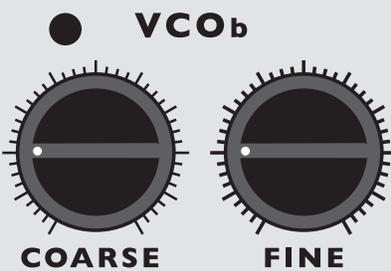


bubblesound INSTRUMENTS

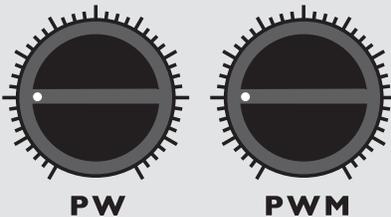
ACTIVE ELECTRONICS FOR A PASSIVE WORLD

Course Tuning
10 seconds - 21.5Hz



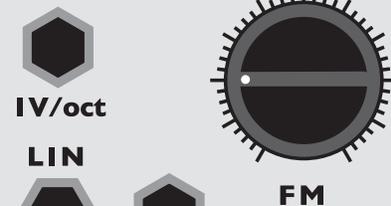
Fine Tuning
About 1/3 of an octave

Pulse Width Pot -
From almost fully positive to almost fully negative



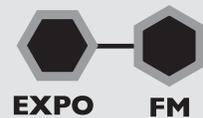
Pulse Width Modulation Attenuator

1 Volt per Octave input

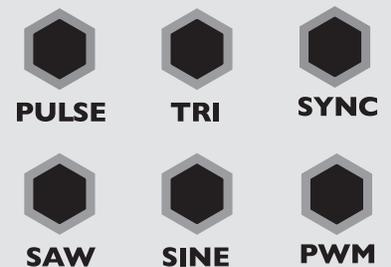


Frequency Modulation Attenuator

Frequency Modulation Input and Switch



Pulse, Triangle, Saw and Sine Outputs



Sync Input

Pulse Width Modulation Input

● bubblesound

BASICS

Outputs - Triangle, Sine, Saw and Pulse

**Inputs - Pulse Width Modulation, Frequency Modulation (Linear and Exponential),
Sync and 1 Volt per Octave**

Range - approx. 10 seconds - 21.4K Hz

Fine Tune Range - approx. 1/3 an octave

Tracking - 5 octaves

Current Draw - 90mA

Calibration

With a scope:

Sine - The Sine is probably the least likely to need adjustment, but just in case here's what to do. There is only one trimpot on the middle PCB, that's the Sine adjustment. Once you've got the VCOb hooked up to your scope use a screwdriver to adjust the trimpot. This can be done without taking the top PCB off. The trimpot has a flat area that can be used to make adjustments. It's a little tricky, but not very hard once you get used to it.

Adjust the pot until the output on your scope looks even and has no peak or point at the top or bottom. I usually have the VCOb running very slow for this, it's easiest if there are only 2 or 3 cycles on your scope.

Saw - The Saw adjustment pot is on the top PCB, near the middle on the left side. It is labeled SAW SHP. Once you hook the Saw output to your scope slow the VCOb down until there are 1 or 2 cycles on your screen, then change the Volt/CM on your scope to 1V. If it looks like there is a bump in the slope the Saw needs to be adjusted. Use a screwdriver to adjust the SAW SHP trimpot until it is a smooth line.

Without a scope:

Sine - There is a simple ways to see if you're Sine output is out of alignment; first slow it way down and use it as a modulator for something like a filter. If it seems like there is a peak at the top or bottom of the cycle instead of a continuously smooth rise and fall it probably needs a little tweak. Next you're going to adjust it. Hook up the Sine output so you can hear it through your speakers. Turn the volume way down, until you can barely hear the Sine. Then start adjusting the trimpot,

the only one on the middle PCB, until you can't hear your VCOb at all. When you get close to a perfect sine the harmonics go away. Once it seems right try it out as a modulator on the same module you used earlier and see if the peaks have gone away.

Saw - The Saw adjustment pot is on the top PCB, near the middle on the left side. It is labeled SAW SHP. Test this output the same way you tested the Sine output. Hook the Saw out to the CV in of something like a filter. Slow the VCOb way down and listen. If there is a noticeable bump, if the falling cutoff (if you're using a filter) is not smooth, the Saw needs to be adjusted. Keep it hooked up to whatever you are using to test it and start to very slowly turn the SAW SHP trimpot until you get it smooth.

If it seems like this would be easier with a scope, you're right. A good, used 20MHz analog scope is \$50-100 on eBay and there are many free software scopes for Windows that use your sound card or audio interface.

Tracking - To adjust the IV/oct tracking you will need a multimeter, preferably one with a frequency counter. We use the BK 2704B, which is discontinued, but the replacement is the same price and has all the same features. You'll need to measure voltage going into the VCOb and the frequency of the oscillator.

Start by setting your VCOb to 220Hz, the Saw output seems to be the best to measure the frequency for the BK we use.

You'll need a voltage source, something like the LvL+rm, the Doepfer A-176 or some other power source that can be attenuated.

With the resting rate of the VCOb at 220Hz add 3V into the IV/OCT input. You're looking for somewhere around 1760Hz. If it's faster or slower use a small flathead screwdriver to adjust the small blue trim pot on the upper right side of the PCB. There are 2, one is closer to the edge of the PCB and one is closer to the chips. The one closest to the edge is the one we're looking for. Slowly turn the adjustment screw until you get the rate between 1755 and 1760. Next, unplug the IV/OCT and see what the resting rate is now. Sometimes it changes slightly during calibration. If it has set it to 220Hz, add the 3V input again and see what the frequency is. Readjust if necessary.

Once that is done adjust your voltage and check the VCO_b response at 1V and 2V. It should be within a couple of cycles of perfect. Next we move on the high frequency adjustment. With the VCO_b resting at 220Hz give it 4V. You should be somewhere around 3520Hz. If not adjust the small blue trimppot closer to the chips slowly until you are getting 3520Hz, more or less. A lot of multimeters will only display 3 digits + a decimal so you'll be tuning to 3.52Hz in that case.

Once that is done change the incoming voltage to 5V and see what you're getting. It should be around 7.04Hz. If not continue to adjust the trimpot closer to the chips.

One thing to keep in mind, these are 100% analog devices with all the inherent flaws and charms which that entails. This VCO will never track "perfectly" even under the best conditions and will almost always be off by a couple of cycles.

Sync Input

The sync in this VCO is a little different than in most Saw core VCOs. If you need a VCO_b to match the frequency and track along with another VCO the easiest way is to turn the oscillators by ear and use a buffered mult to send the same CV to each oscillator. But there is a sync input. To use this the VCO_b you want to be the slave needs to be resting at a slower rate than the master VCO, but the closer together they are tuned the better the result will be. You will need to take either the Square/Pulse or the Saw out from the master VCO and plug that into the Sync input of the VCO_b. That should allow the VCO_b to stay synced to the other VCO.