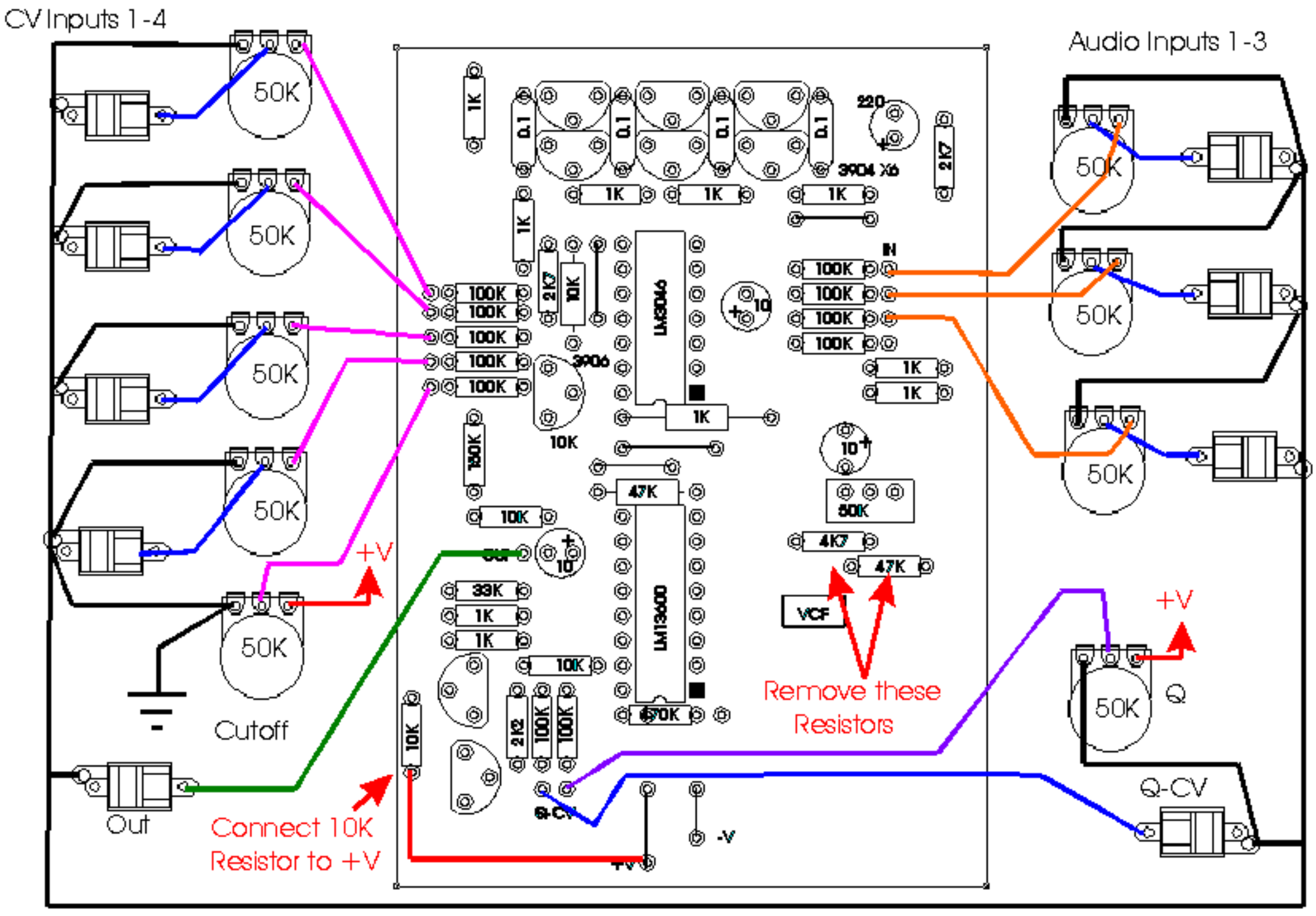
VCF

Changes Remove the 4.7K and 47K resistors that strap the peak resonance trimmer. Connect the 10K resistor going to the Q-CV PNP pair to +12V. There is an open pad under VCO2.



The PCBoard



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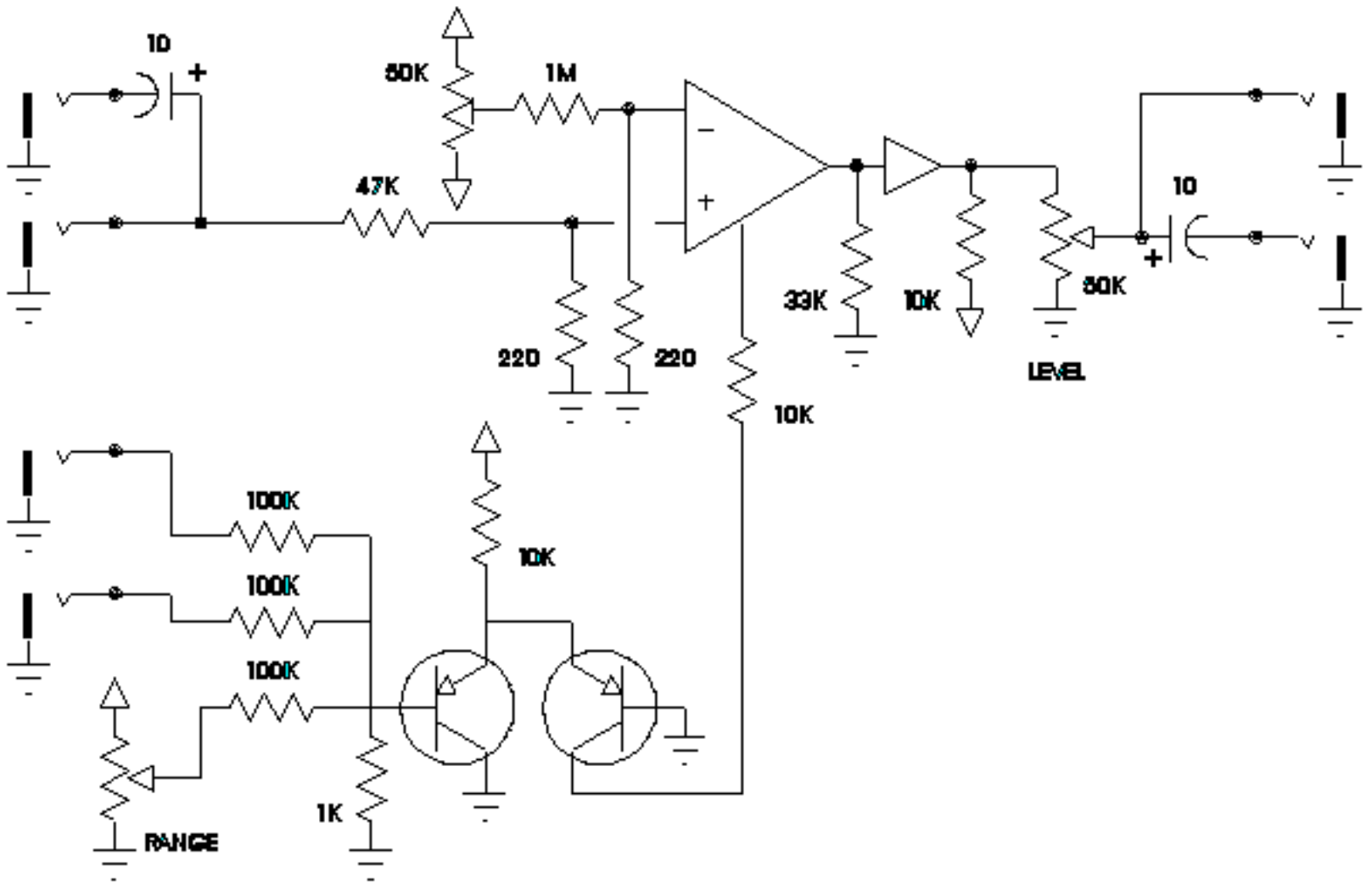
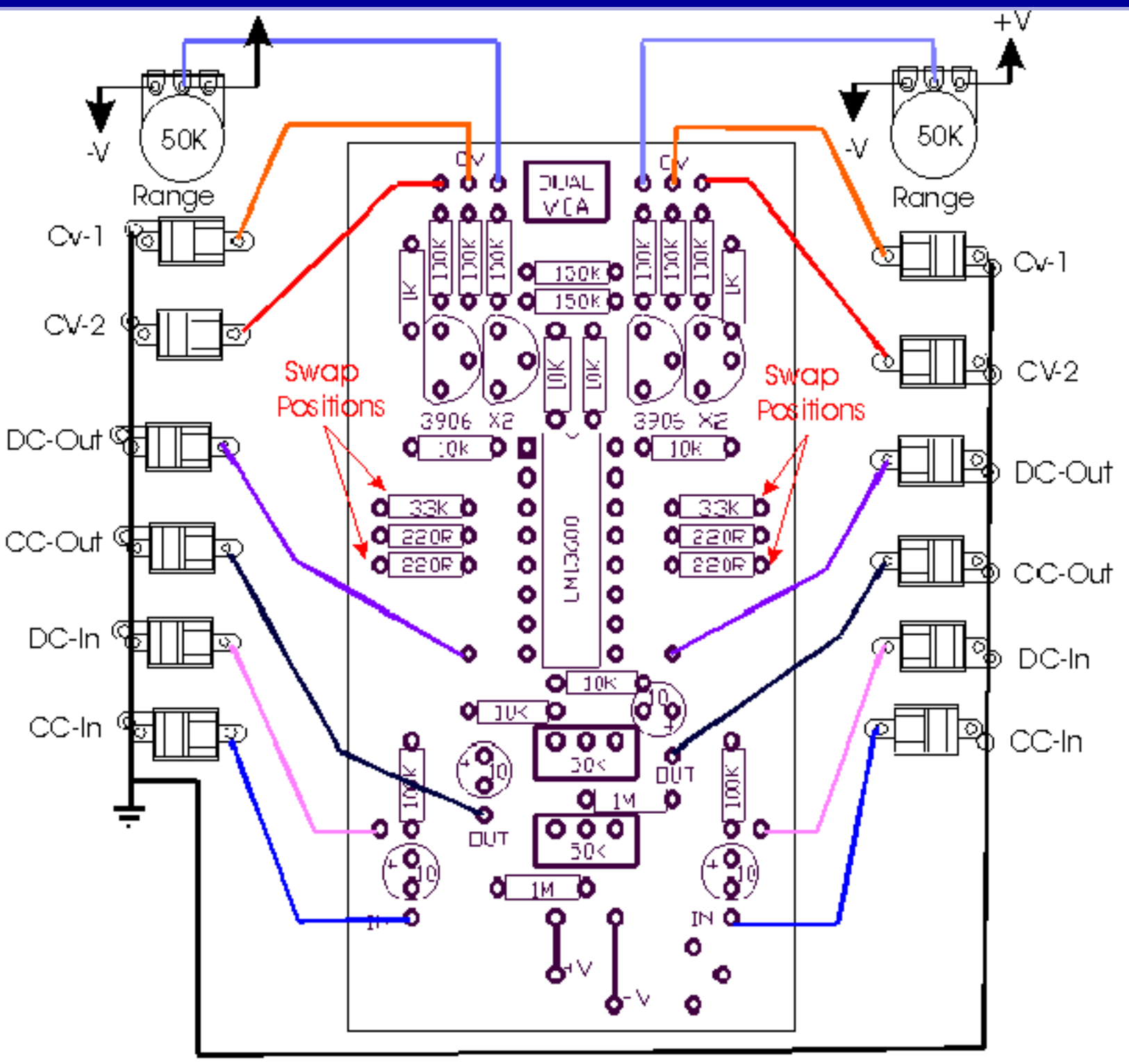
Dual VCA

Schematic



The PCBoard



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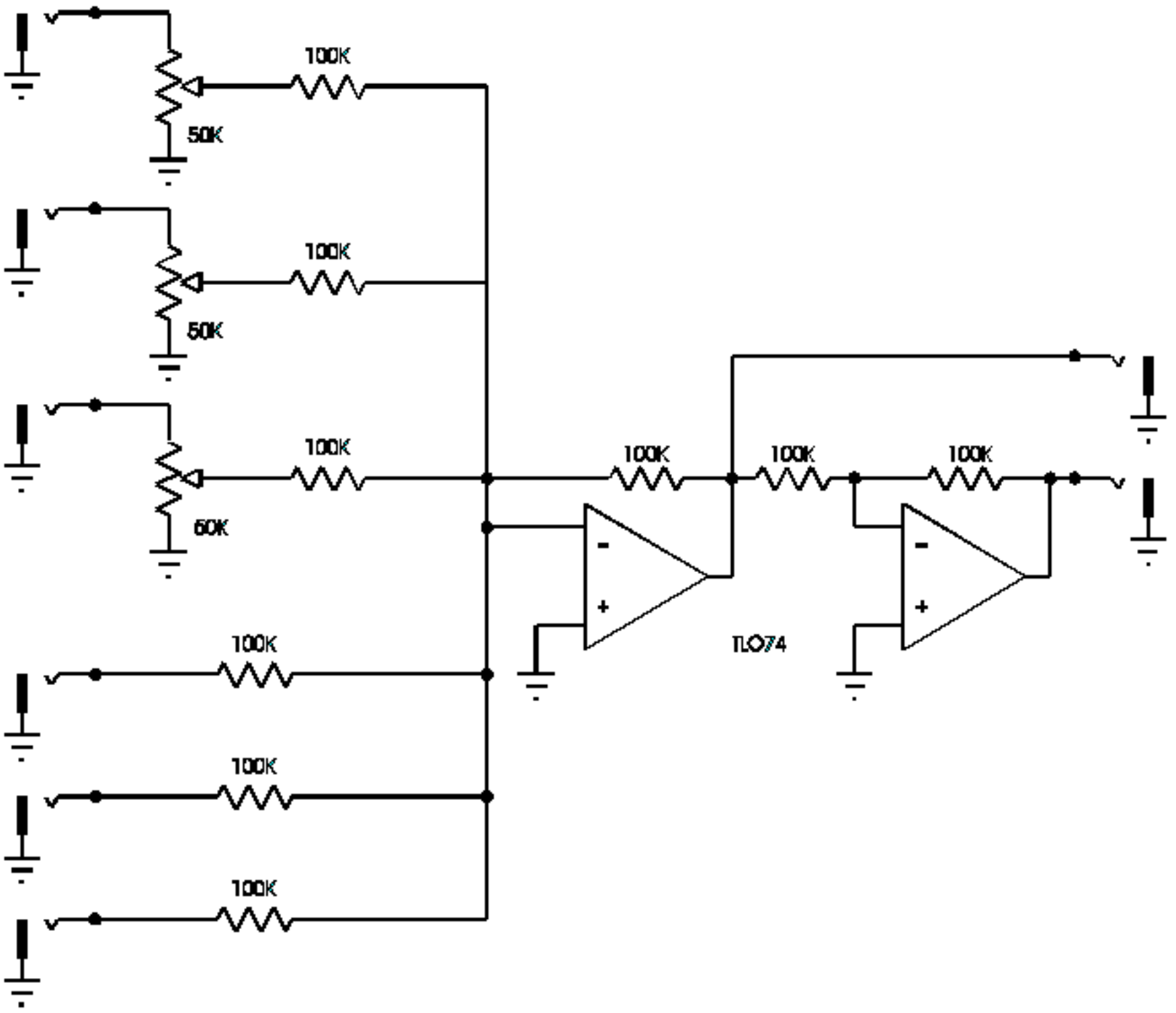
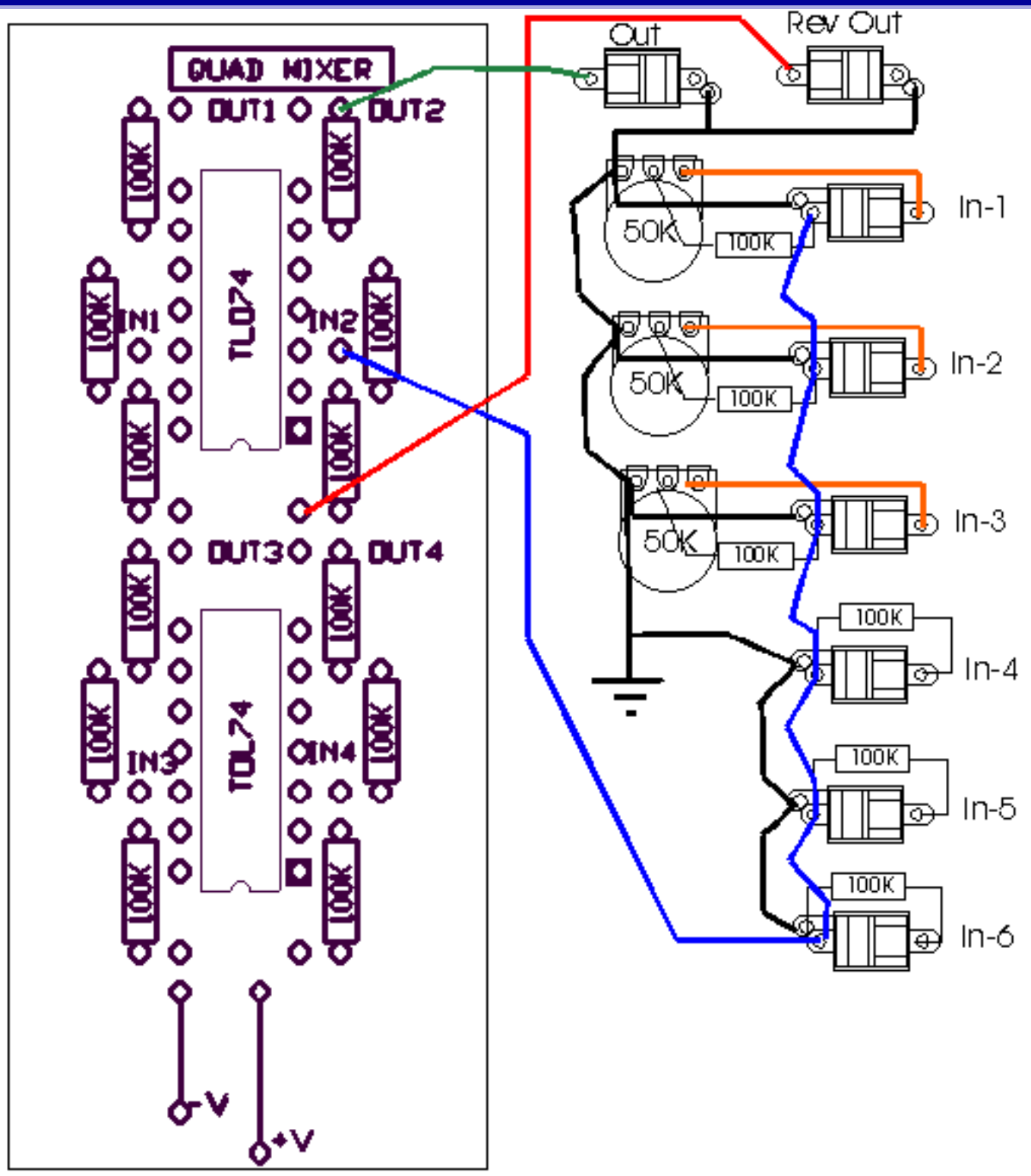
Mixer

This shows one of 4 identical mixers. The summing resistors are not mounted on the pots and jacks

Schematic



The PCBoard



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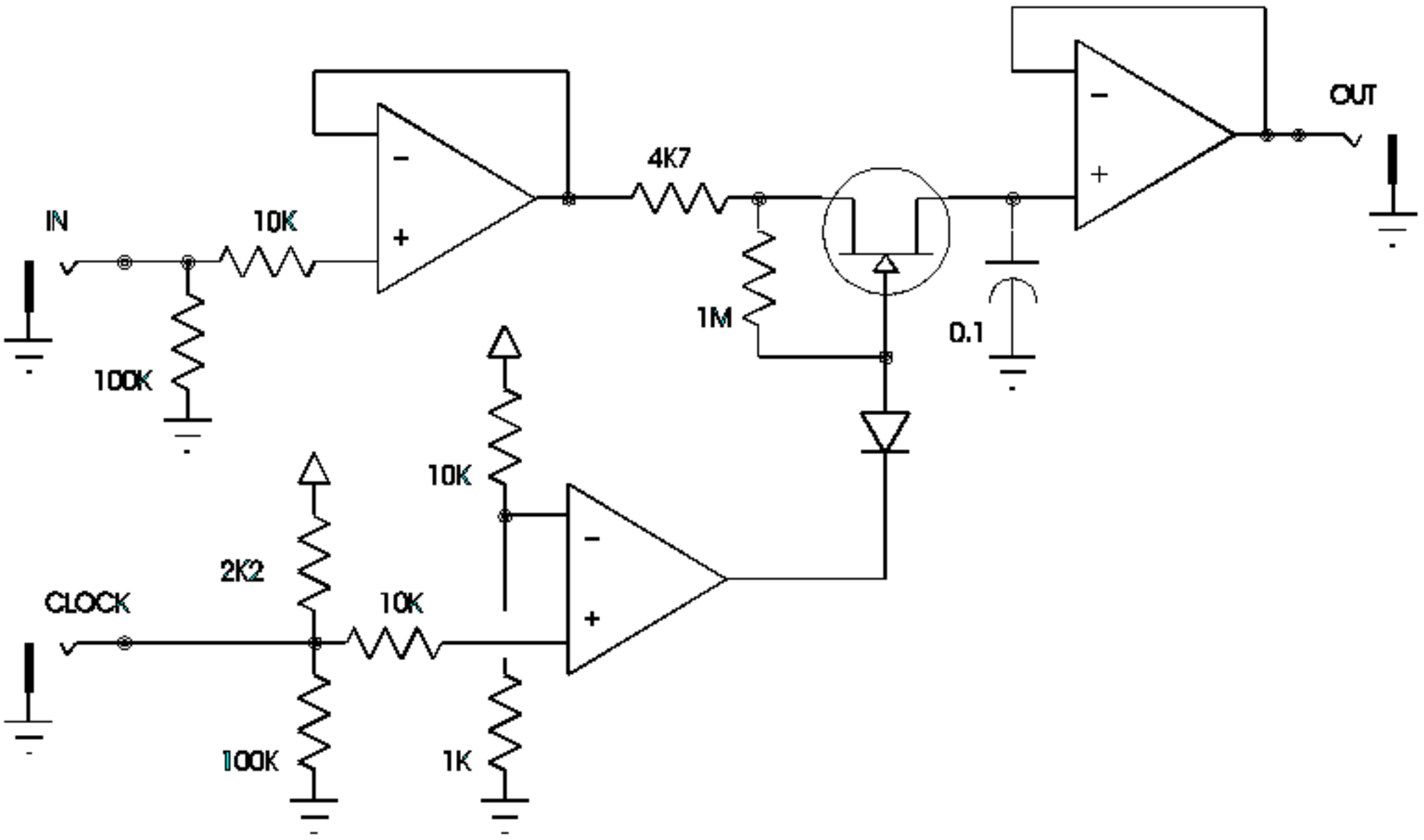
Sample And Hold

Schematic



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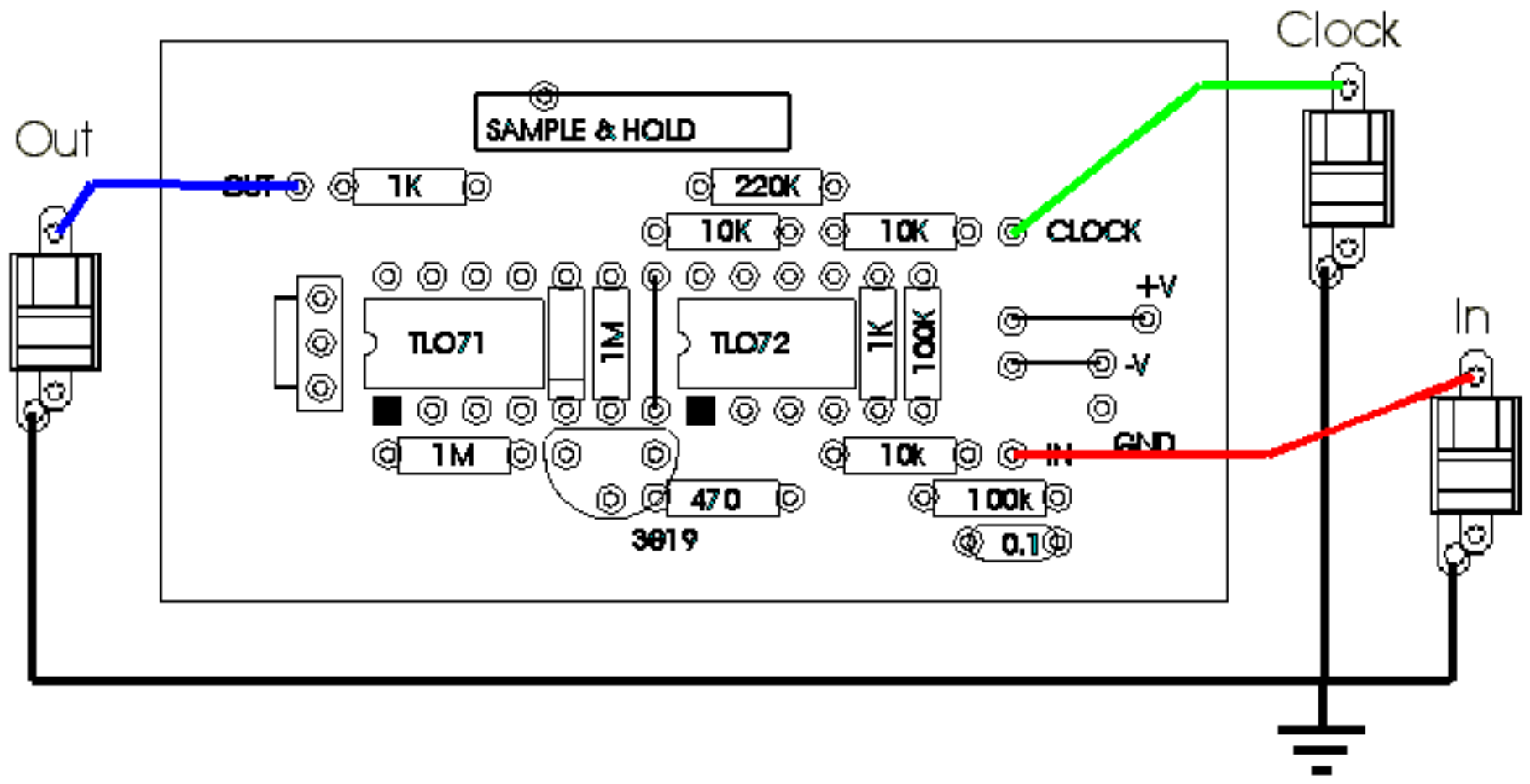

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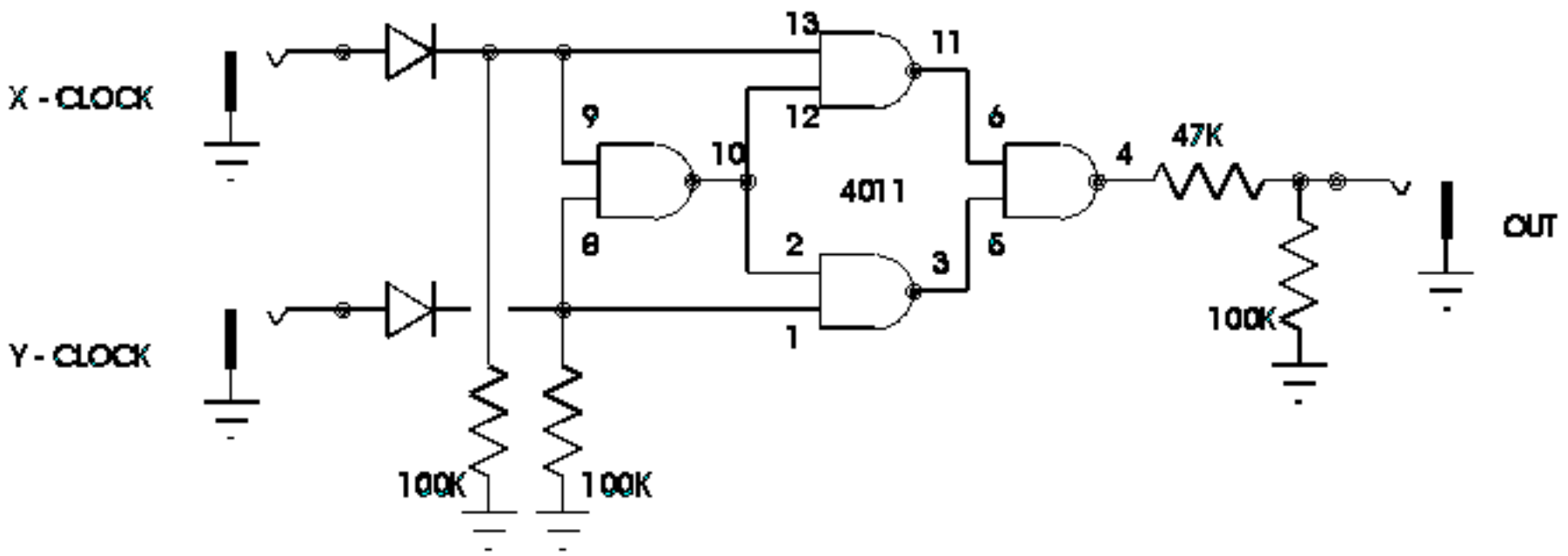
Ring Modulator

Schematic



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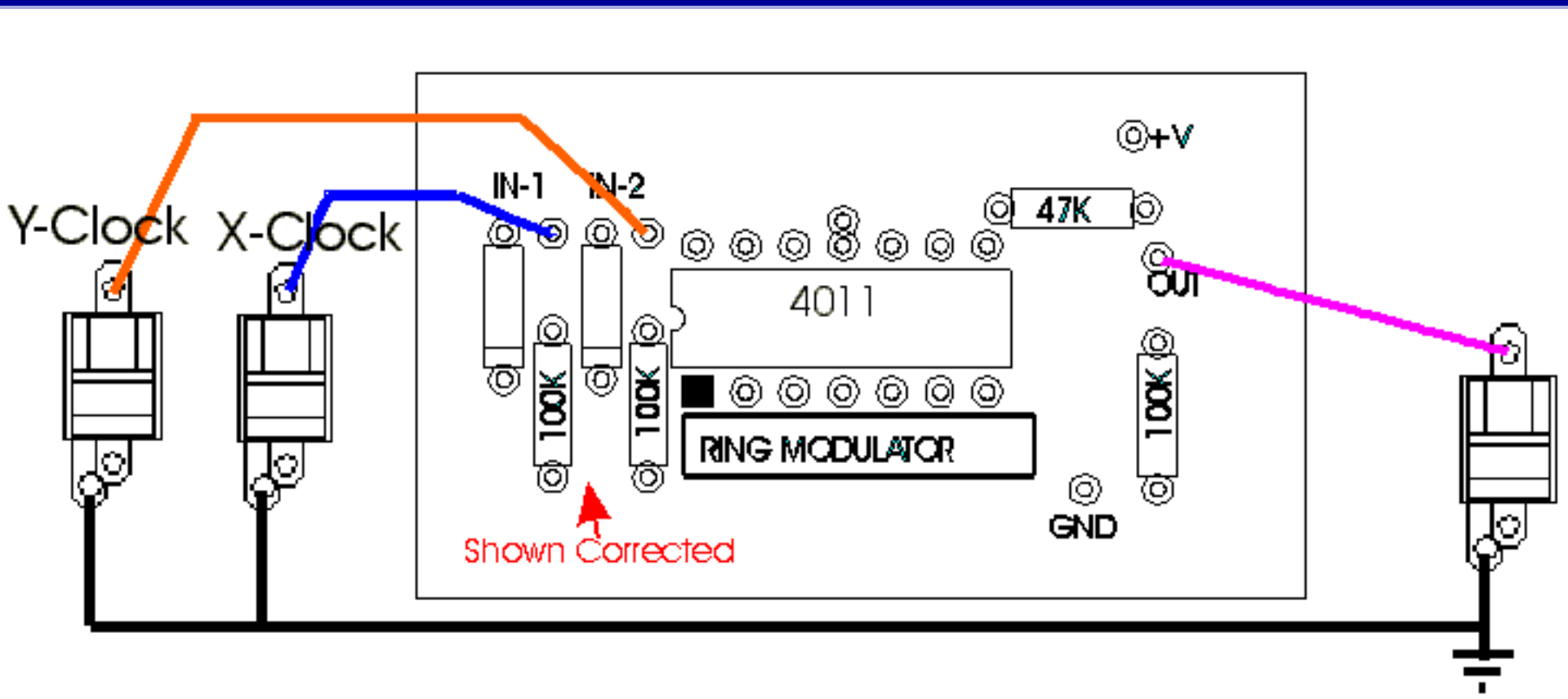

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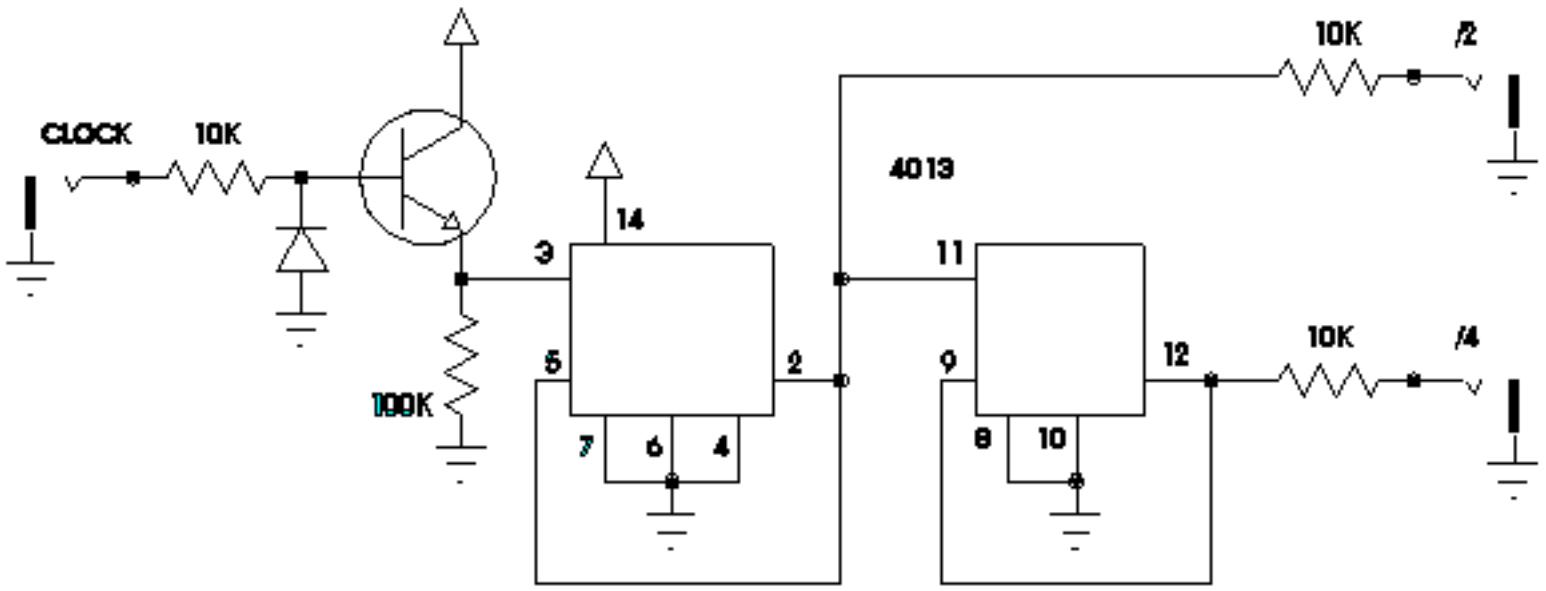
Sub Octave

Schematic



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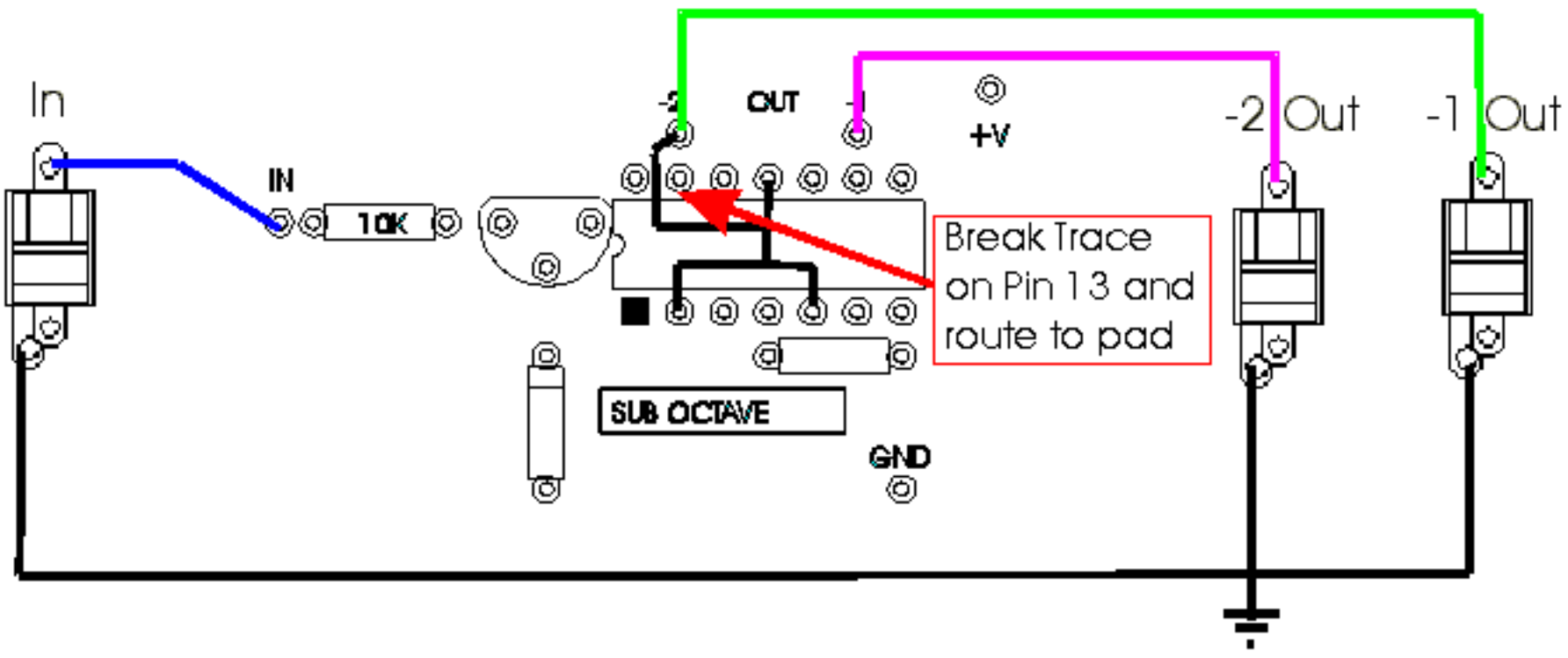

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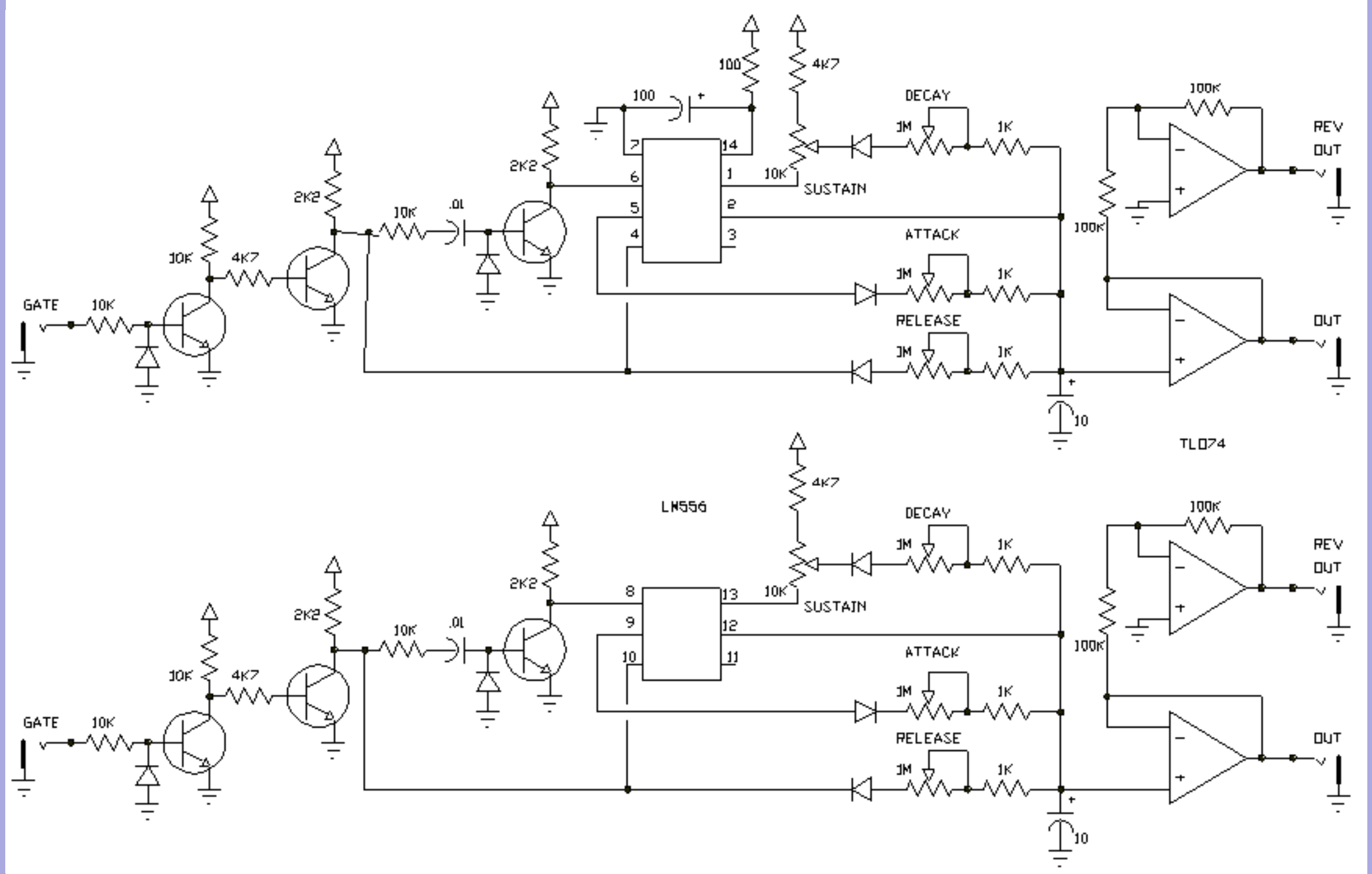
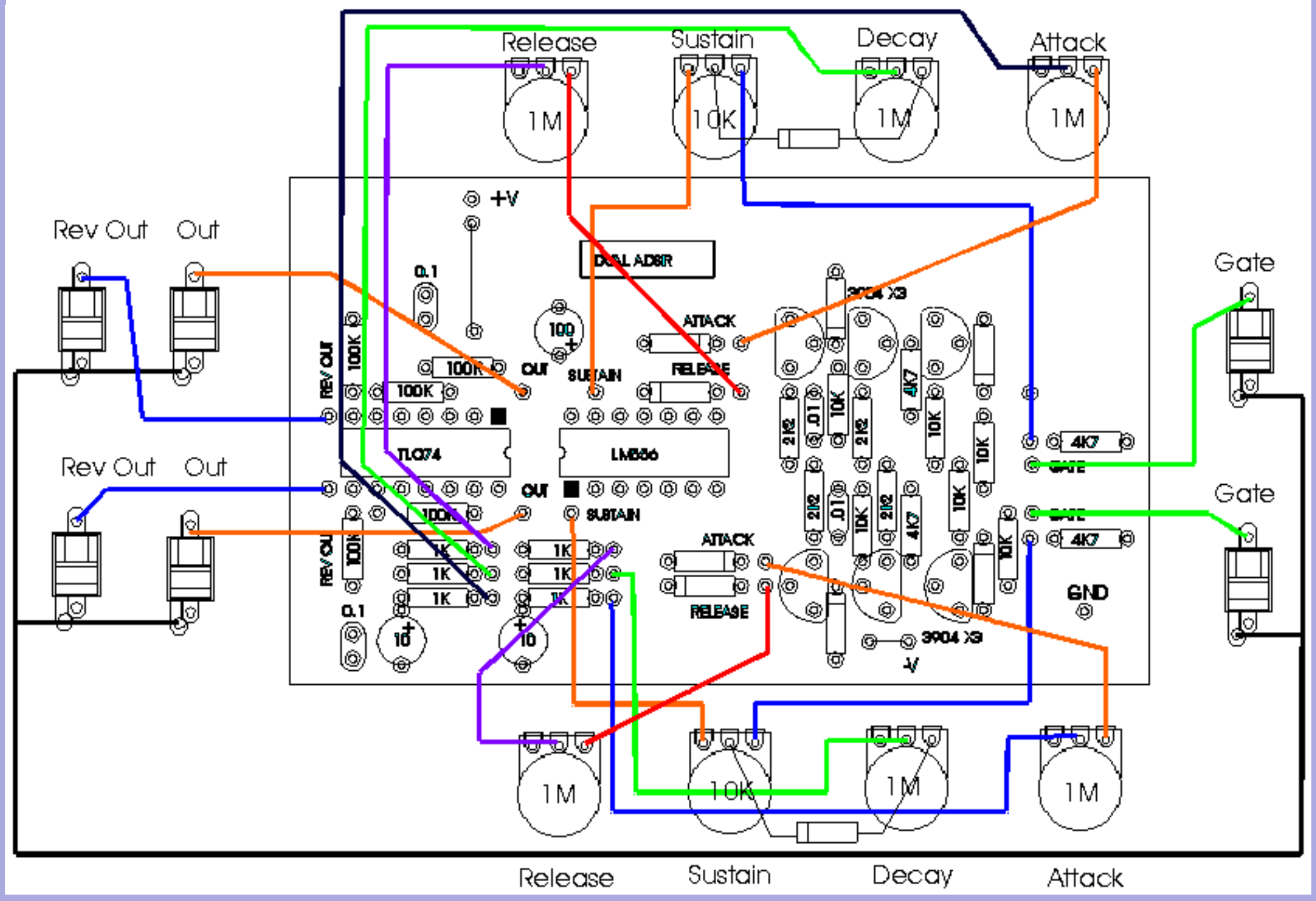
ADSR 1&2



The PCBoard



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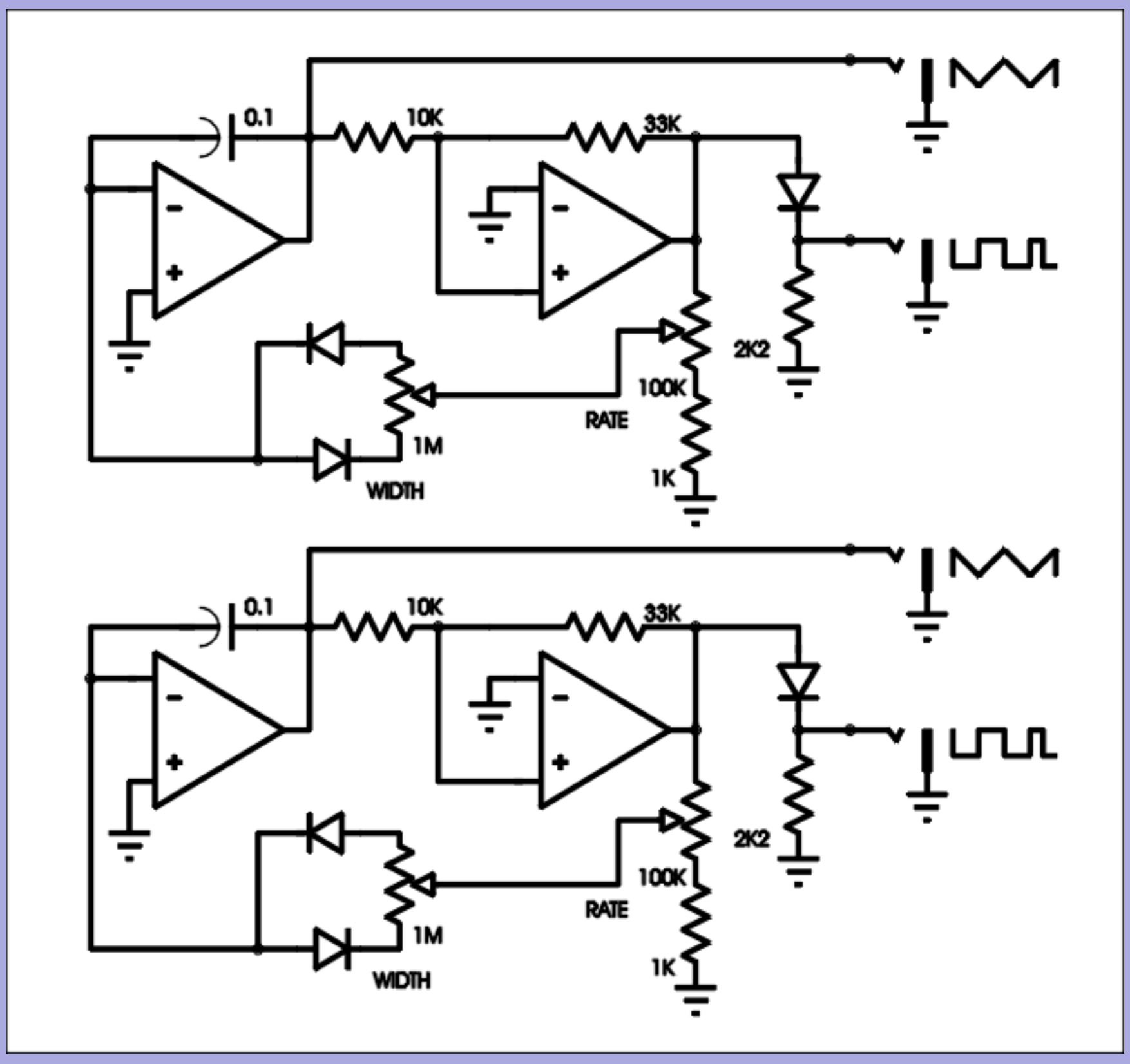
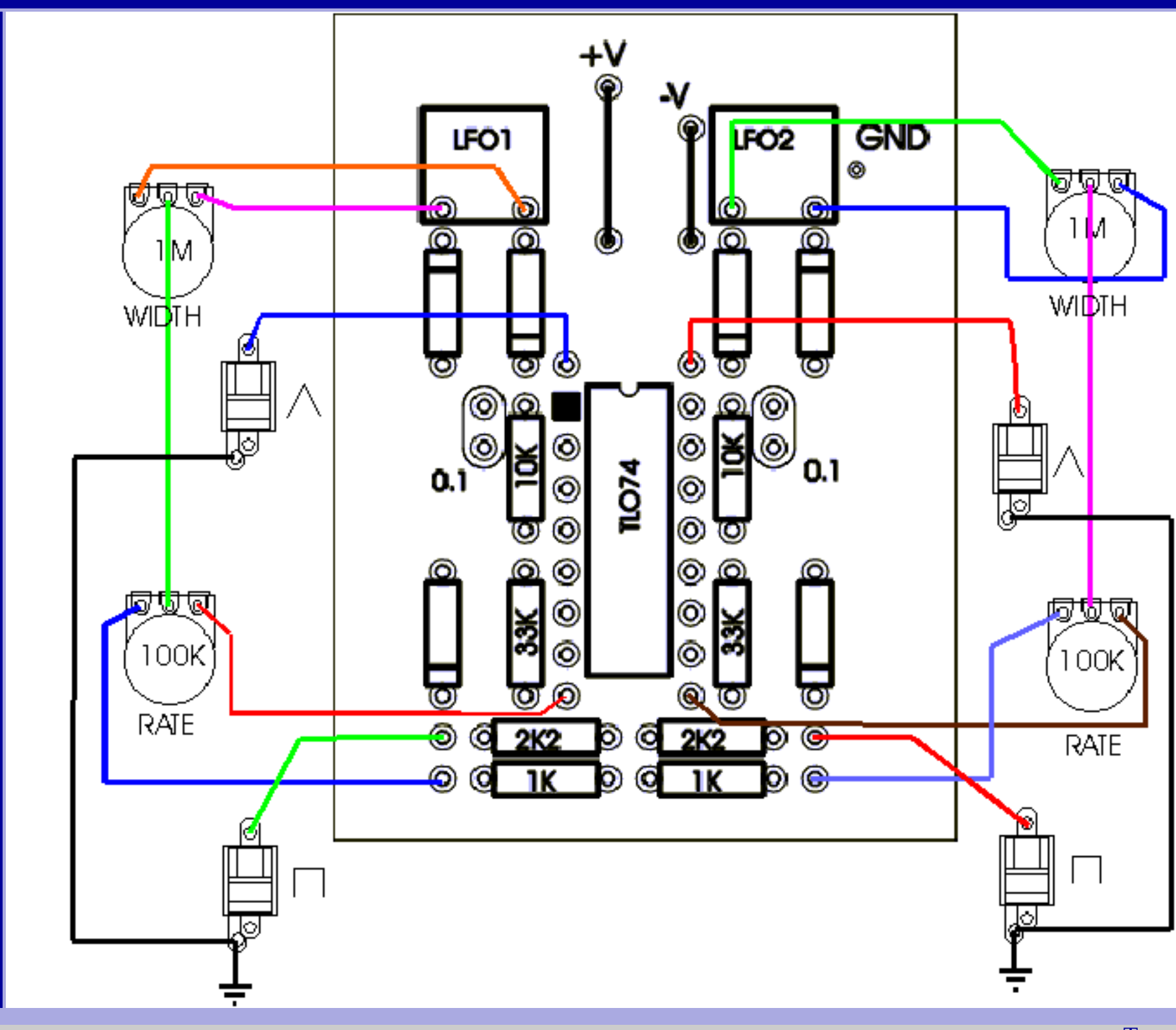
LFO 1&2



The PCBoard



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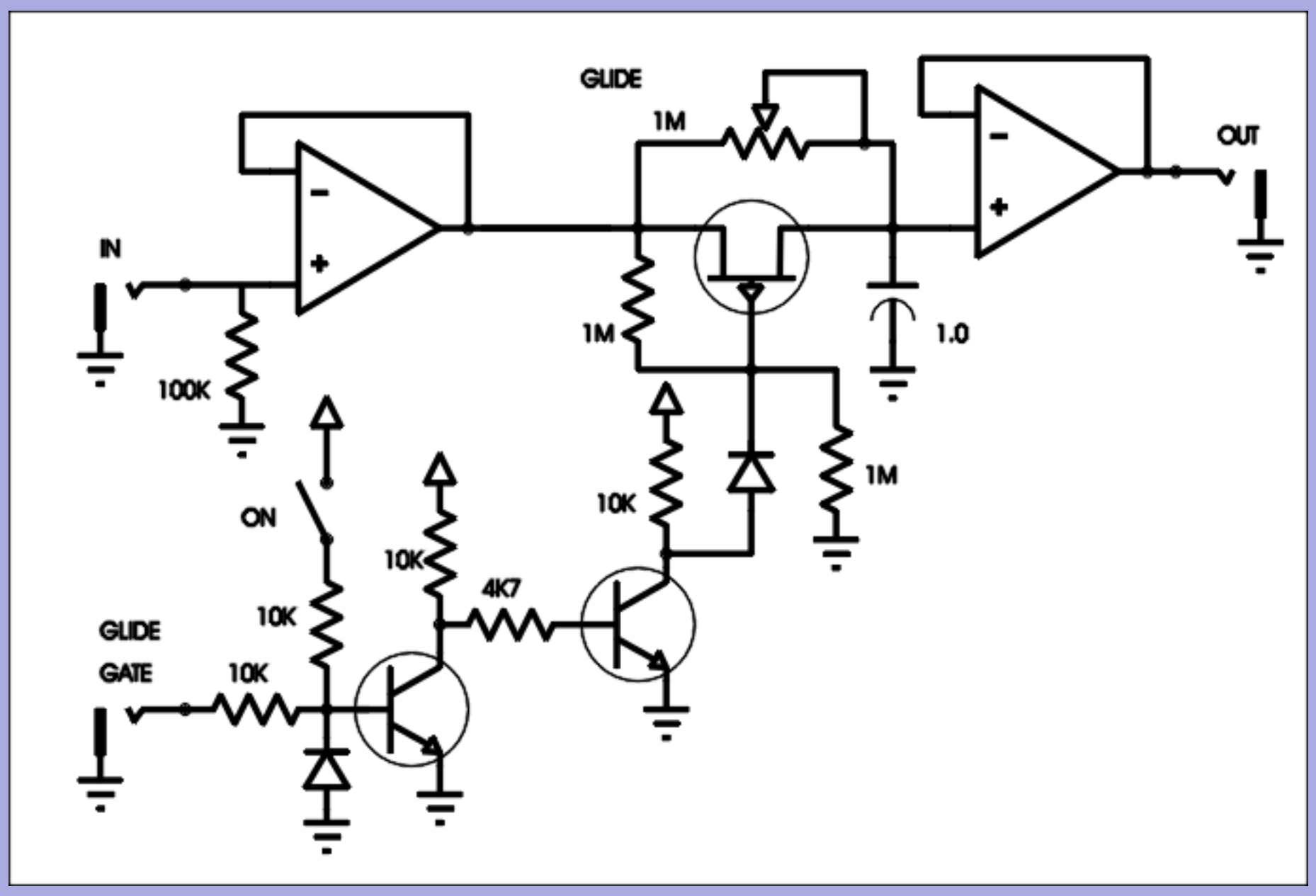
Lag

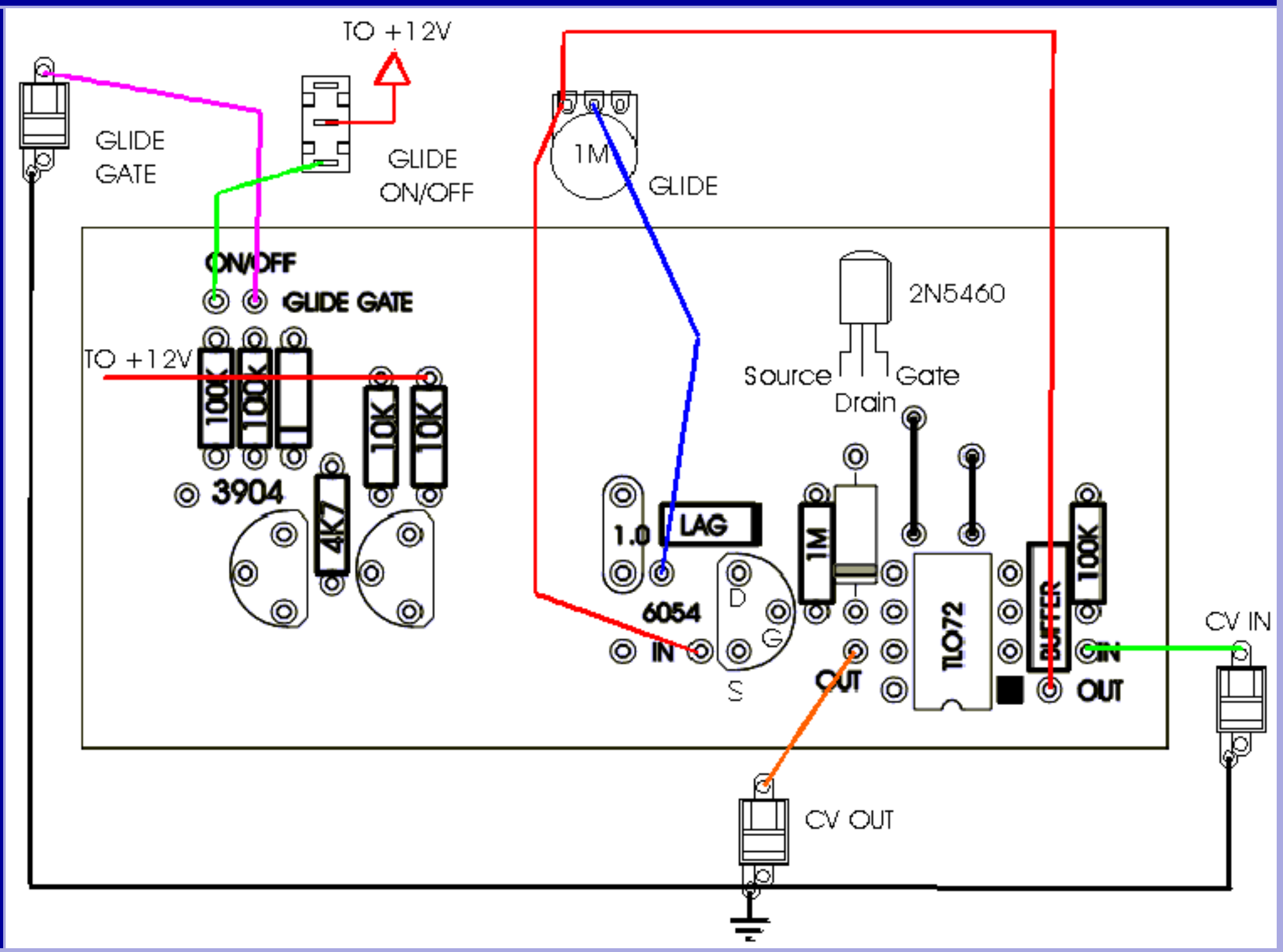
Changes

I put 6054 on the pcboard it should have been 5460 for 2N5460. Note the pin out.

The two 10K resistors connected to the NPN collectors should go to +V. The pcboard layout connects them to gound. There is a +V jumper just to the left supplying +V for the staircase generator. Connect them there.



The PCBoard



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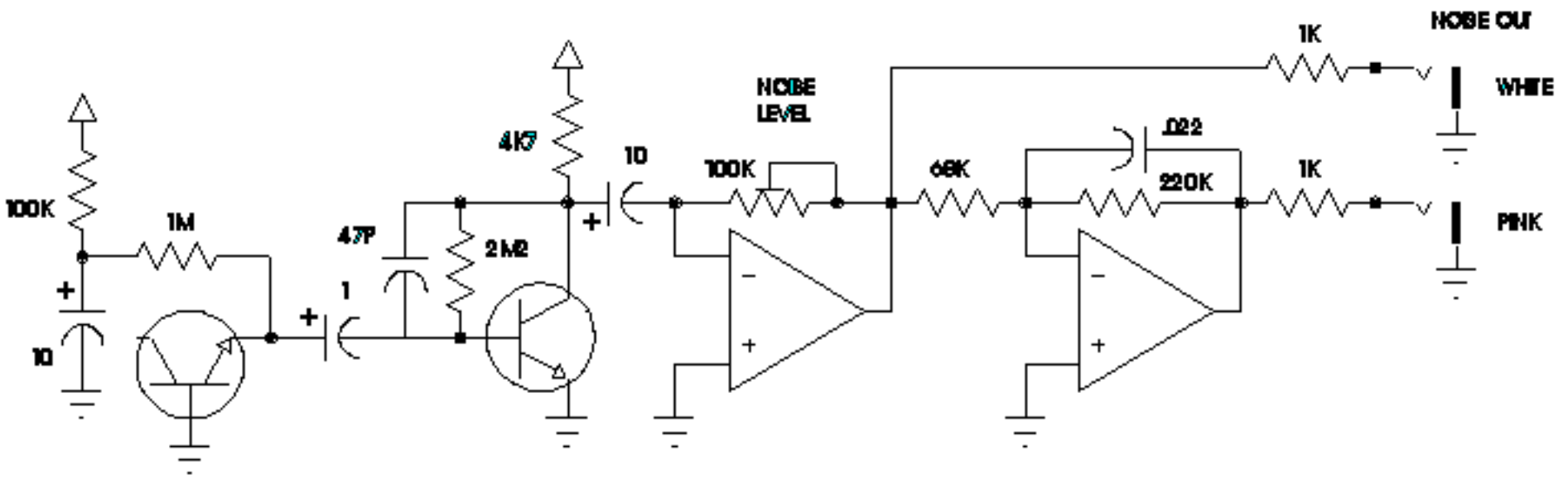
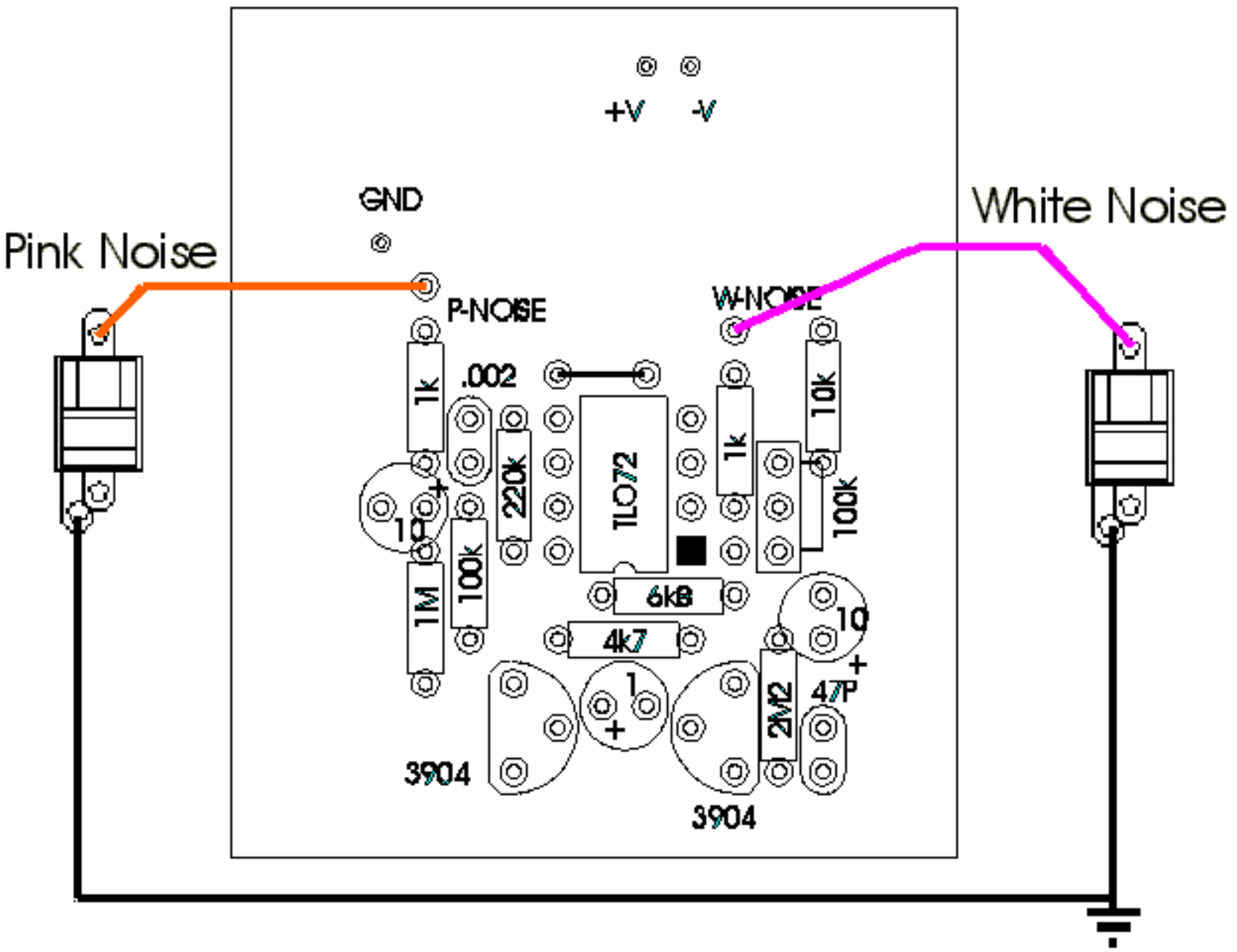
Noise

Schematic



The PCBoard



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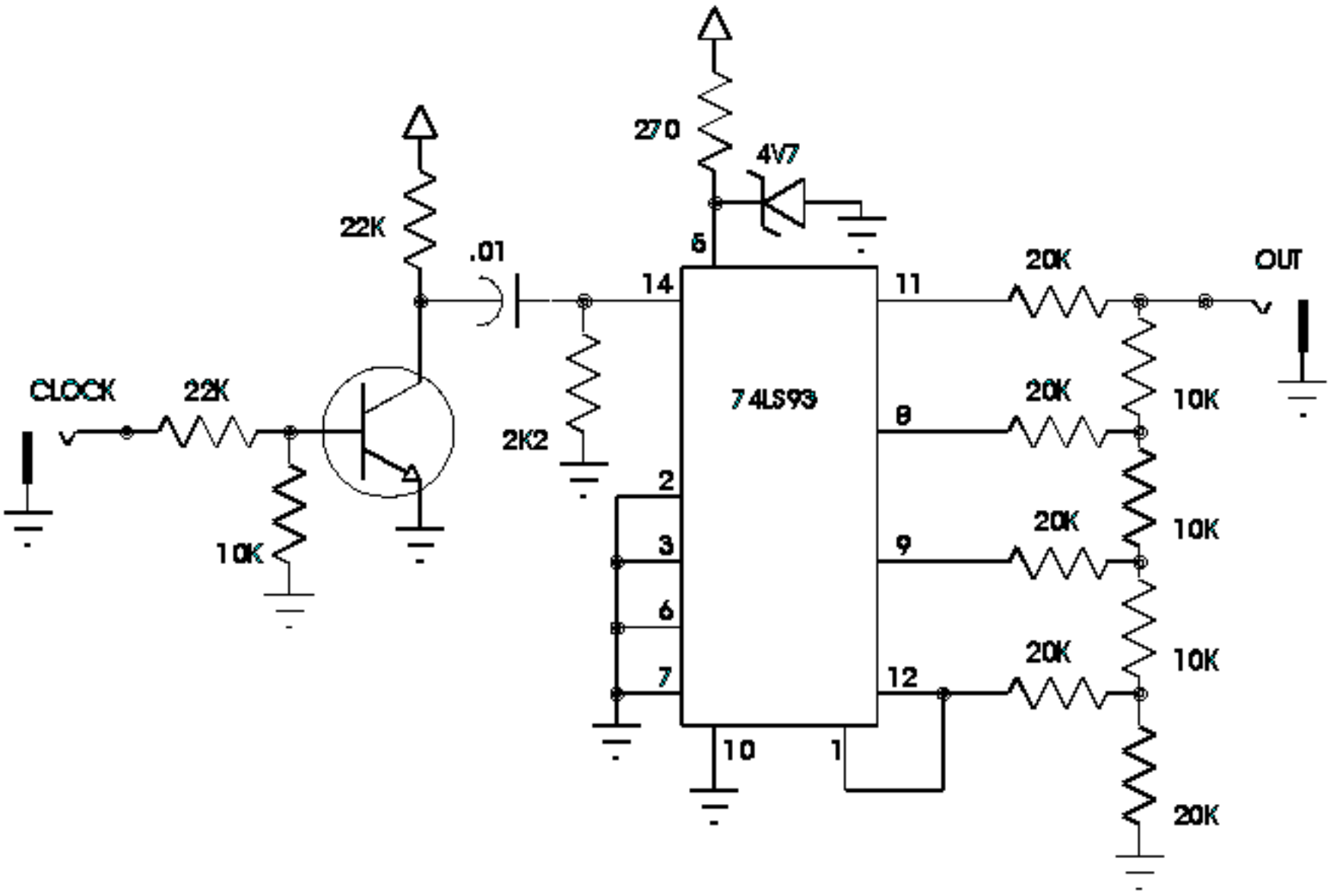
Staircase Generator

Schematic



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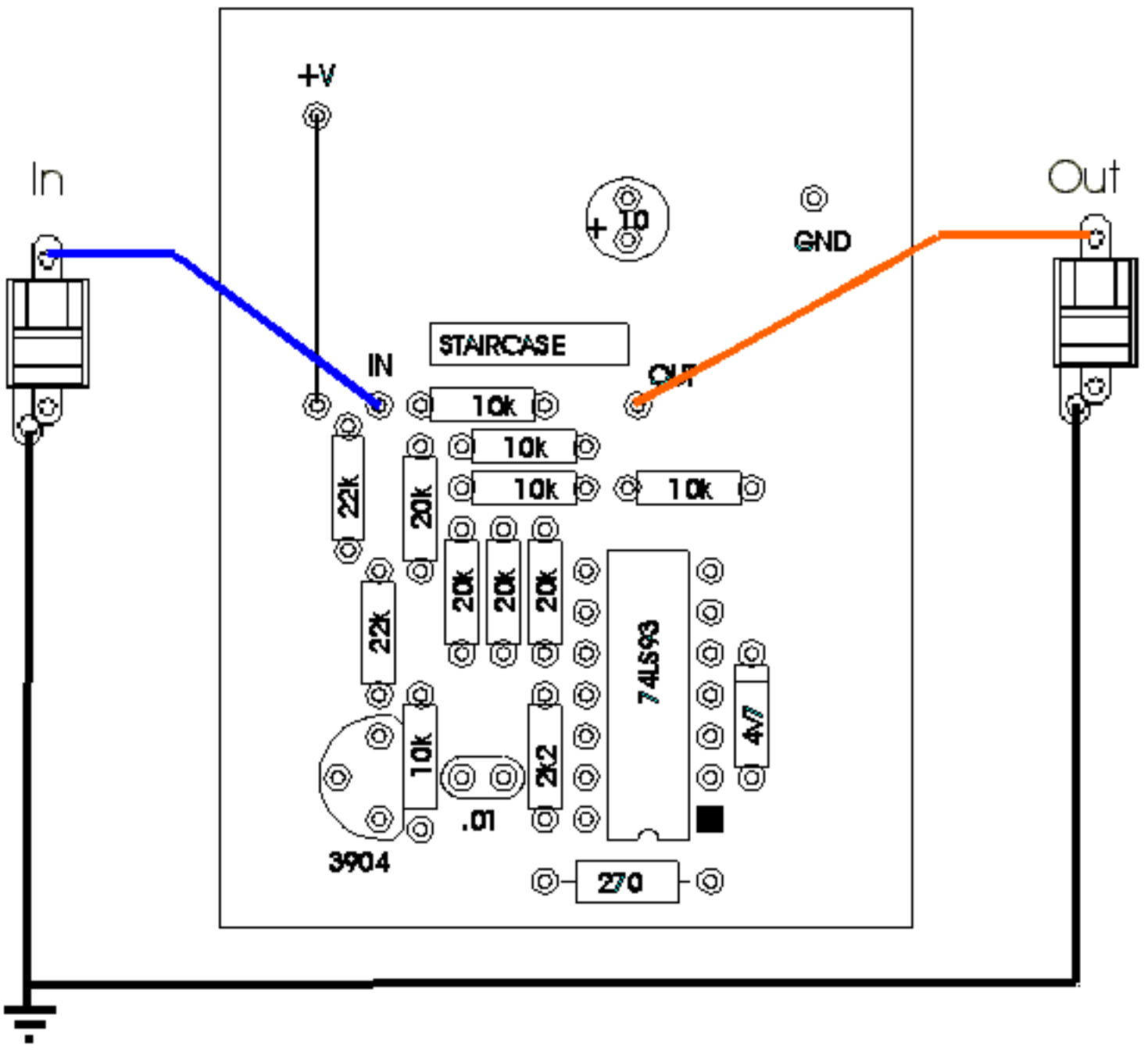

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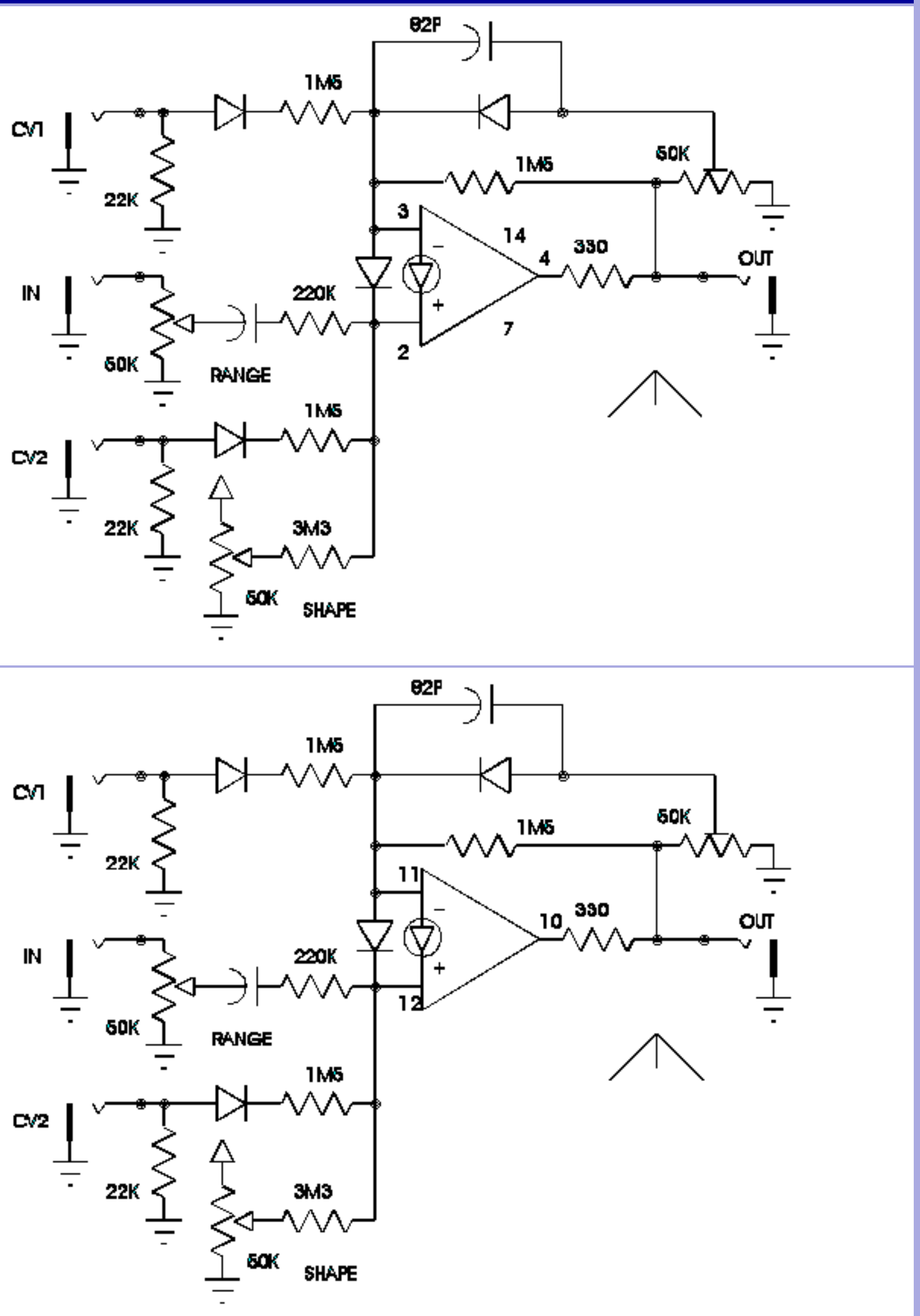
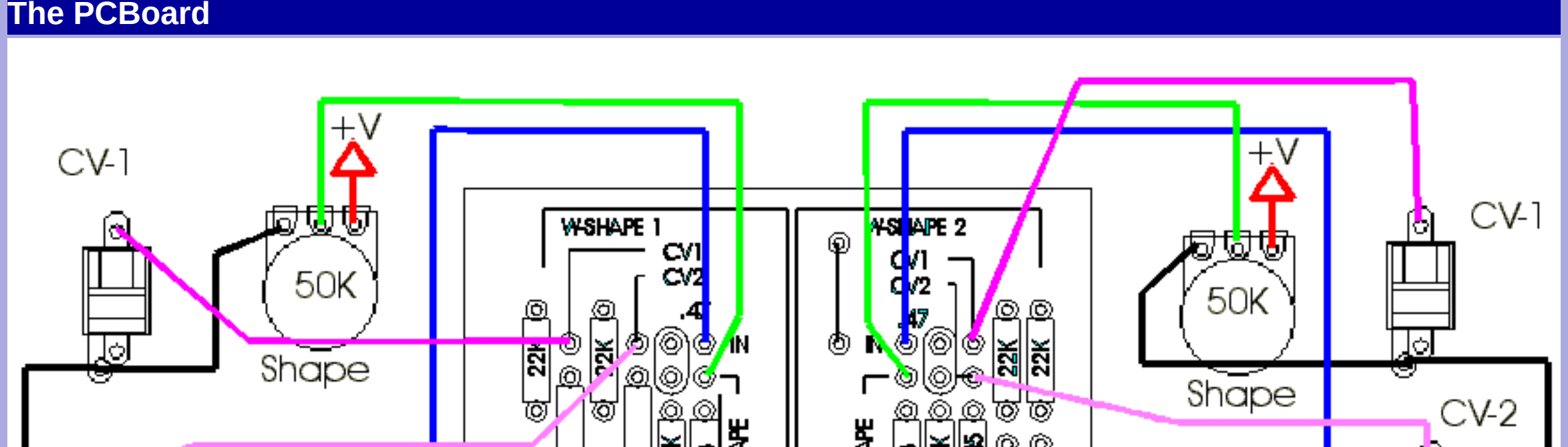
Wave Shaper 1&2



The PCBoard



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