

# Q148 VCA++

Aug 4, 2017

The Q148 VCA++ combines a normal VCA, a left-right panner, a clipping monitor, a tuner, and a headphone amplifier all in a single-space module. The Q148 VCA++ makes a great final output module for studio or live work.

The VCA section operates like the Q108 VCA with both manual and voltage control. When patching in a control voltage, the VCA knob becomes an attenuator for the control voltage and essentially becomes your volume control.

The panning section gives you manual or voltage control of where the sound goes - left and/or right. Patch in an LFO to bounce the sound back and forth, or use an envelope to move the sound from one side to another for each note.

The tuning section provides an A (440hz) or C (523hz) standard for setting oscillators. It's super convenient and you might even find creative uses for it within your playing. The center position is off.

An LED indicates when the signal is getting close to the natural clipping level of the internal circuits to prevent distortion and help you set proper levels for the best signal-to-noise ratio.

The Q148 has a built-in stereo headphone amplifier with a volume control. As with any headphone amplifier, always start at the zero setting and slowly increase the volume to a safe level.



**Headphone Warning:**  
Start at 0 (zero) and slowly increase for a safe operating volume.

Only use stereo plugs in the headphone jack.

## Q148 VCA++ Specifications

**Panel Size:** Single Width 2.125"w x 8.75". Moog Unit (MU) format.

**Functions:** VCA, Stereo Panning, Clipping indicator, Tuner, Headphone Amplifier.

**VCA CV levels:** 0V=off, 5v=on.

**PAN CV levels:** -5V=left, 0v=center, 5V=right (Bipolar mode). 0V=left, 5V=right (Unipolar mode).

**Audio levels:** 10V peak-to-peak typical. 28v maximum.

**Tuner:** 440hz (A) and 523hz (C).

**Headphone Amplifier:** Stereo. Can drive most modern headphones. Only use stereo plugs.

**Power Requirement:** +15V@60ma, -15V@60ma, +5V@50ma

**Power Connector:** Synthesizers.com standard 6-pin keyed MTA connector.

## Headphone Warnings

### Using loud headphone levels can damage hearing!

Always begin with the headphone level at 0 and slowly increase the level as you listen. Hang headphones around your neck at first instead of on your ears.

Changing a patch or turning a knob can have a huge effect on sound level so be careful.

### Headphone jack only

Do not plug headphones into any other jack besides the headphone jack. Doing so may damage hearing and circuits.

### Stereo plugs only

Do not insert a mono plug into the headphone jack, it is strictly stereo. Doing so shorts the driver circuit and may cause damage.

***Synth Safely***

# Q148 VCA++

The Q148 VCA++ has 5 sections to logically divide the functions. VCA, panning, outputs with clipping indicator, tuner, and the headphone amplifier.



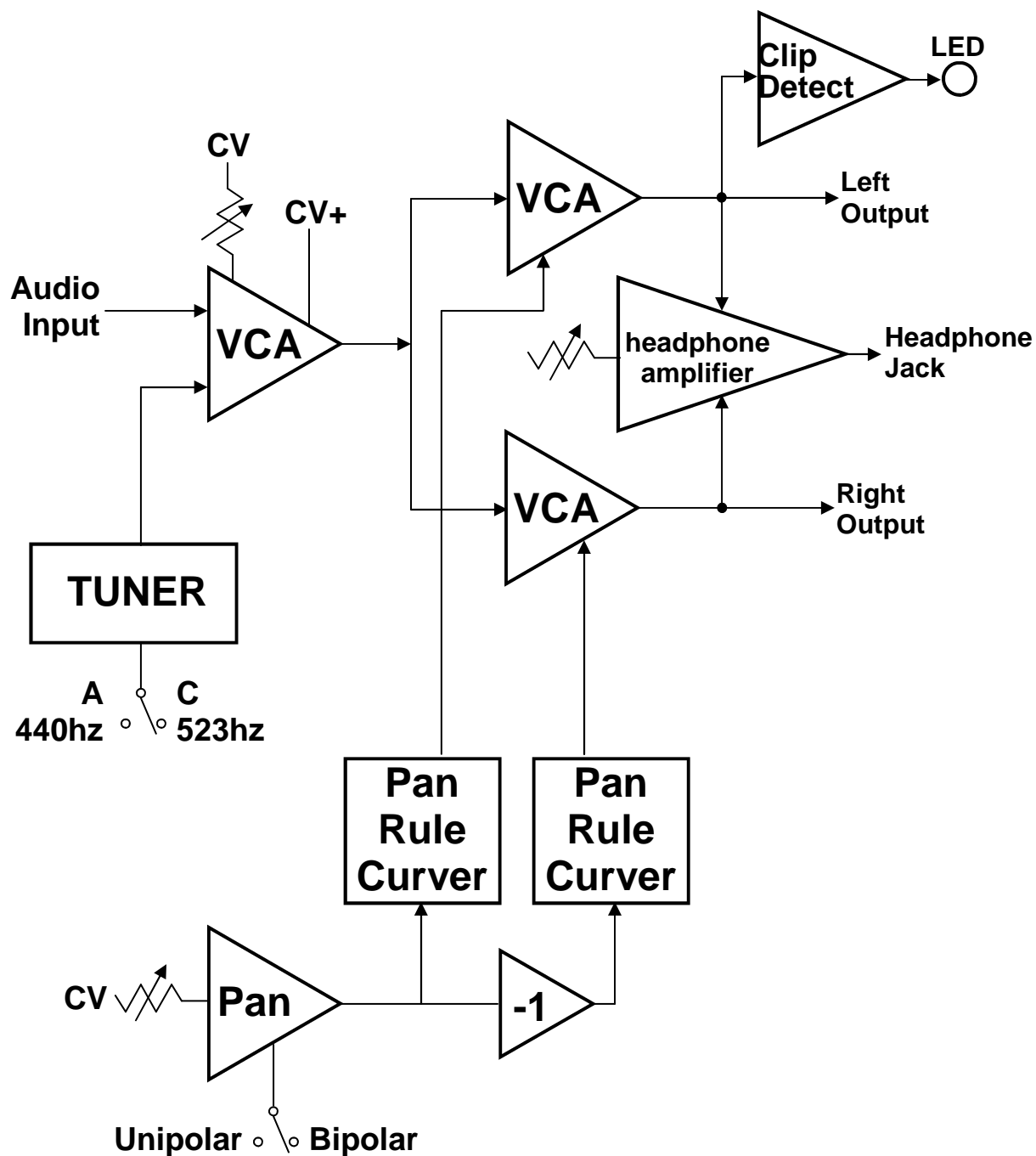
## Headphone Warning

Start at 0 (zero) and slowly increase for a safe operating volume.

# Q148 VCA++

## Functional Diagram

The Q148 consists of many circuit blocks connected together in a logical and musically useful way to make best use available space and provide maximum usability.



# Q148 VCA++

## VCA

The core of the Q148 VCA++ is a voltage controlled amplifier.

Patch your audio signal, often from a filter, into the IN jack.

With no plug in the CV jack, the GAIN knob provides manual control of the amplitude, aka volume.

With a plug inserted into the CV jack, the GAIN knob attenuates the incoming CV signal. This gives you control over how much affect the CV signal has on the amplitude. If the knob is fully counter-clockwise then the CV has no effect. When fully clockwise, the CV has the full effect as described below.

For typical use, an envelope generator will be patched into the CV jack and the GAIN knob will be turned all the way up.

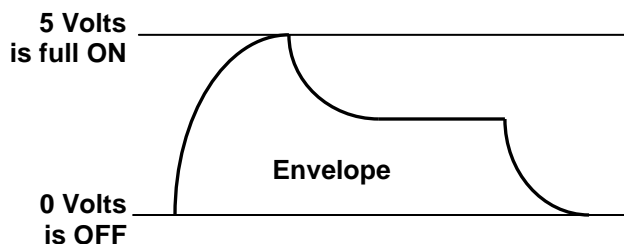
A second, unattenuated control voltage input can be found at the CV+ jack. This voltage is added to the CV jack to create a voltage that controls the amplitude.

To use the Q148 as a single channel mono VCA without panning, see the next section.

The VCA operates between 0 and 5 volts. 0 volts turns the VCA off and 5 volts turns the VCA on to 100%.



The final control voltage used to control the VCA is a combination of the CV jack times the GAIN knob, plus the voltage at the CV+ jack



### Headphone Warning

Start at 0 (zero) and slowly increase for a safe operating volume.

# Q148 VCA++

## Panning

To use the Q148 as a single channel mono VCA, set the pan switch to Unipolar, set the knob to full counter-clockwise (LEFT), and use the LEFT channel output.

With no plug in the CV jack, the PAN knob provides easy manual control of panning left and right.

With a plug inserted into the CV jack, the knob attenuates the incoming CV signal. This gives you control over how much affect the CV signal has on panning. If the knob is fully counter-clockwise then the CV has no effect. When fully clockwise, the CV has the full effect as described below.

The switch selects whether the CV signal is a Unipolar signal like from an envelope generator (0v to 5v), or a Bipolar signal like from an oscillator (-5v to +5v).

**Unipolar** - For CV signals that don't go negative such as an envelope.

With the Pan knob turned fully clockwise:

CV = 0 volts = Left

CV = 2.5 volts = Center

CV = 5 volts = Right

**Bipolar** - For CV signals that go negative and positive such as an oscillator.

With the Pan knob turned fully clockwise:

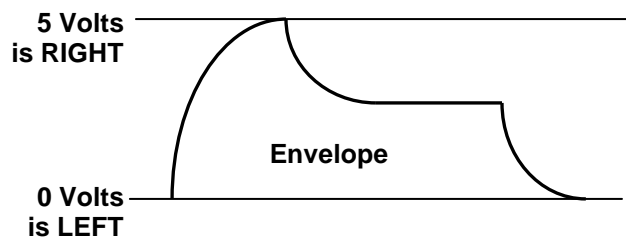
CV = -5 volts = Left

CV = 0 volts = Center

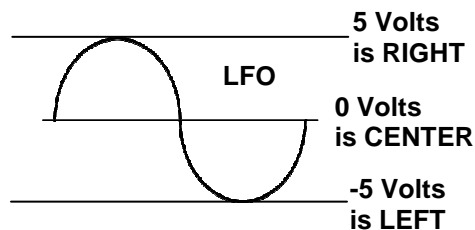
CV = 5 volts = Right



### UNIPOLAR



### BIPOLAR



### Headphone Warning

Start at 0 (zero) and slowly increase for a safe operating volume.

# Q148 VCA++

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## Outputs

The LEFT and RIGHT output jacks provide a high-level signal for your external gear. This can be a mixer, powered speakers, an amplifier system or a DAW. You'll need to attenuate the signal at your external gear for the optimal level.

When using the Q148 as a single channel mono VCA, use the LEFT output jack.



## Clipping Level

An LED provides indication that the signal on the left channel is close to clipping. This is approximately 22Vpp. Normally you want to stay away from levels that cause the LED to flicker.

## Tuner

A built-in tuner provides a tone for tuning oscillators. A 440hz and C 523hz are provided. The center position is OFF. The tuner tone appears at both outputs and at the headphones.



## Headphones

A built-in headphone amplifier provides convenient monitoring. Since levels are unknown, start with the knob set to 0 (ZERO) and slowly increase the volume while playing to achieve a safe operating level. The headphone jack is stereo and will drive most modern headphones. Do not insert a mono plug or circuit damage may occur. The headphone output can also be used as a stereo output with moderate distortion.



Changing a patch or turning a knob can have a huge effect on sound level so be careful.

### Headphone Warning

Start at 0 (zero) and slowly increase for a safe operating volume.

# Q148 VCA++

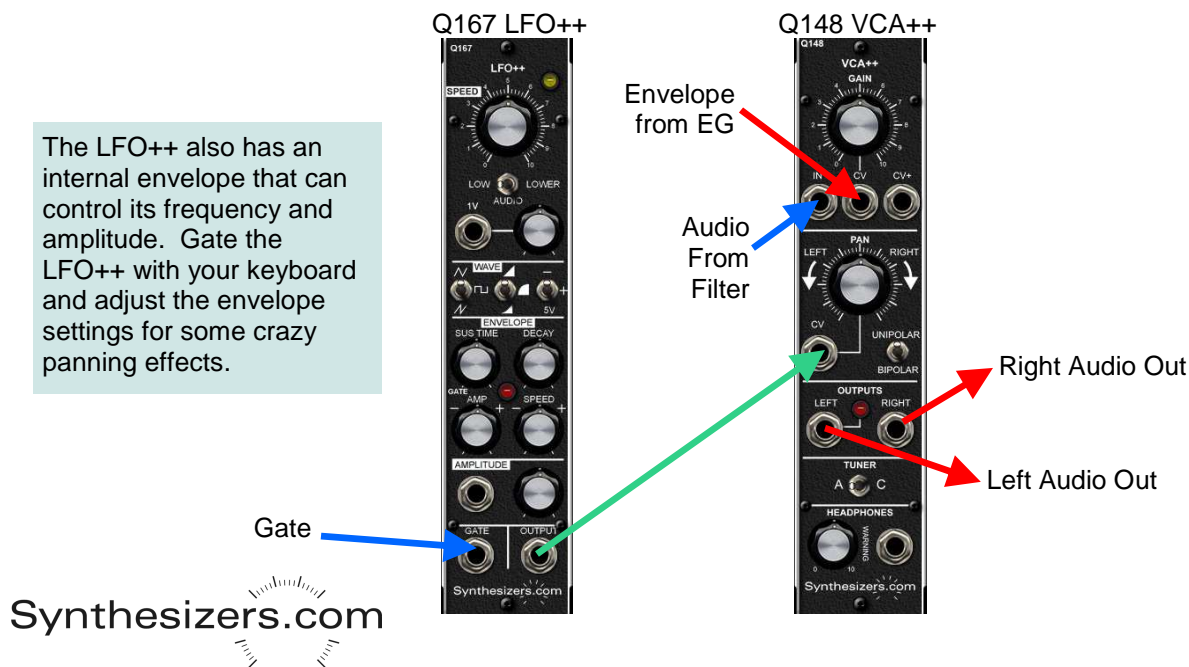
## Basic Synth Patch

Here's a basic synthesizer patch with one oscillator, one filter and the VCA++. The envelope is controlling the VCA and the filter. No panning is occurring - turn the PAN knob full left.



## LFO panning

This patch is the same as above, but uses an LFO to bounce the audio left/right. The PAN knob controls the depth of this effect by controlling how much of the LFO signal gets through. Set the Pan switch to BIPOLAR and set the LFO++ waveform to + so it will create a bipolar waveform.

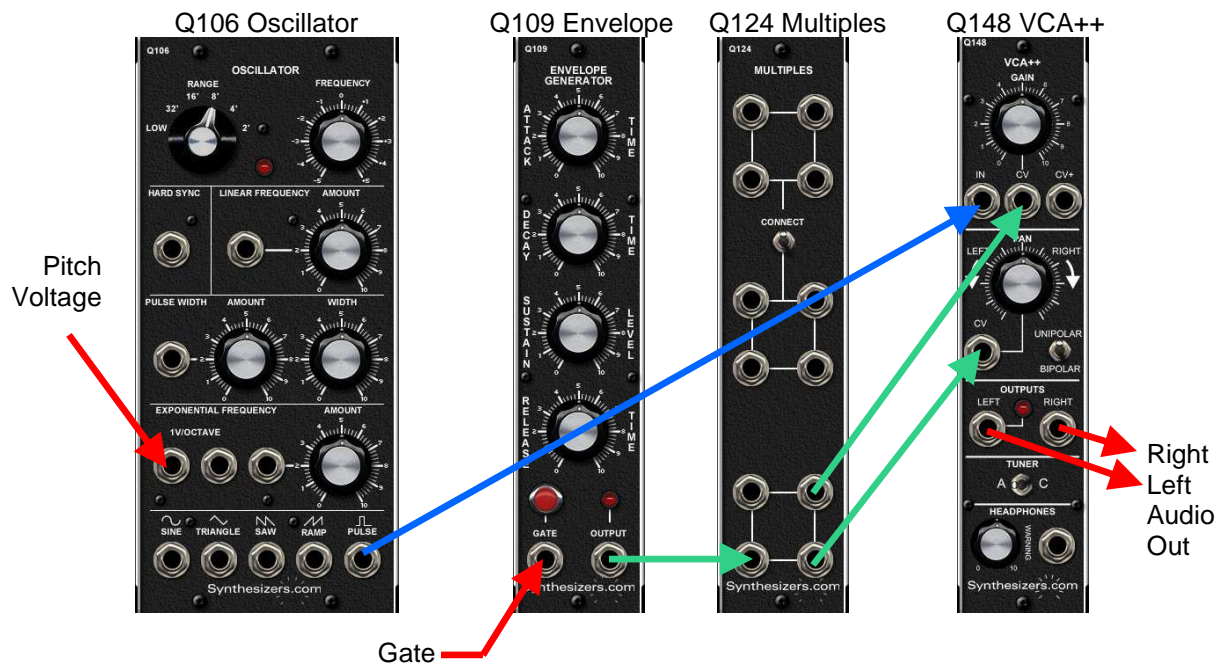




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## Envelope Panning

In this patch, an envelope generator controls panning from left to right for each note. You can use one envelope for both the VCA and for panning, or separate envelopes. Set the Pan switch to UNIPOLAR since the Q109 makes 5v signals. This example only shows one oscillator and no filter for simplicity.



## Sequencing

This patch controls where each note goes - left or right. The 2nd row is patched to the Pan portion of the Q148 VCA++. Set the OUTPUTS switch to 0/+5 and the MODE to 3x8. Turn the stage knobs to CCW for left, CW for right, and to the center for center. Set the Pan switch to Unipolar and the Pan knob to CW. Use the first row for pitch voltages for your melody, and the 3rd row to control a filter.



# Q148 VCA++

## Calibration

### Prepare for testing

You'll need an oscilloscope, digital voltmeter, frequency counter, and a precise 5v source such as the Q174 MIDI Interface module.  
The Q148 module must be powered.  
Turn tuner off (center position).  
Set pan switch to UNIPOLAR.

### Left VCA feedthrough adjustment

VCA CV <-- 1khz triangle wave, unipolar, 0-5v.  
GAIN knob CW  
PAN knob CCW  
Oscilloscope @20mv to LEFT output  
Adjust left VCA feedthrough trimmer for minimal bump.

### Right VCA feedthrough adjustment

Move scope to RIGHT output  
PAN knob CW  
Adjust right VCA feedthrough trimmer for minimal bump.

### Left pan feedthrough adjustment

IN <-- 5.0 volts DC.  
PAN CV <-- 1khz triangle wave, unipolar, 0-5v.  
GAIN knob CCW  
PAN knob CW  
Oscilloscope @20mv to LEFT output  
Adjust left Pan feedthrough trimmer for minimal bump.

### Right pan feedthrough adjustment

Move scope to RIGHT output  
Adjust right Pan feedthrough trimmer for minimal bump.

### Left gain adjustment

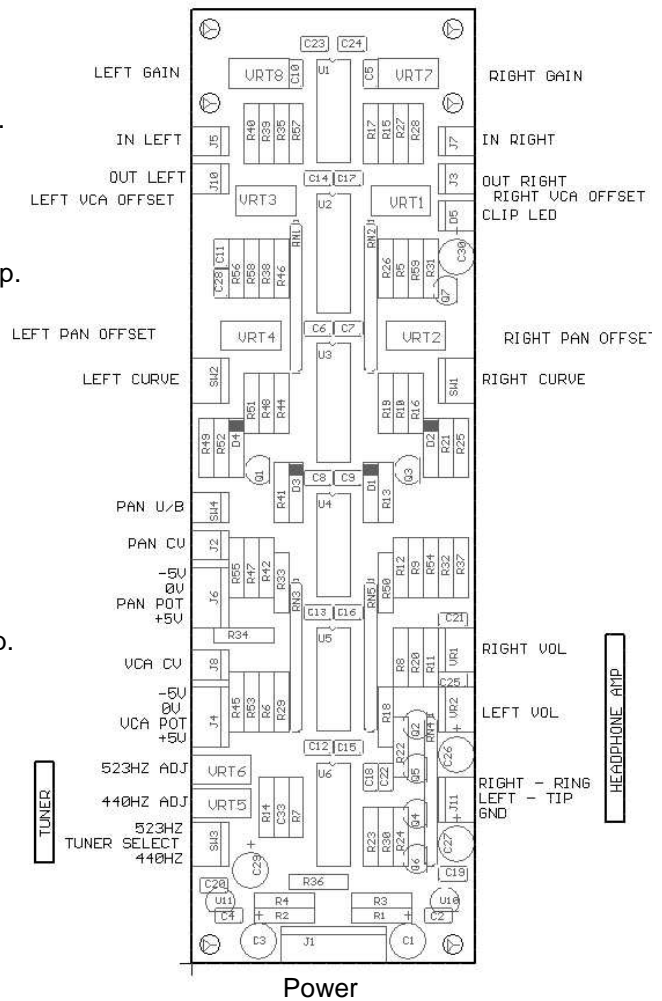
IN <-- 5.0 volts DC.  
GAIN knob CW  
PAN knob CCW  
Voltmeter to LEFT output  
Adjust left gain trimmer for exactly 5.0 volts.

### Right gain adjustment

PAN knob CW  
Voltmeter to RIGHT output  
Adjust right gain trimmer for exactly 5.0 volts.

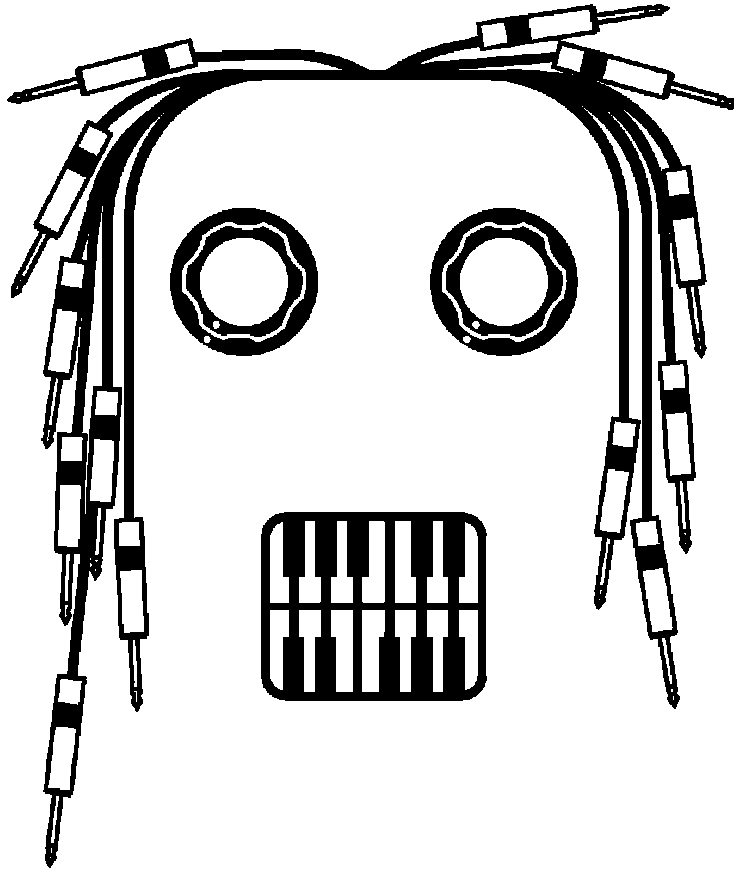
### Tuner adjustment

No inputs or CV plugs.  
LEFT output to frequency counter or match to precise pitch source.  
GAIN knob CW, PAN knob CCW  
Set tuner switch to A and adjust trimmer for 440hz, set to C and adjust for 523.25hz.





# Patcher Jack



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