Taiga Tuning Guide

Taiga Hardware Calibration V1.0.1

Taiga Owners Tuning Guide

Similar to an acoustic instrument, an analog synth like Taiga may require a small manual retuning from time to time. Modern electronic components and designs have dramatically improved stability however, so you should rarely need to adjust your synth. If you experience a performance issue or simply wish to keep your Taiga running at its very best, this guide will walk you through the process of retuning each element of the instrument.

Tools

There are a few tools you will need in order to access, measure, and adjust the trimmers on the back of the module. If available, some optional tools will allow you to be more precise with your adjustments (though they are not required). A few deeper calibrations do require additional tools, but those will likely never need to be readjusted. Instructions for those advanced procedures will be listed at the end of this guide.

Necessary Tools

- A medium crosshead (Phillips) screwdriver (for removing panel screws)
- A very small crosshead (Phillips) screwdriver (such as those used for eyeglass repair). If you have a non-conductive (i.e. plastic) screwdriver available, that is ideal
- A tuner (higher precision is better, but any will do)
- An audio system (speakers, headphones, or DAW) with decent response through full audio range (from low bass to high treble)

Optional Tools

- An oscilloscope (either software-based or stand-alone hardware)
- A DC voltage meter (can be found on any standard multimeter)
-

Taiga Oscillator Tuning

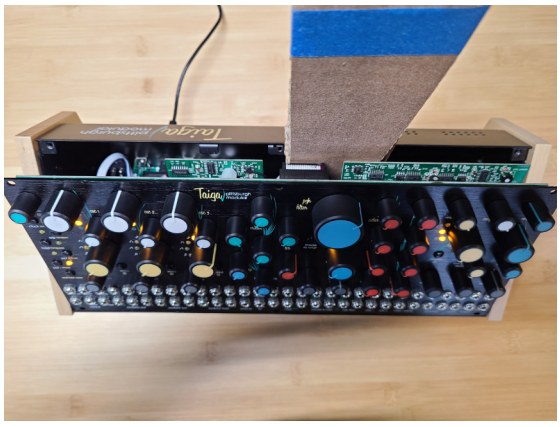
CAUTION

In order to access the calibration trimmers, the Taiga module must be separated from the metal frame. However, a few words of warning first…

Adjusting the trimmers on Taiga takes care and patience. It also requires you to make adjustments to the circuitry while the instrument is powered on. Do not touch any of the components or contacts on the circuit board with a metal tool, as damage can occur. Any damage caused during user tuning may result in a repair and retuning fee.

Removing Taiga from the Case for Tuning

1. Unscrew the 6 black Phillips head screws from the 4 corners, top edge, and bottom edge of the front panel. Take care not to strip or cam out the heads. Store them somewhere safe.
2. Lift the top edge of the panel slightly away from the case, slide the module up slightly, and then slide the bottom of the module out and away from the case.
3. Leave the short, flat 16-pin ribbon cable attached to the module and rest the bottom edge of the panel on the bottom edge of the case where it would normally sit. Place a thin, non-metallic material (such as cardboard or fabric) just behind the module so that it can be rested against the case without the circuit board touching the metal (see picture).



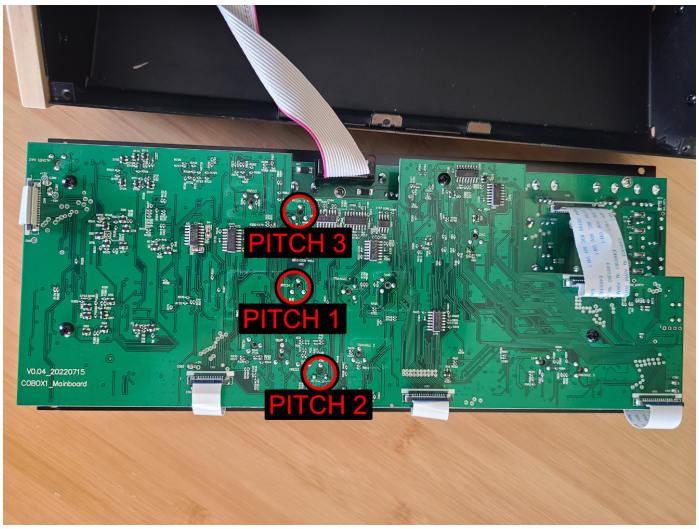
A Note on Tuning

It is the nature of analog electronics to change behavior slightly in response to changes in temperature. While some elements are more heat-sensitive than others, it is strongly recommended that you allow your Taiga to fully warm up (approx. 20-30 minutes) before measuring or adjusting anything.

Taiga Oscillator Pitch Tuning

A) Oscillator Pitch Tuning

The 3 Taiga oscillators are fully analog, free-running VCOs with range, scaling, and temperature compensation adjustments. For the vast majority of tuning issues, only the scaling control (labeled **PITCH**) should need to be adjusted (see picture for trimmer locations)



This procedure outlines tuning Oscillator 1. The same procedure can be applied to the other 2 oscillators and their corresponding PITCH trimmers.

1. Connect your audio output cable and tuner to the **[Osc 1 Sine Output Jack]**. Turn **FM, Shape, and Shape CV knobs** for that section all the way to the left (counterclockwise).
2. Connect a MIDI controller or DAW to the synth via the included MIDI adapter cable plugged into the **[MIDI In Jack]**.
3. Play the C note on your controller (or your DAW's virtual keyboard) that roughly corresponds to a C2 (~65 Hz) from the oscillator. You may need to adjust the octave settings on your controller or on Taiga to get it in range. Once it is close, adjust the **[Osc 1 Pitch Knob]** to an exact C2.
4. Press the **[Oct + Button]** on your Taiga 4 times and play the same C note on your controller. The oscillator should now be playing something close to a C6 (~1046 Hz). Remember the exact tuning of the note played here (such as C6 +34 cents, for example).
5. Use the Oct - button to go back down to C2. Locate the **[PITCH 1 Trimmer]** hole on the back of the module. Insert the small crosshead screwdriver through the hole in the PCB so that you can adjust the **[PITCH 1 Trimmer]**. Adjust this trimmer to match the same tuning offset you measured at C6 (in the above example, set it to C2 +34 cents) *With practice, you will likely find that slightly "overshooting" (going past) the tuning offset will allow you to dial in the tuning more quickly.

Pitch Tuning

6. Adjust the **[Pitch Knob]** so that the reading is once again a perfect C2
7. Go back up to C6 and measure the new tuning offset
8. Repeat the process of adjusting the offset at C2 with the **[PITCH 1 Trimmer]** and retuning it to C2 with the **[Pitch Knob]** until C2 and C6 are perfectly in tune with each other.

Well done! Your oscillator should now be in tune.

At this point, the largest factor to any remaining inaccuracy with tuning is related to temperature. To account for this, you will need to slide the module back into the case so that it can warm up to the normal operating temperature. Once this is done, allow the synth to warm up for ~20 minutes and then measure the tuning at C2 and C6 again. If you find that C6 has drifted away slightly, note the tuning difference and then apply this difference to C2 using the **[PITCH 1 Trimmer]** adjustment procedure you did before.

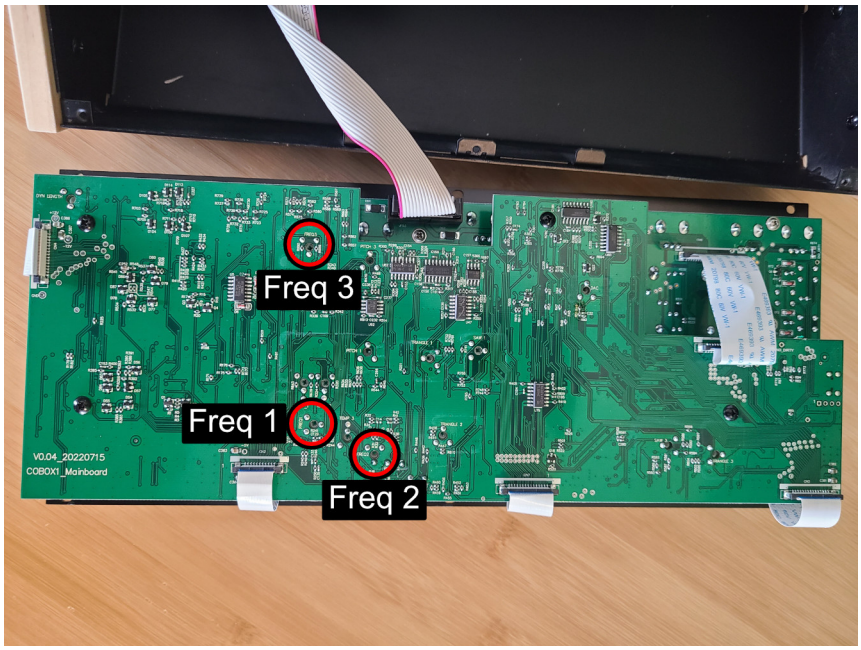
Repeat this process with Osc 2 **[PITCH 2 Trimmer]** and Osc 3 **[PITCH 3 Trimmer]** to get all three of your oscillators in tune. To save time, you can wait to perform the final warm up tuning until you have roughly tuned all 3 of the oscillators

Oscillator Pitch Knob Centering

B) Oscillator Pitch Knob Centering

Ideally, each of your oscillators will be in tune when the **[Pitch Knob]** is set to center (12 o'clock). This means that when you play a C note with your keyboard, a C note will play from the oscillator. However this is a fully analog knob and potentiometers are not perfect so the exact position can vary a little bit.

If you would like to re-center the **[Pitch Knob]** of an oscillator, this can be done by adjusting the corresponding **[FREQ Trimmer]**. Please note that adjusting the **[PITCH Trimmer]** has an effect on the center point of the **[Pitch Knob]**, so it is recommended that you make this adjustment after fully tuning your oscillators.



This adjustment can be particularly temperature sensitive, especially for Oscillator 1 (which has a much smaller **[Pitch Knob]** range than the others). For best results, only remove the module from the case to make the adjustment and then return it to allow the circuitry to warm up and restabilize.

1) After a thorough warm up time, center the **[Pitch Knob]** to exactly 12 o'clock and measure any tuning discrepancy when playing a note. For example, you may play a C3 note with your keyboard and measure C3 +20 cents from the oscillator.
2) Adjust the **[FREQ1 Trimmer]** so that the oscillator plays a perfect C3 when the Pitch knob is centered.
3) Allow the module to restabilize in temperature inside the case, measure the tuning at center, and then make any final adjustments as needed.

Repeat this process with Osc 2 **[FREQ2 Trimmer]** and Osc 3 **[FREQ3 Trimmer]**. These adjustments will be less temperature sensitive than Osc 1, as they have a much larger Pitch knob range.

Oscillator Output Starting Amplitude

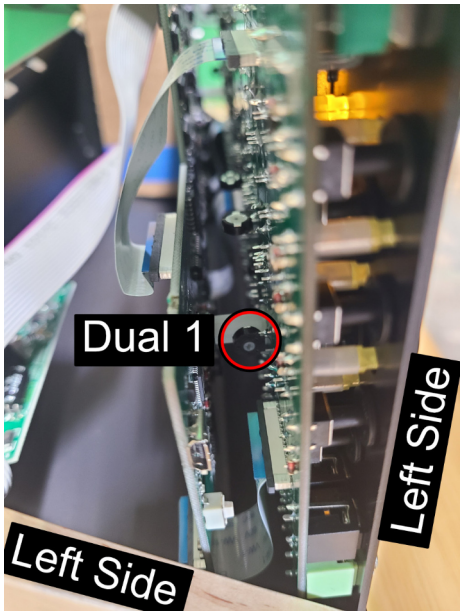
C) Oscillator Output Starting Amplitude

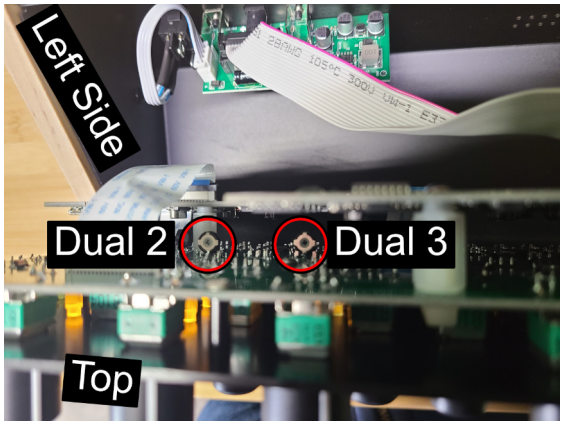
The shaping section of each oscillator uses an amplifier to feed the wave folding circuitry. The **[Shape Knob]** controls the strength of this amplifier. Ideally, when the **[Shape Knob]** is turned fully to the left (counterclockwise), the signal from the **[Oscillator Out Jack]** will be a full-sized, but unfolded waveform.

The calibration for this section allows you to set the baseline amplitude of the oscillator when the **[Shape Knob]** is turned all the way down. Though the factory setting for this calibration is a full-sized, unfolded wave, this trimmer does allow the lowest position to be set anywhere from completely silent (amplitude goes to 0) to already partially folded.

1. Connect your audio output to the **[Osc 1 Out 1 Jack]**. Play a low-mid note (C2-C3) and turn FM, Shape, and Shape CV knobs all the way down. Select the Sine wave (top light on) using the **[Seed Button]**.
2. Listen to the audio carefully (turn up volume if needed) and adjust the **[DUAL1 Trimmer]** so that the audio is as loud as possible WITHOUT beginning to change timbre or starting to folding.
3. Place the module back into the case, allow it to warm up and stabilize, and confirm that the response has not changed.

Repeat this process with Osc 2 **[DUAL2 Trimmer]** and Osc 3 **[DUAL3 Trimmer]**.





Oscillator Triangle Shape Adjustment

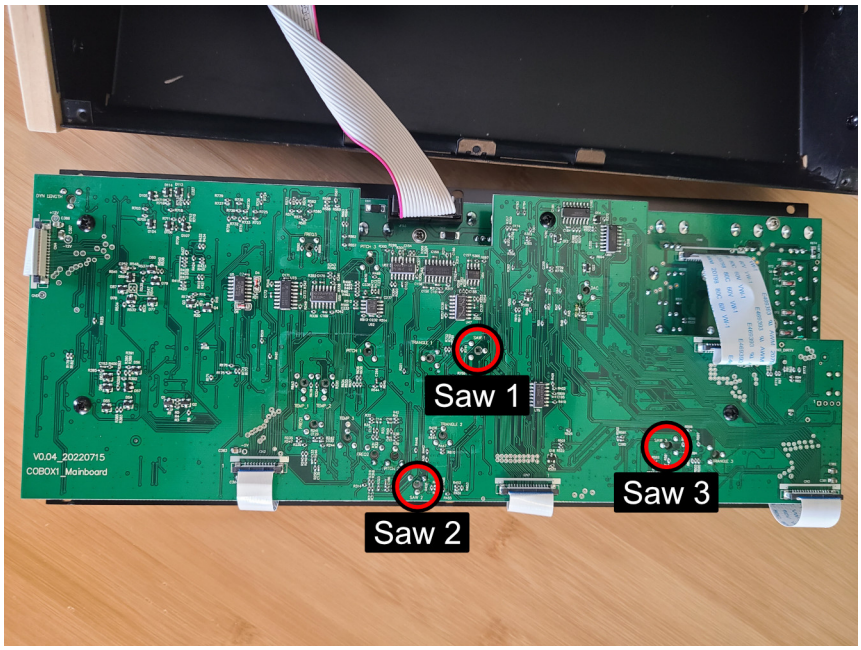
D) Triangle Shape Adjustment

Taiga uses a cascading wave shape architecture, in which various core shapes are created out of previous shapes. The first adjustment in the chain uses the **[SAW 1 Trimmer]** to set the DC offset of the Saw wave being sent into the Triangle shaper. Adjusting this offset allows the Triangle wave to be fine tuned into a perfect triangle shape

1) Connect your audio output to the **[Osc 1 Out 1Jack]**. Play a low-mid note (C2-C3) and turn **FM, Shape, and Shape CV Knobs** all the way down. Select the Triangle wave (2nd light from top is on) using the **[Seed Button]**.
2) Listen to the audio carefully (turn up volume if needed) and adjust the **[SAW 1 Trimmer]** so that any "buzz" has been minimized and the wave sounds as smooth and mellow as possible

If using an oscilloscope, look at the triangle waveform and adjust the **[SAW 1 Trimmer]** so that the small "hook" in the peak of the wave is eliminated

Repeat this process with Osc 2 **[SAW 2 trimmer]** and Osc 3 **[SAW 3 trimmer]**.



Oscillator Triangle Shape Adjustment

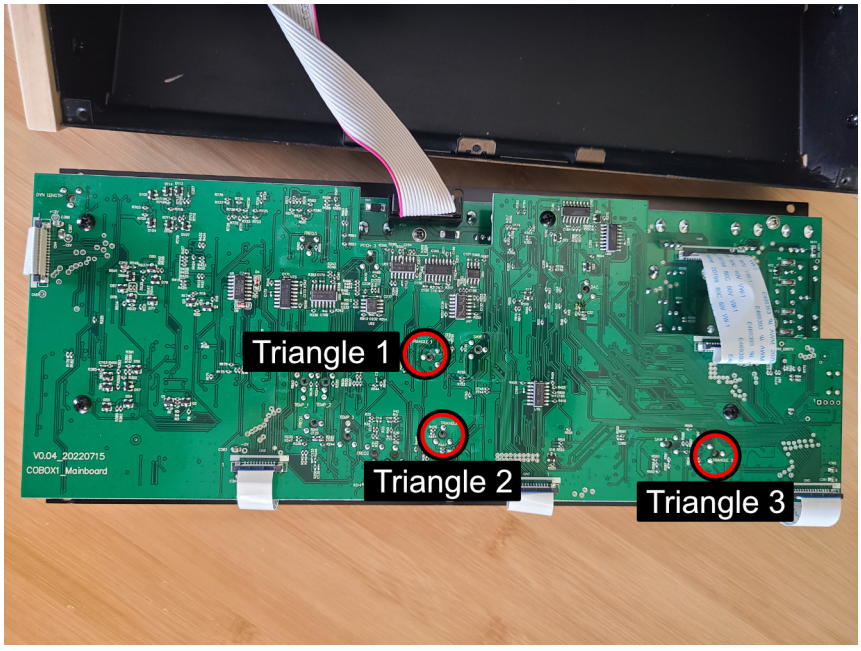
E) Sine Wave Adjustment

The Sine wave is created from the Triangle wave. Depending on the DC offset of the Triangle wave being fed into the Sine shaping circuit, the resulting wave will be more or less symmetrical. Adjusting the **[TRI 1 Trimmer]** allows the Sine wave to be calibrated as symmetrically as possible, with the least amount of upper harmonic content.

1. Connect your audio output to the **[Osc 1 Sine Jack]**. Play a low-mid note (C2-C3) and turn the FM knob all the way down.
2. Listen to the audio carefully (turn up volume if needed) and adjust the **[TRI 1 Trimmer]** so that the Sine wave sounds as mellow and smooth as possible. If this is difficult, sweep the **[TRI 1 Trimmer]** in both directions until you can hear the shape become obviously distorted. Once you find those outer distortion points, set the trimmer to the center-point between them.

If using an oscilloscope, look at the sine waveform and adjust the **[TRI 1 Trimmer]** so that the upper and lower portions of the waveform are identically rounded.

Repeat this process with Osc 2 **[TRI 2 Trimmer]** and Osc 3 **[TRI 3 Trimmer]**.



Excellent! Your oscillator should now be fully calibrated.

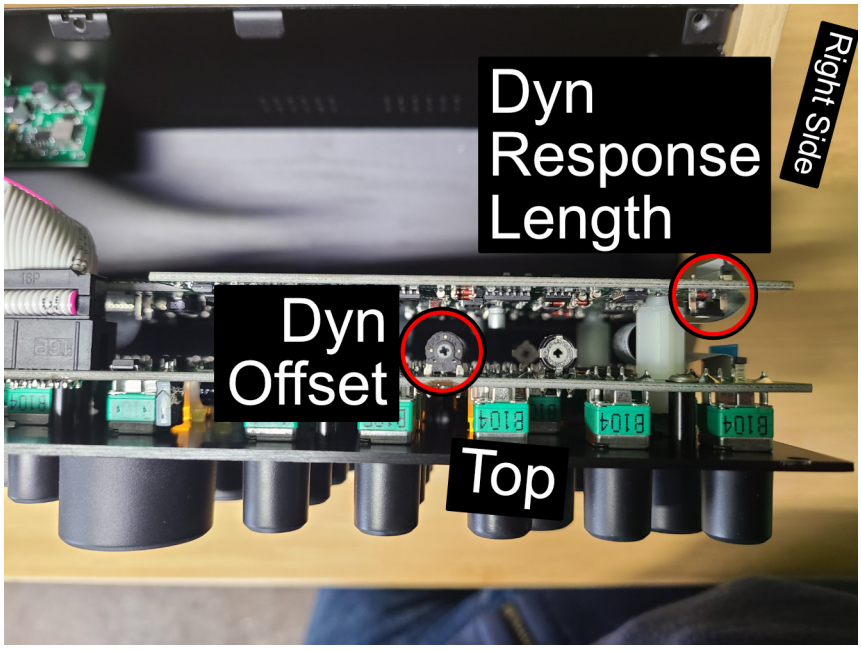
Dynamics Cutoff Point Adjustment

F) Dynamics Cutoff Point Adjustment

The **[Dynamics Knob]** is unique in that it controls both the volume (VCA) and upper harmonic content (lowpass filter) of audio. With the **[Dynamics Knob]** turned fully to the left (counterclockwise), the VCA portion will be completely silent. However, the lowpass filter requires a bit of fine tuning in order to completely silence the signal. Adjusting the **[Dyn Offset Trimmer]** allows you to set this lowest position of the **[Dynamics Knob].**

1. Set the **Response, Dynamics, Low Pass Gate Resonance, Resp CV, and Dyn CV Knobs** full left (counterclockwise). Press the **[Mode Button]** to select LowPass Gate mode (center and bottom lights turned on).
2. Patch **[Osc 1 Sine Out]** to **[Dynamics In]**. Set the octave ranges on your synth and controller so that you can play the lowest note that can be either heard through your speakers or measured in a DAW. You can temporarily turn up the **[Dynamics Knob]** during this process to confirm that audio is playing. Turn the **[Dynamics Knob]** all the way back down once you have found your low note.
3. Adjust the **[Dyn Offset Trimmer]** just to the point where the audio goes silent. You do not want to take this any farther than that, as it will begin to add a DC offset "thump" to your signal path whenever the lowpass gate is triggered.
4. Confirm the calibration by turning up the **[Dynamics Knob]** (to bring the volume back up) and then turning it back down again (to silence it).

If using an oscilloscope, set the vertical division to 200 mV and adjust the **[Dyn Offset Trimmer]** until the waveform is just barely visible.



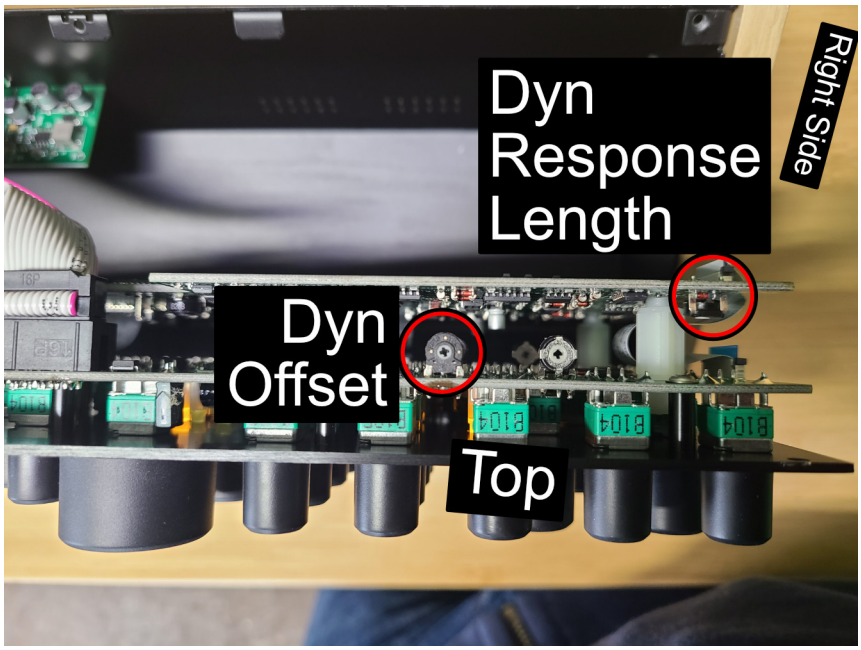
Dynamics Response Range Adjustment

G) Dynamics Response Range Adjustment

The **[Response Knob]** allows you to adjust the decay time when in lowpass gate mode. The overall range of this control is set using the **[Dyn Length Trimmer]**. While there is a factory specification for this setting, this is the most subjective adjustment on the instrument and can be set to your personal preference. Ideally, the Response range should allow for percussive sounds anywhere between very tight and "plucky" (when turned full left) all the way up to a much longer response that can ring out for 1 second or more.

1. Use the same knob and patch settings as for the Dyn Offset adjustment. Play a midrange note from the oscillator (we use C3). Set all ADSR 2 knobs full left (shortest settings).
2. Turn on the Arp Mode and Hold Mode and tap the C3 key on your controller. The unit should now be playing a repeating, short note. Adjust the clock speed to approximately 1 beat per second by tapping the **[Clock Button]**.
3. Adjust the **[Dyn Length Trimmer]** so that the note is as short as possible, while still containing some pitch information (i.e., you can tell the pitch of the note, as opposed to a simple "click" sound).
4. Sweep the **[Response Knob]** up through its full rotation and confirm that you like the overall range. If you would like to shift the range shorter or longer, you can adjust the **[Dyn Length Trimmer]** accordingly.

If using an oscilloscope, set your oscilloscope to 20 ms and 2 V divisions and adjust the **[Dyn Length Trimmer]** so that the notes lasts approximately 60 ms (3 divisions on the scope) when the **[Response Knob]** is turned full left.



Echos Delay Adjustment

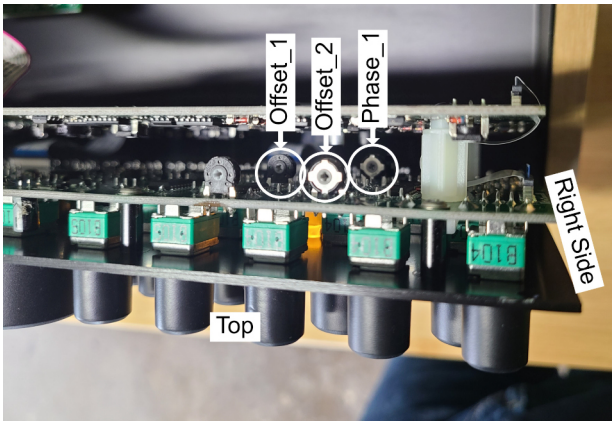
H) Echos Delay Adjustment

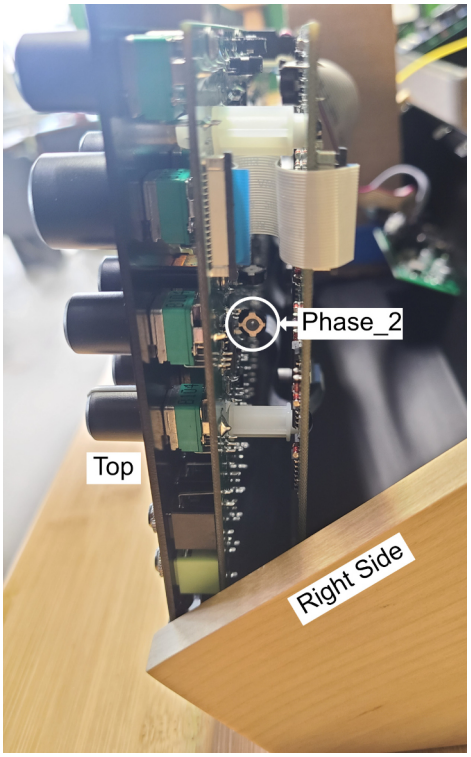
The analog delay (Echos) section is a complex circuit with a variety of calibration adjustments. A full recalibration should not be necessary once it has been calibrated at the factory. However, each trimmer can be adjusted as needed to improve the overall sound and performance:

Clock Filtering
The [**Phase_1 Trimmer]** will allow you to cancel out high frequency clock noise that has entered the signal path while being processed through the BBD chips. Turn the Time and Mix knobs all the way up to hear the clock most prominently. Adjust the [**Phase_1 Trimmer]** to make this high frequency tone as quiet as possible.

Regen Strength
The **[Phase_2 Trimmer]** can be used to set the overall feedback (Regen) strength within the circuit. This sets the point at which the **[Regen Knob]** brings the feedback gain past the point of unity gain, where it begins to self-oscillate. Set the **[Regen Knob]** all the way up and the **[Time knob]** all the way down. Adjust the **[Phase_2 Trimmer]** so that the self-oscillating signal is as loud as possible, but does not become squared off or distorted

Signal Quality
-The **[Offset_1 Trimmer]** and **[Offset_2 Trimmer]** adjust the DC offset of the audio signal as it is being fed into each BBD chip. If they are set too far one way or the other, the audio will begin to distort or even go completely silent. When turning either of these trimpots, you will find a point on each end of the rotation where the signal begins to distort. Set each trimpot to the center-point between these 2 points of distortion





Advanced Taiga Adjustments

I) Advanced Calibrations

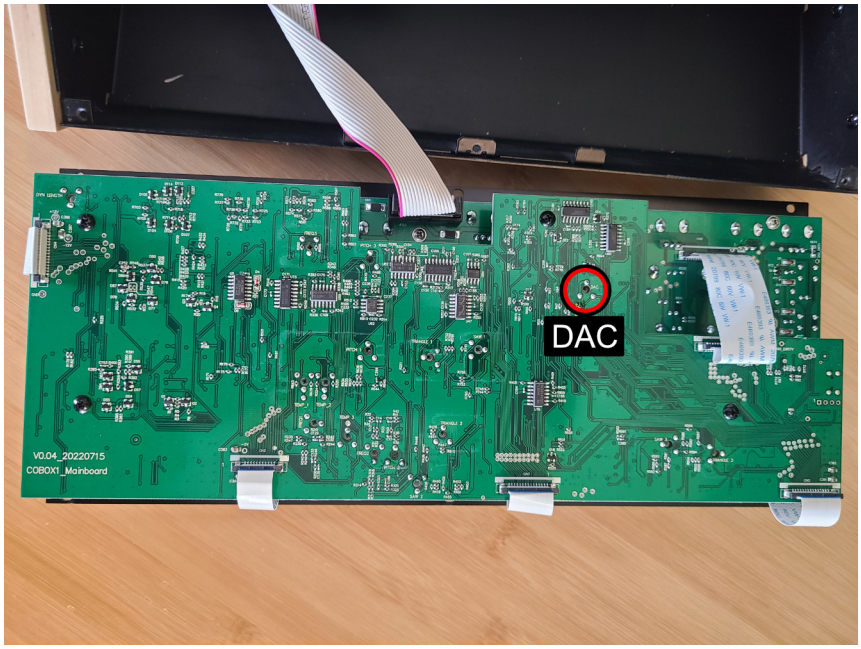
The following adjustments require familiarity with a multimeter and the ability to probe test points on the circuit board without causing damage. These calibrations should not be attempted unless you are experienced with this tool and are sure that adjustments need to be made in these sections.

DAC Calibration

The digital-to-audio conversion portion of the MIDI section converts digital pitch information from the processor into an analog Volt/Octave voltage to be used by the oscillators and the **[Pitch Out Jack]**. The DAC trimmer sets the scaling of this conversion so that it is as linear and accurate as possible.

1. Connect a MIDI cable in the same manner as you would for tuning the oscillators.
2. Connect the multimeter (set to DC voltage) to the **[Pitch Out Jack]** via a patch cable and clips or a custom 3.5mm TS-to-multimeter cable converter. The red (pos) lead goes to the tip and the black (neg) lead goes to the sleeve.
3. Play the C note on your controller corresponding to a 4V reading. Note the voltage offset (such as 4.013V).
4. Play the C note 4 octaves higher and read the voltage at 8V. Adjust the **[DAC Trimmer]** to recreate the same offset as at 4V (such as 8.013V using the previous example).
5. Go back down to 4V and read the new offset. Recreate this offset at 8V.
6. Once the offsets at 4V and 8V are the same, the calibration is complete.

Even though there is an overall voltage offset, the interval between voltages is precise, which will result in accurate tracking with a well-tuned oscillator.



Advanced Taiga Adjustments

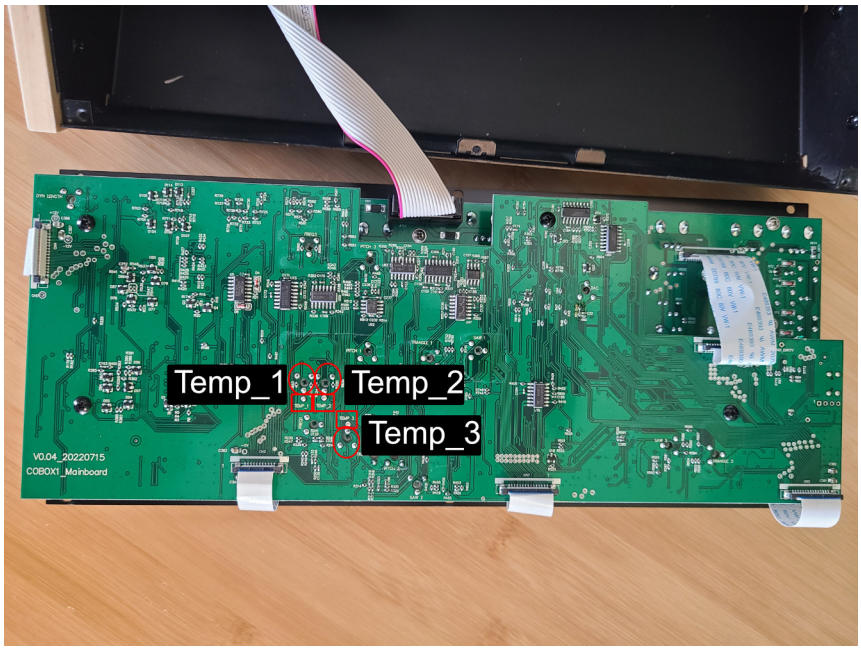
TEMP Calibration

Each of the 3 oscillators has a static DC voltage applied to the core which is designed to compensate for tuning drift during temperature changes. When set properly, the overall scaling of each oscillator should not change dramatically between a cold start and full stabilized running temperature. However, if large, temperature-related scaling changes are noticed and are interfering with use of the synth, adjusting the voltage with the **[TEMP Trimmer]** may help.

1. Set your multimeter to measure DC voltage and connect the black (neg) to ground via the sleeve of a patch cable plugged into the **[Pitch Out Jack]**.
2. Touch the red lead to the test point labeled **[TEMP_1]** near the **[TEMP 1 Trimmer]**.
3. Adjust the **[TEMP 1 Trimmer]** until you get a reading of 0.332V

This voltage has been determined to be the best average for temperature compensation with these oscillators. However, the exact voltage for each specific oscillator may vary by a few millivolts. However, this average voltage should keep the oscillator from drifting more than a few cents/octave during warm up.

4. Repeat process using **[TEMP_2 Test Point]** with **[TEMP 2 Trimmer]** and **[TEMP_3 Test Point]** with **[TEMP 3 Trimmer]**.




Taiga
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