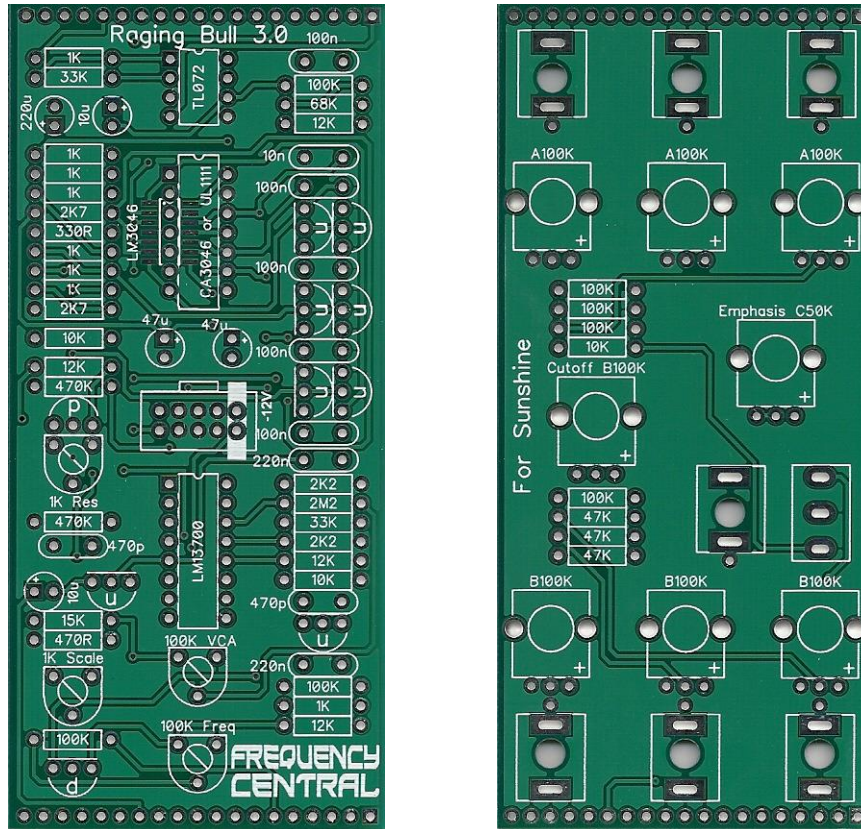


# FREQUENCY CENTRAL

Build documentation for:

## RAGING BULL 3.0

Based on the legendary Moog Taurus Mk I VCF and VCA.



A big part of the sound of the Taurus was the way in which the VCF interfaced with the VCA, so on Raging Bull the VCA is always in the audio path. A toggle switch allows you to select 'always open' or CV control of the VCA from CV input 3. This is a very flexible arrangement, for example:

1. By sending an ADSR into CV3, the signal will go to the VCA CV input unattenuated and the VCF CV input via the attenuator
2. By sending a gate into CV3, and setting the attenuator to zero, the VCA can be gated while the gate has no affect on the VCF

### **Key to PCB screen print:**

**n:** This signifies NPN BC547 transistors. Note the correct pinout as shown by the half circles.

**p:** This signifies PNP BC557 transistors. Note the correct pinout as shown by the half circles.

The PCB shows the correct orientation for BC547/BC557. Other transistor types can be used (eg 2N3904/2N3906), but please observe the correct pinout.

Please observe the correct polarity of the electrolytic capacitors.

### Bill of Materials

<p>330R x 1 470R x 1 1K x 8 2K2 x 2 2K7 x 2 10K x 3 12K x 4 15K x 1 33K x 2 47K x 3 68K x 1 100K x 7 470K x 2 2M2 x 1</p> <p><u>All resistors ¼ watt metal film.</u></p>	<p><u>470pF x 2</u> <u>10nF x 1</u> <u>100nF x 5</u> <u>220nF x 2</u> <u>10uF electrolytic x 2</u> <u>47uF electrolytic x 2</u> <u>220uF electrolytic x 1</u></p>	<p>CA3046* <u>TL072</u> <u>LM13700</u> <u>BC547 x 8</u> <u>BC557 x 2</u>  <u>8 pin socket</u> <u>14 pin socket</u> <u>16 pin socket</u></p>	<p><u>A100K x 3</u> <u>(or these)**</u>  <u>B100K x 3</u> <u>(or these)**</u>  <u>B100K x 1</u> <u>C50K x 1***</u>  <u>1K trimmer x 2</u> <u>100K trimmer x 2</u>  <u>SPDT toggle x 1</u>  <u>3.5mm socket x 7</u>  <u>SPDT switch</u>  <u>Male 40 pin header</u> <u>Female 40 pin header</u> <u>10 pin box header</u>  <u>Big knob</u> <u>Little knob</u></p>
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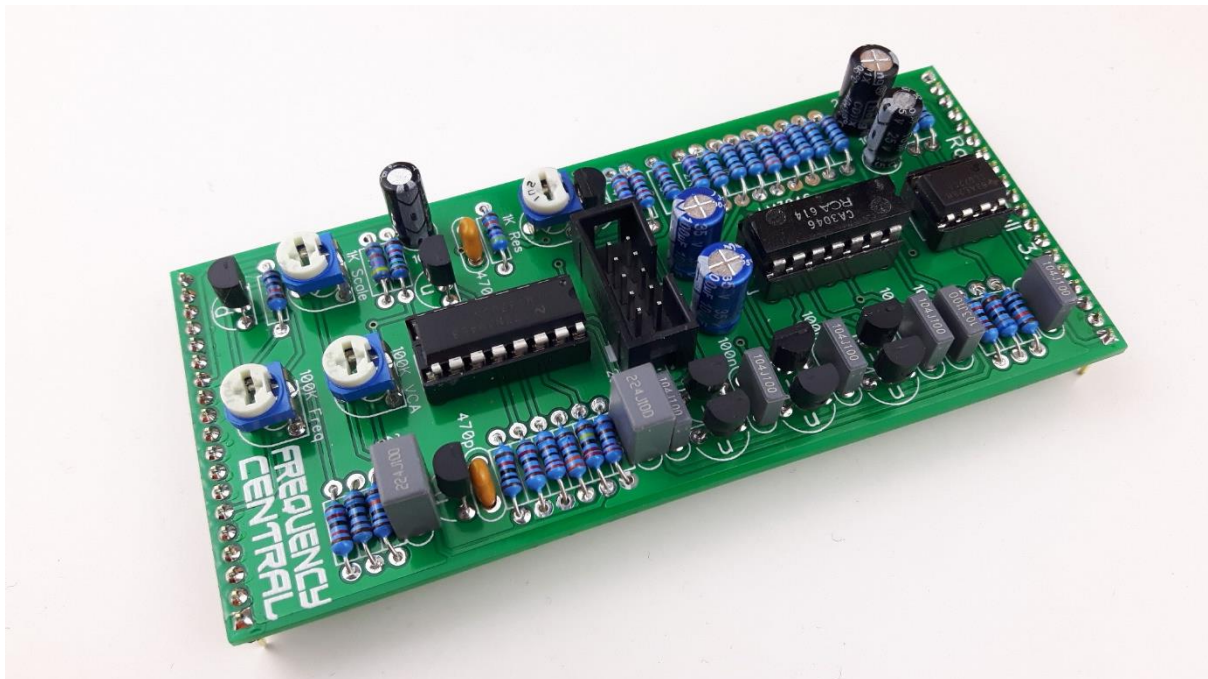
\* CA3046 can still be got for some suppliers such as Banzai, Das Musikding, Small Bear and some reputable Ebay sellers. <http://dsmcz.com/prestashop/en/> sell UL1111 for only £1.53, they are functionally identical to CA3046. Alfa Rpar will shortly be releasing a CA3046 clone. The PCB also includes pads for SMD LM3046.

\*\* I prefer the Song Heui tall trimmers because they have a longer shaft and a white notch.

\*\*\* If you can't get C50K, use B50K instead

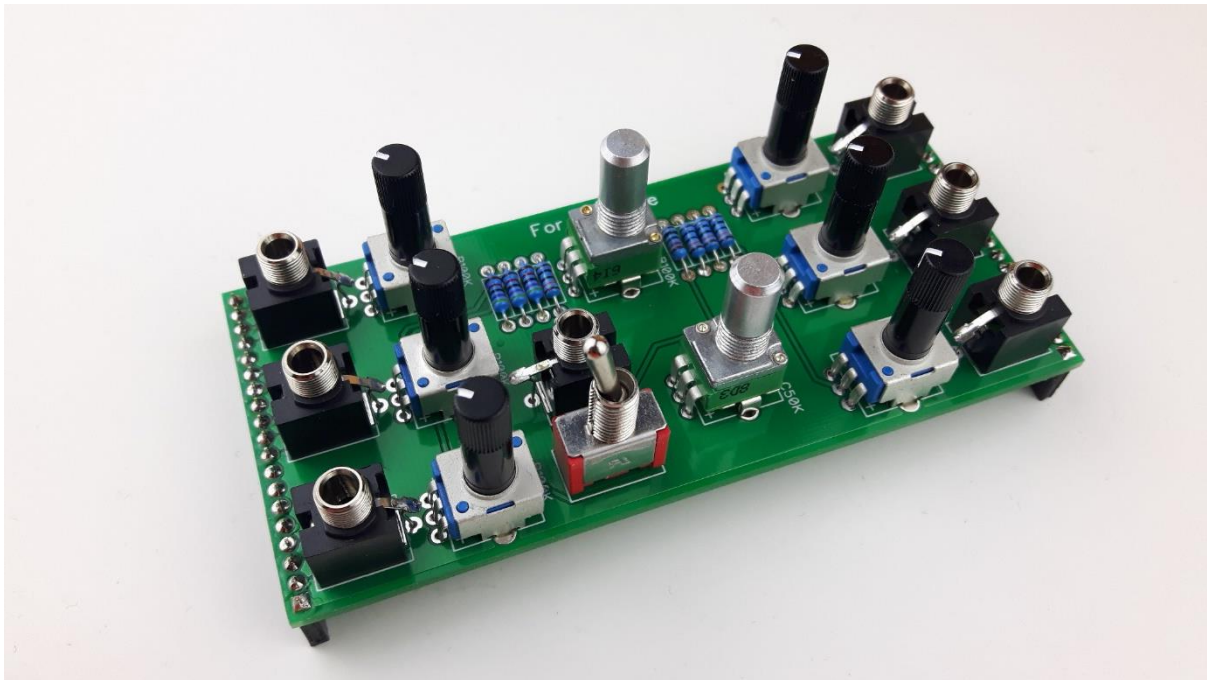
## Main PCB assembly

1. Solder all resistors.  
Tip #1 - don't mix up the 2K2 and 2M2  
Tip #2 - don't mix up the 470R and 470K
2. Solder all IC sockets
3. Solder all non-electrolytic capacitors
4. Solder all transistors
5. Solder all electrolytic capacitors
6. Solder the power header – if you're using box type, observe correct polarity
7. Cut male headers to size and solder them into place. Make sure that they stick out of the bottom of the PCB.



## Pots 'n' sockets PCB

1. Solder all resistors
2. Place all sockets on the PCB, making sure the ground tabs line up with the PCB's ground pads, then place the panel over them. This will assure that the sockets are correctly positioned. Flip the whole lot over and solder the sockets into place.
3. Place all pots and the switch on the PCB, and fold over their mounting tabs at the rear of the PCB, then place the panel over them. This will assure that they are correctly positioned. Flip the whole lot over and solder the pots into place.
4. Cut female headers to size and solder them into place. Make sure that they stick out of the bottom of the PCB.



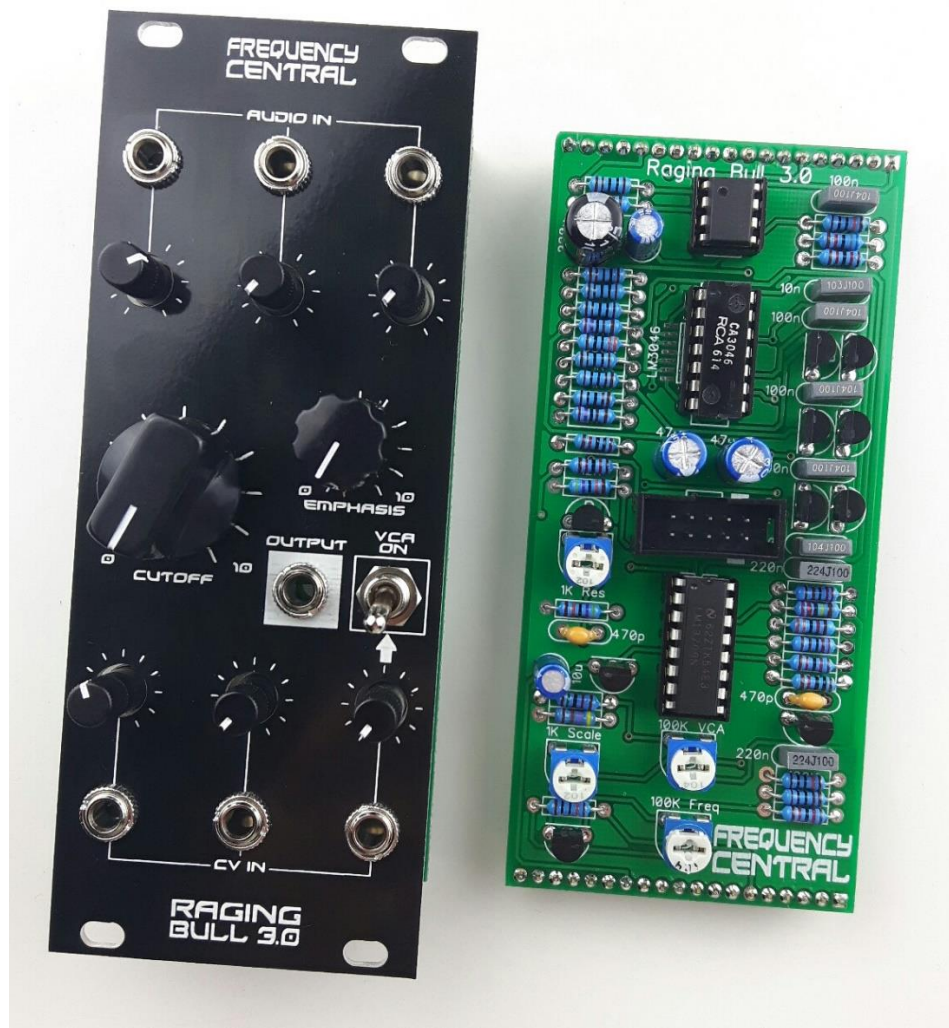
Note: Not all pots and sockets are equal in height. Providing you use the ones in the links provided, everything will line up perfectly.

Make sure that you plug the **Main PCB** into the **Pots 'n' sockets PCB** the right way around – Frequency Central logo should be the right way up.



## Calibration

1. **VCA trimmer:** flick the toggle switch down, send a nice snappy ADSR into CV3 input. Adjust Bias trimmer to sweet spot, ie there is no DC thump. The chances are that that the sweet spot is around the mid position.
2. **Scale trimmer:** turn Emphasis all the way to self oscillation. Patch a 1V/oct source into CV input 1, with the attenuator fully clockwise. Play octaves and adjust the Scale trimmer until they are spot on.
3. **Freq trimmer:** you want to tweak this so that the filter is fully open when the Cutoff pot is fully clockwise.
4. **Res trimmer:** you can adjust exactly where the Emphasis knob starts to self oscillate. If in doubt, leave this trimmer in it's mid position.



RDH 17/11/18