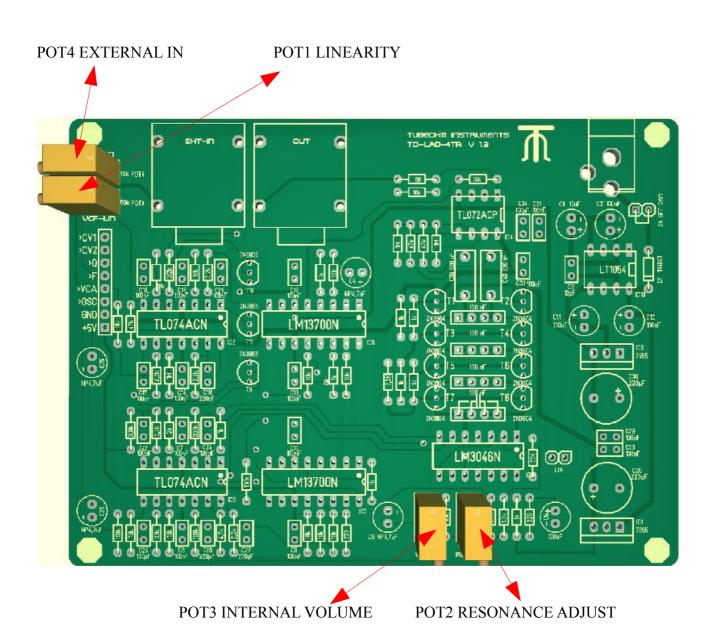
### TO-LAD-4tr V 1.3 Filter for Shruthi-1 from Mutable Instruments

#### Calibration instructions



#### What you need:

- 1:) frequency multimeter or a guitar tuner or the TubeOhm filter-calibrator
- 2:) screw driver

Now we come to the important point, the calibration.

We have on the Ladder Filter four trim-potis for the calibration.

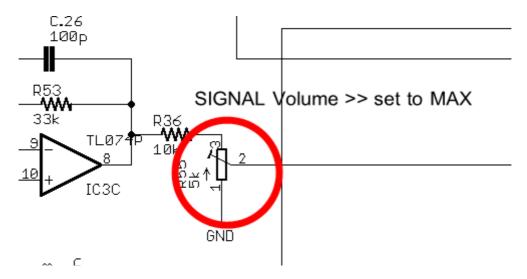
Pot1= linearity

Pot2= resonance adjust ,clockwise more resonancy, anti clockwise less resonancy

Pot3= internal Volume, clockwise less Volume, anti clockwise more volume

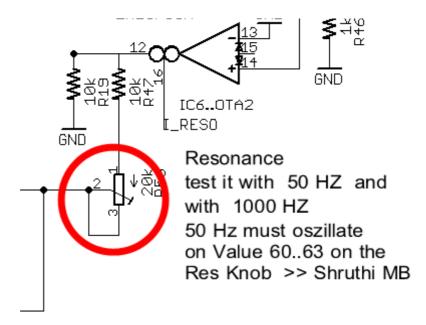
Pot4= external volume

## First step -- adjust the internal volume.



- 1:) connect the filter board with the Schruthi motherboard and switch it on.
- 2:) screw Pot 3 ANTICLOCKWISE to maximum volume and let it so !!!!! you will hear a click if the poti is on maximum.
- 3:) now you should hear sound, if you play with Shruthi!

#### Second step – adjust the resonancy



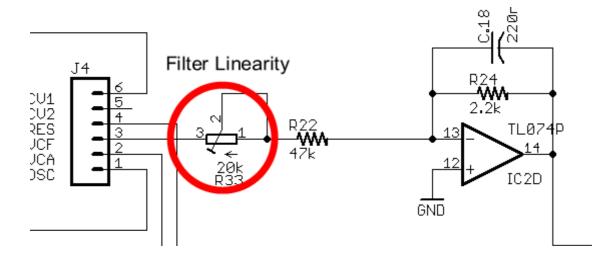
- 1:) Set all Oscillators and the suboscillator in Shruti to OFF. Set in the filter Page in Shruthi the Filter ADSR to ZERO, set the Filter LFO to ZERO.
- 2:) Set CUTOFF to 30
- 3:) Set RESONANCE to 63!!!!
- >>>> is there RESONANCY FEEDBACK ???<
- 4:) if not, screw the Pot 2(50kOhm) clockwise until you will hear the resonancy !!!!!
- 5:) now it is time for the frequency counter or the TubeOhm filter-calibrator
- 6:) Set resonancy to 63 and move the cutoff knob on Shruthi, until the resonance frequency reach 100 Hz. From 95Hz to 105 hz is OK
- 7:) now set the Resonancy knob in Shruthi to 51 and adjust the Pot 2 . On value 51 you must hear the beginning of the resonancy on F = 100 Hz. Move the resonance knob to 50 and the resonancy switched off!
- 8:) test it a few times.
- 9:) do the same settings with 1000Hz. The resonance begins at the resonancy value =47.
- \*\*\*because of part tolerace, it can be that 1000 HZ resonancy frequenc comes on 47 +/- a few digits.

#### Short form.

Pot 2 to max – clockwise, select 100 Hz, set the reso knob to 51 and adjust the Pot 2 in this way that the resonancy 100 Hz on value Reso =51 begins and stop at value 50!! Test it with 1000 Hz, reso value must be 47 +/- 1..2 digit.

OK ?? Great, let us adjust the filter linearity.

#### Third step – filter linearity:



The Filter becomes from Shruthi a V/OCT voltage. It is very important that the Filter moves it's frequency with the note you play.

One oct higher must double the frequency. But attention, the frequency is relative to the cutoff value and not absolute.

Absolute is the difference between C2,C3,C4.....

Example. Cutoff 30, both oscillators and the sub to OFF, Filter LFO and ADSR to off. Resonancy maximum.

If you play now C 3 you have a Q-Frequency 100 HZ, C4 = 200 HZ and C5 = 400 Hz But this depends on the cutoff !!!

Turn the cutoff to 20, you will have maybe on C 3 =75Hz,C4= 150 Hz and C5=300Hz This I mean with 'ABSOLUTE differencys'.

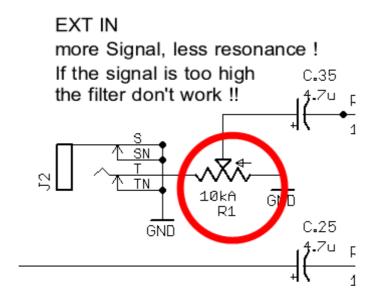
The linearity is stable from 50 HZ p to 3000 HZ, over 3000 HZ it can be that the linearity is minus 5..10 %.. That doesn't matter, because only the sounds changes a little. Important is, that the linearity is in rage from 50 to 3000 HZ.

- 1:) take a guitar tuner or a frequency counter or the TubeOhm Filter calibrator.
- 2:) play on the Keynoard C2, C3, C4 and measure the Frequency.
- 3:) from C2 to C3 you should have the double frequency.
- 4:) from C3 to C4 you should have the double frequency.

**Adjust Pot 1 linearity** until in the low and mid range (50...3000 Hz) the filter doubles the frequency from one octave to the next.

This is very important for the Filter FM, because FM interact with the resonancy. Is the resonancy out of tune, it gives more intermodulations and distortions.

# **Stepp 4 EXTERNAL VOLUME:**



One behavior of a Ladder filter is, it doesn't work on high Amplitudes.

Another effect is, more input volume, less resonancy volume.

Less input volume, more resonancy volume , but a bad SIGNAL to NOISE ratio!

So you had to adjust the **POT 4 External Input** in this way that the noise is less and Resonancy is not to loud.

\*\*\* Note for the internal Volume Pot3. I have test it with different internal Volumes. Less internal Volumes gives more resonancy output, but more noise in the signal. So, please set Pot3 to Maximum. This gives the best results.

TubeOhm 11.04.2013