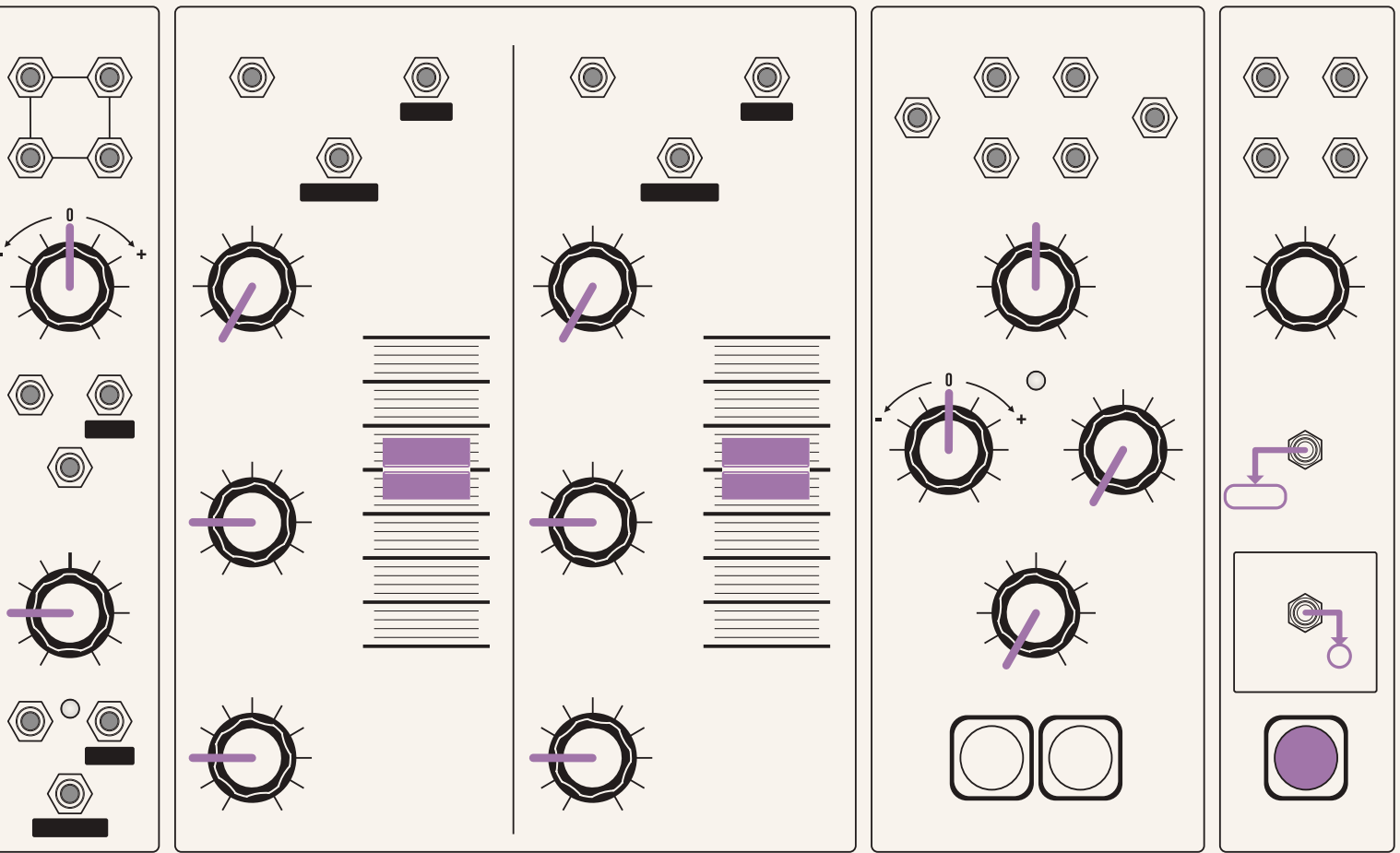




# Matriarch

## Patching with Intention Vol. 1



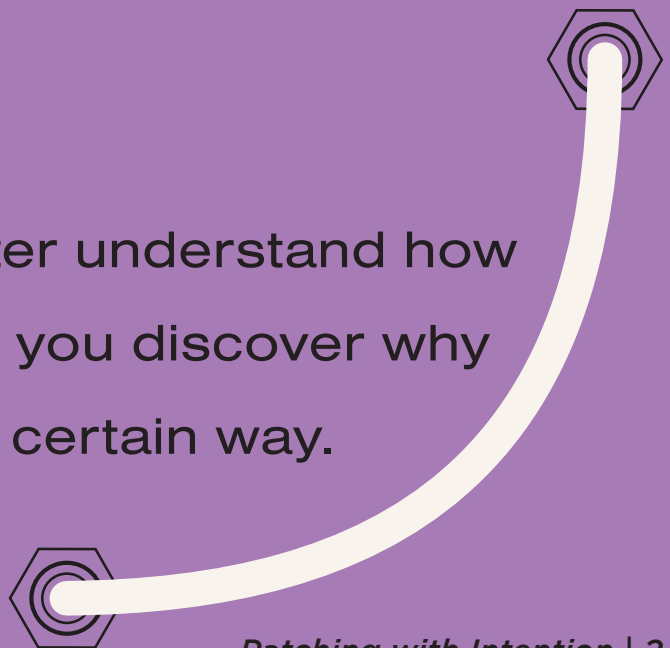
Get started with patching techniques and explore deeper synthesis concepts with stereo filter movement and 2-operator FM synthesis.

# Patching with Intention

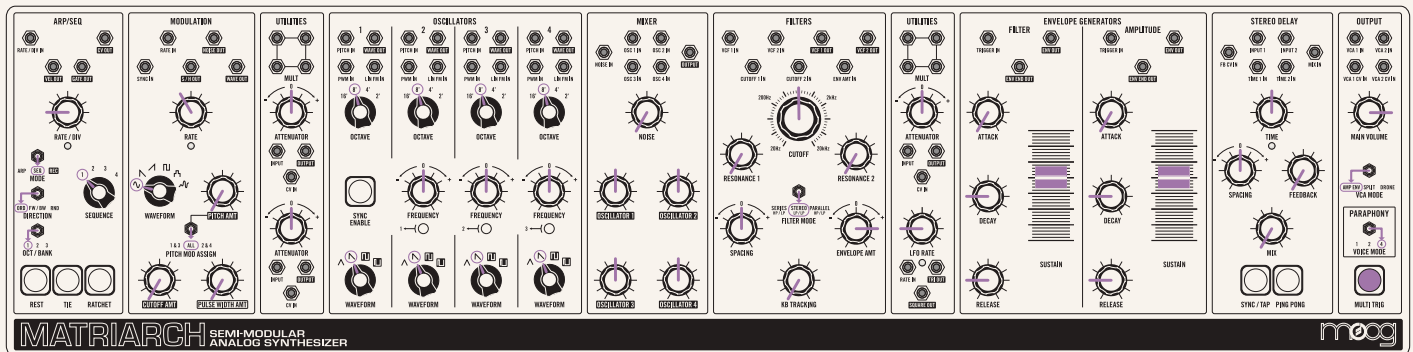
There are many ways to approach patching a synthesizer like Matriarch. There's no "wrong" way to do it, and randomly patching inputs to outputs can lead to wonderful, unexpected results.

Other times, however, you may want to patch with some intention. Perhaps you have an electric piano sound in mind that you would like Matriarch to approximate. Or an idea may strike you while falling asleep: I wonder what would happen if I patched the envelope generator to the delay time...

This guide will help you better understand how to patch Matriarch and help you discover why you might want to patch it a certain way.



# Initialized Patch



Before getting started, match your Matriarch to the initialized patch settings above. Each section builds upon the last, so explore them in sequential order for the best results.

You can find the full patch diagrams for all patches discussed in this guide in the accompanying PDF patchbook.

# First Steps

**Matriarch is an extremely powerful and flexible synthesizer composed of many different modules based on Bob Moog's original designs. Its semi-modular nature means that, while it is full of patch points, there are many patch connections already made for you under the hood.**

Let's begin by designing a sound that does not require patching. First, start by matching your Matriarch parameter settings to the initialized patch diagrammed on the previous page. Play some notes and some chords to get an idea for how this initialized patch sounds.

This patch results in a nice, clear sound, but let's get a bit of movement going. A common way of doing that is to generate some extra movement in the filter. When we press a key the **FILTER ENVELOPE** will open the filter by an amount set by the **ENVELOPE AMT** knob in the **FILTERS** section.

Layering a **MODULATION OSCILLATOR** will add a bit of vibrato-like texture to our sound. This is such a common sound design technique that we don't have to physically patch anything to achieve it. Turn up the **CUTOFF AMT** knob in the

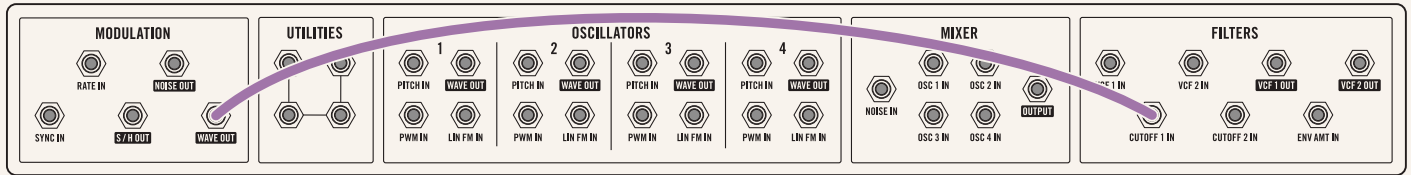
**MODULATION** section and then raise the **MOD** wheel to apply the modulation oscillator to the filter cutoff. You should hear the filter opening and closing based on the settings in the **MODULATION** section.

Now, let's try and achieve this same result through patching. Through this exercise we'll learn how to use the all-important utilities section of Matriarch and get a better handle on how to use modulation and patching to greatly expand Matriarch's sound palette.

Before we begin, turn the **CUTOFF AMT** knob back down and return the **MOD** wheel to zero.

## MAKE THIS CONNECTION

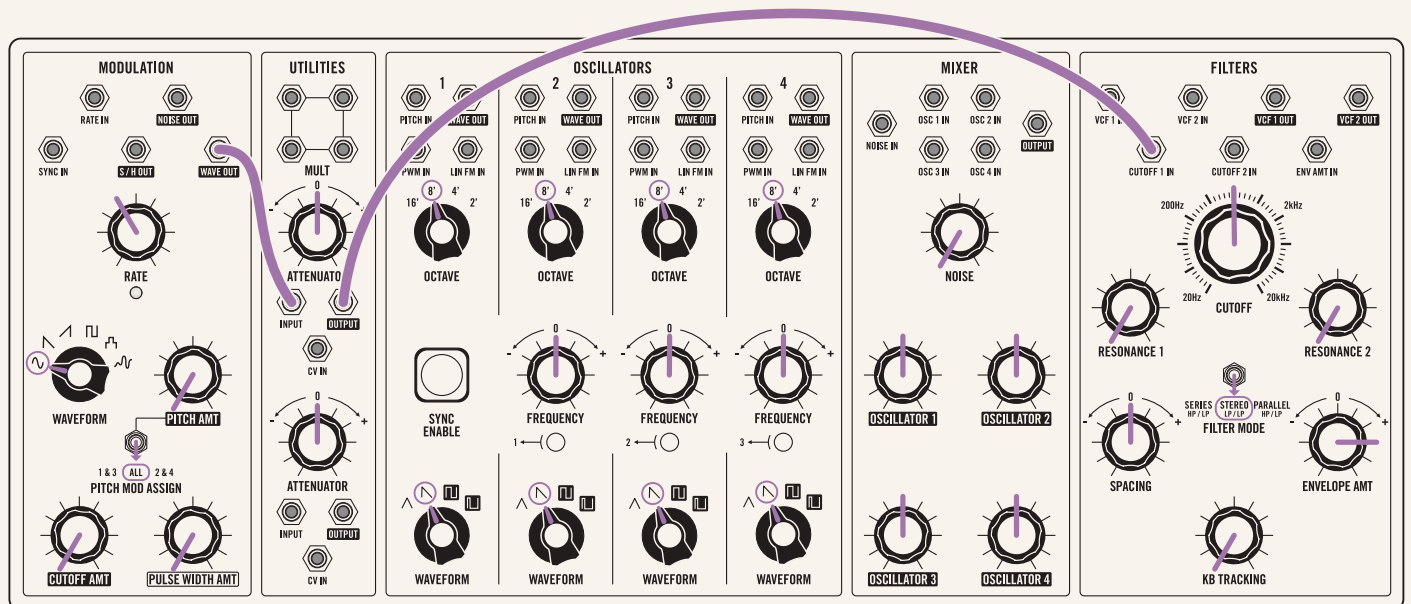
We want to take the **MODULATION** oscillator and have it move the **FILTER** up and down. Our first impulse might be to simply take the **WAVE OUT** of the **MODULATION** section and patch it directly to the filter's **CUTOFF 1 IN**.



While that certainly gets the filter moving, it doesn't allow us to control the amount of modulation applied. With this direct patching, the modulation oscillator swings the filter all the way open and all the way closed.

## MAKE THIS CONNECTION

Let's explore a way to apply more subtle modulation. In order to have control over the depth of modulation, we can use an attenuator.



**Note:** Any of the attenuators on Matriarch can be used for this.

The **ATTENUATOR** takes the signal applied to its input—in this case a sine wave oscillating between -5 volts and +5 volts—and decreases it. With the attenuator knob at noon, the signal is decreased to zero, effectively silencing it. Moving the attenuator knob clockwise a little bit will raise the signal to oscillate between -1 volt and +1 volt (for example). Moving it fully clockwise will pass the original signal through with no attenuation: -5 volts to +5 volts.

Now we can use the **ATTENUATOR** knob to control the depth of modulation. Moving the knob clockwise will increase the modulation depth, and moving it counter-clockwise towards noon will decrease the modulation depth. Moving it further counter-clockwise will invert the modulation, but more on that in a second.



At this point, we've successfully replicated the cutoff modulation that is hardwired via the **CUTTOFF AMT** knob and **MOD WHEEL** through patching! Let's use this as a starting point for further patch exploration..

# Inverting Attenuators and Stereo Movement

**Matriarch features a stereo filter, which is really two filters layered on top of each other and routed separately to the left and right channels.**

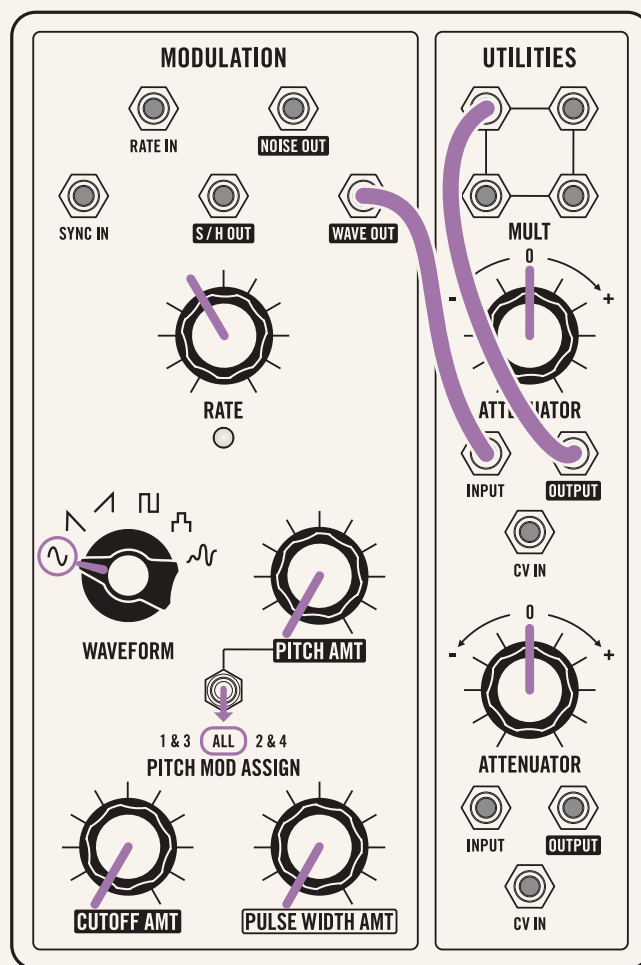
Patching the modulation oscillator to the **CUTOFF 1 IN** (like we did in the previous section) moves both filters up and down, since the **CUTOFF 1 IN** is normalled to the **CUTOFF 2 IN**. This means that a voltage patched to **CUTOFF 1 IN** will also be patched to **CUTOFF 2 IN** unless there is something else patched to **CUTOFF 2 IN**, so we have the same signal from the **MODULATION** section moving both **FILTER 1** and **FILTER 2** simultaneously.

As it stands right now, we don't really have a stereo signal: both **FILTER 1** and **FILTER 2** move up when the modulation oscillator goes up and they move down when it goes down. Let's now explore how to add stereo-depth and movement through patching.

## MAKE THIS CONNECTION

By using more utilities, we can easily patch this stereo movement. Patch the modulation **WAVE OUT** to an **ATTENUATOR** input as before. This attenuator will be the knob that controls the modulation depth. Next, let's take the

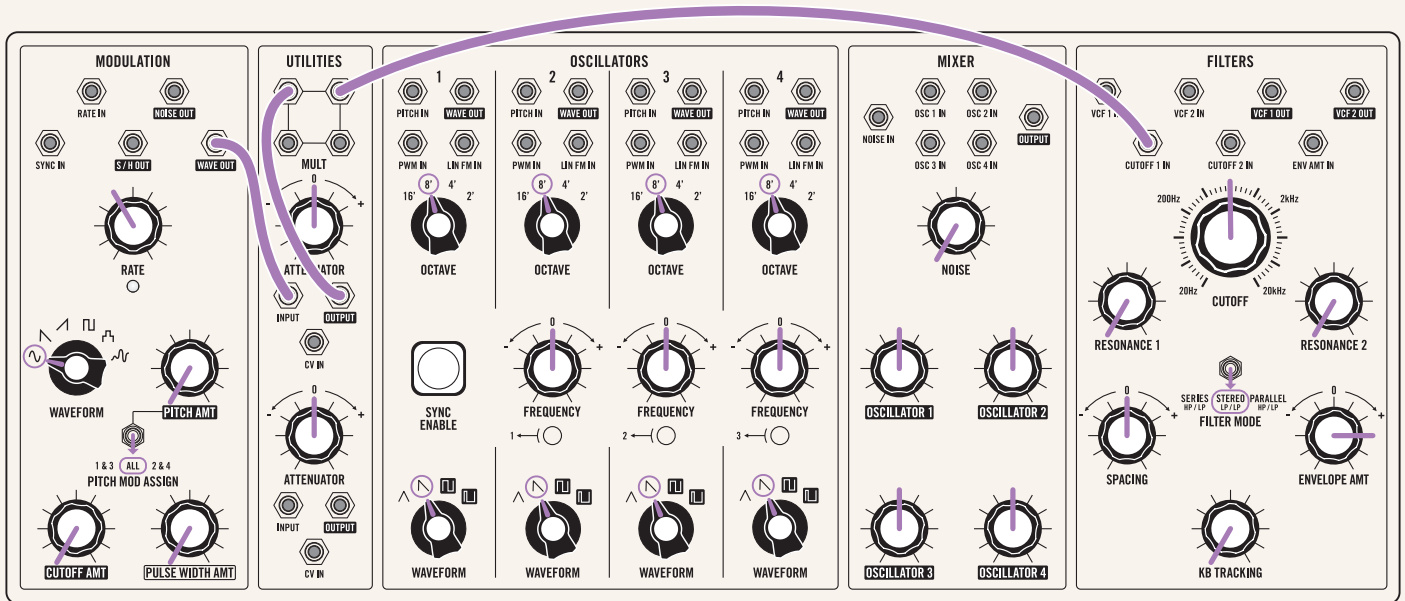
**ATTENUATOR** output and route it just above to a **MULT** input. It doesn't matter which of the four jacks in the **MULT** we use, but let's use the top left jack.



The **MULT** takes a signal and allows us to send it to multiple destinations. Since we have a signal patched into one of the jacks, all of the remaining jacks now contain copies of that signal.

## MAKE THIS CONNECTION

Next, patch one of the **MULT** outputs to **CUTOFF 1 IN** as before. This just replicates the patch as we had it before.

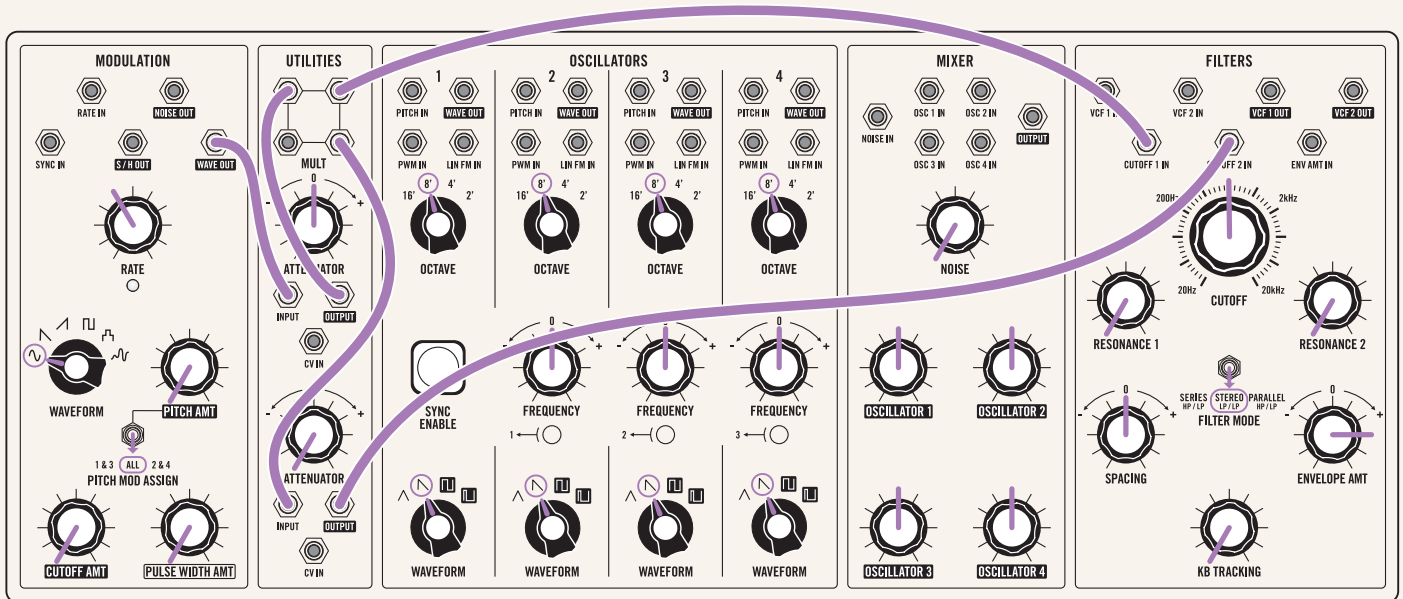


The fun begins when we take another **MULT** output and route it to a different attenuator. By turning this second attenuator completely counter-clockwise we invert whatever signal is patched into it. This means that when the modulation oscillator goes up, the signal out of this inverted attenuator will go down and vice versa.



## MAKE THIS CONNECTION

Patch another one of the **MULT** outputs to a new **ATTENUATOR** input. Now, patch the output of this new **ATTENUATOR** to the **CUTOFF 2 IN**. Make sure that this second attenuator's knob is turned fully counter-clockwise.



The first attenuator acts as an attenuator for both left and right motion, since the attenuated version then goes down to the second attenuator which completely inverts whatever signal is coming in. If you move the second attenuator knob completely clockwise, we return to mono with both filters moving in sync. Moving the second attenuator knob back to fully counter-clockwise returns us to stereo space with the filters moving in opposition directions.

With this patch, we've taken a pretty typical subtractive synth effect—an LFO moving the filter up and down—and created a much deeper stereo version using just a handful of patch cables and a few utility modules. While utilities like mults and attenuators don't exactly stand out as being the most exciting parts of a modular synthesizer, this exercise shows just how important they can be in creating more interesting and exciting patches.

# Extended Keyboard Techniques: Velocity

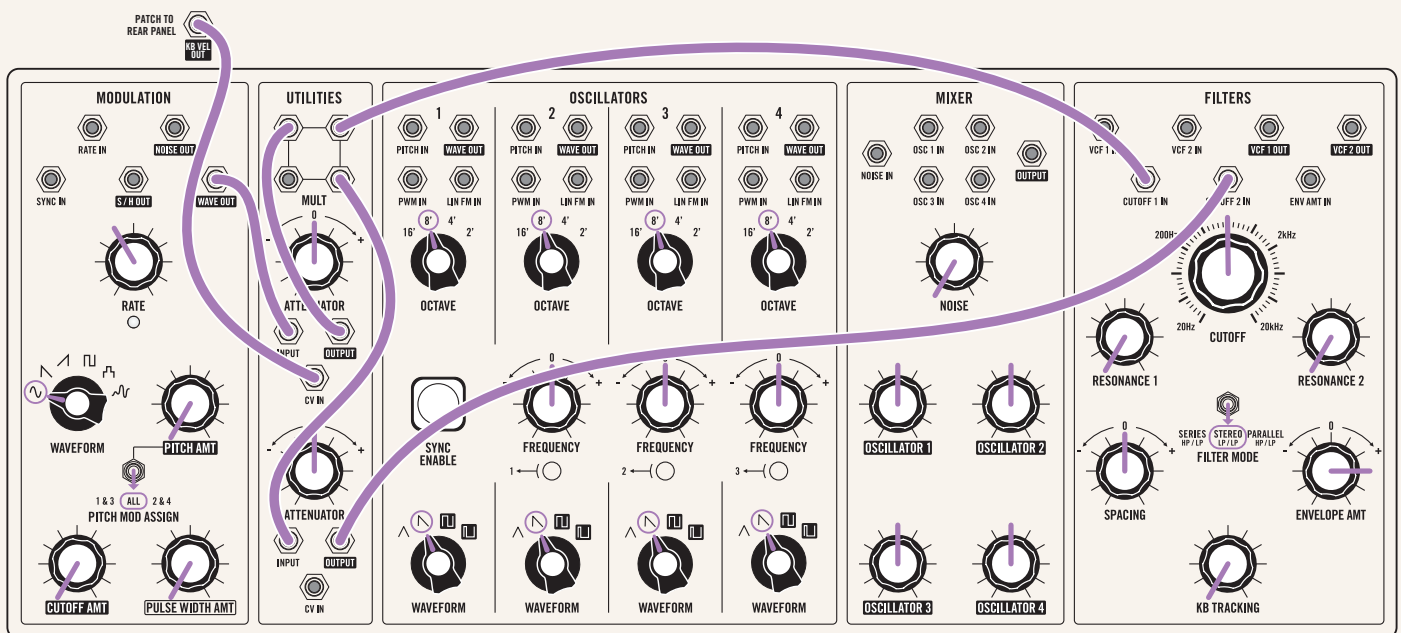
Matriarch is a hands-on performance instrument that combines the power and flexibility of a modular synthesizer like Moog's vintage modular systems with the playable functionality of a Minimoog. Let's now explore how patching can be used to enhance creative playability.

On Matriarch's back panel are CV outputs for keyboard velocity and aftertouch: how hard the keys are pressed and the amount of pressure applied to a key after it's held down, respectively. These two aspects of Matriarch's keyboard are not routed to anything by default and require patching to use.

Let's expand the patch we've been working with and layer on some performance controls. First, we'll use the keyboard velocity to control the depth of stereo filter modulation. The harder we press a key, the wider the filter movement will be.

## MAKE THIS CONNECTION

We can achieve this by simply patching the **KB VEL OUT** (on the rear panel) to the **CV IN** of the pitch attenuator which controls our modulation depth.



Turn the first (upper) attenuator knob to noon. The **KB VEL OUT** sends a voltage from 0 to 5 volts depending on how hard the keyboard keys are pressed. With the attenuator knob at noon, a low voltage from **KB VEL OUT** caused by pressing the keys very softly will raise the attenuator knob slightly - resulting in very subtle filter movement. Pressing the keys harder will send a higher voltage out of **KB VEL OUT**, subsequently opening the attenuator more and generating wider filter movement.

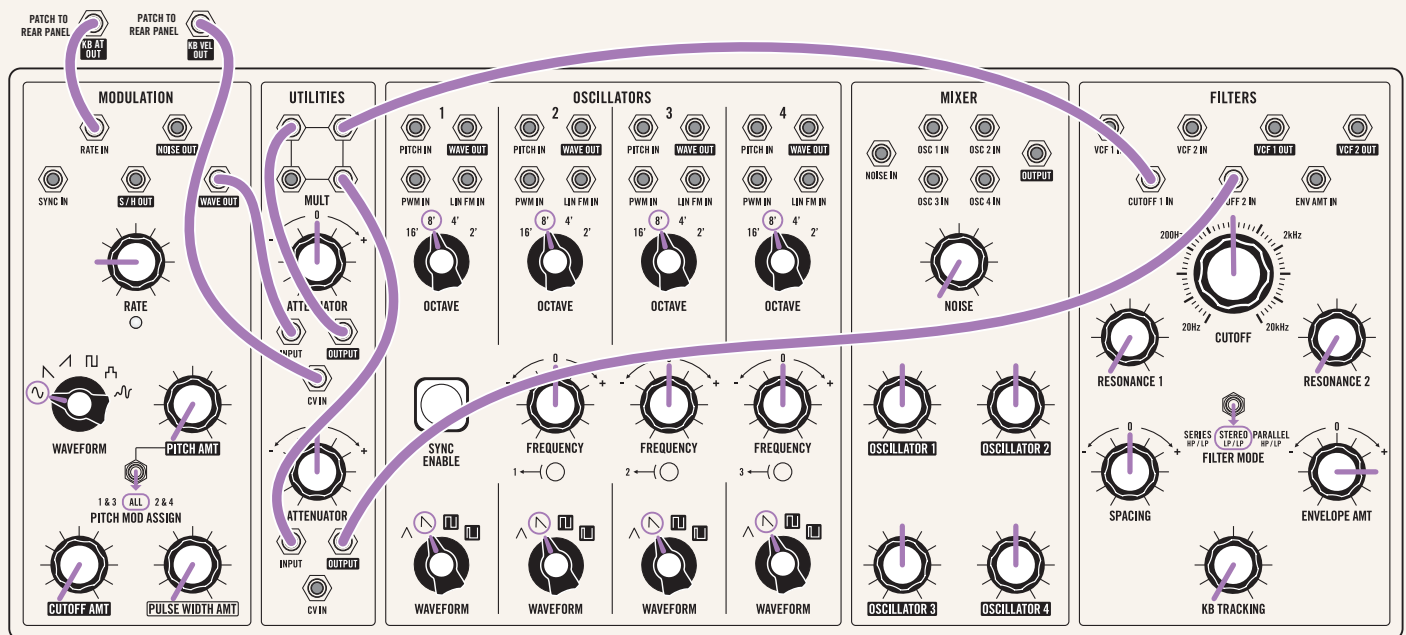
**Take a moment to pause here and just play the keyboard - listening to how your keyboard playing opens and closes the modulation. With some thoughtful patching we've taken our initialized patch—a nice, but rather standard synthesizer sound—and created a synthesizer that responds to our touch to generate some interesting stereo movement.**

# Extended Keyboard Techniques: Aftertouch

Let's take it a step further with aftertouch. While the keyboard velocity controls the depth of modulation, we can patch aftertouch to control the rate of modulation.

## MAKE THIS CONNECTION

Patch the **KB AT OUT** (on the rear panel) to the **MODULATION** section's **RATE IN**.

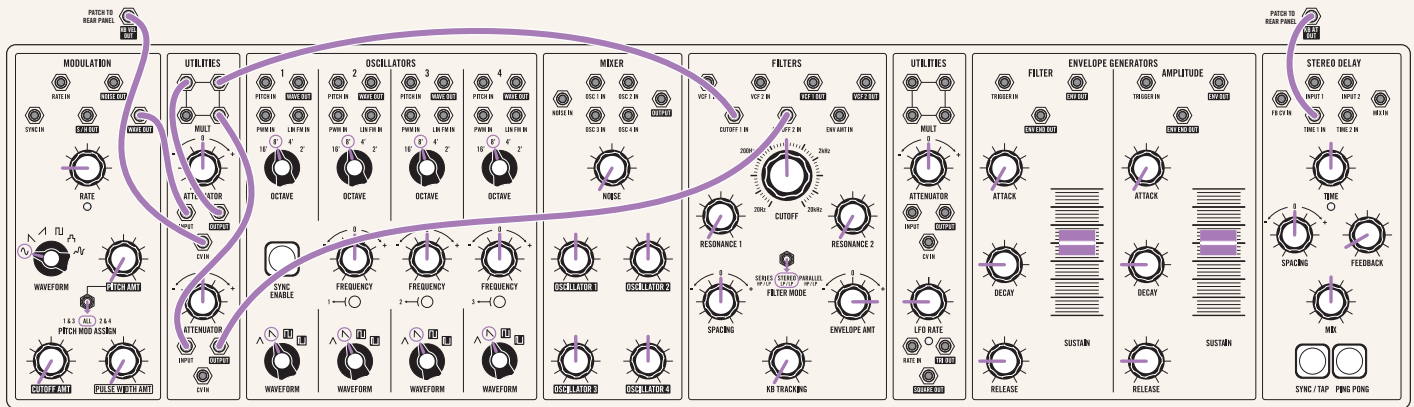


Move the **RATE** knob down to around 9 o'clock to set a slow modulation rate for this patch. The **KB AT OUT** will send a higher voltage as you apply aftertouch (pressure to the keys once they're held down), and will speed up the modulation rate the more aftertouch you apply. With the keyboard velocity still adjusting the depth of modulation, play around with this patch and explore all of the interesting ways you can control stereo movement.

Up to this point we've had a single goal in mind: stereo filter motion.. Currently, all of our patching is related to how those filters move, and how we can control that movement. But remember, Matriarch is an open-ended synthesizer capable of an astoundingly wide array of sounds. All of these techniques can apply to modulating delay times, oscillator pitches, or sequencer movement just like we've used them to modulate the filter.

## MAKE THIS CONNECTION

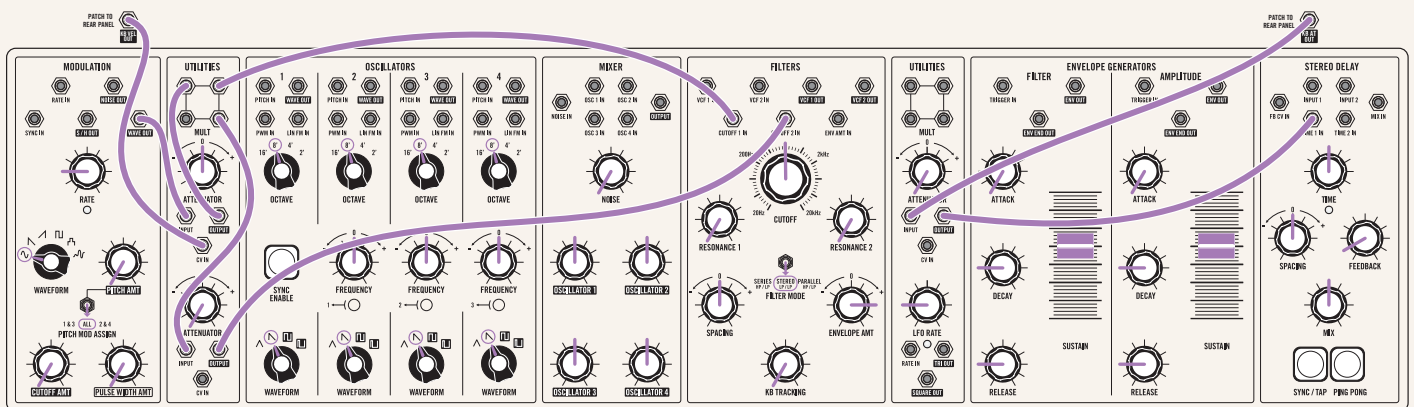
Keeping the patch as we have it, let's now use aftertouch to modulate the delay. Take the **KB AT OUT** and patch it to the **TIME 1 IN** of the **STEREO DELAY**.



Increase the **MIX** knob in the **STEREO DELAY** section to noon and add a bit of feedback with the **FEEDBACK** knob. Play around, and you'll notice that now as you apply aftertouch you lengthen the delay time—resulting in some wonderfully wobbly sounds.

## MAKE THIS CONNECTION

We still have an attenuator handy, which we can use to invert the aftertouch voltage if we like. Patch **KB AT OUT** to the remaining **ATTENUATOR** input, set the **ATTENUATOR** knob counter-clockwise to invert the incoming voltage, and patch the output to **TIME 1 IN** in the **STEREO DELAY**. This will make it so that applying aftertouch shortens the delay time rather than lengthens it.



In fact, with this attenuator we have control of both the range of modulation for aftertouch and its direction—such is the power of the inverting attenuators of Matriarch!

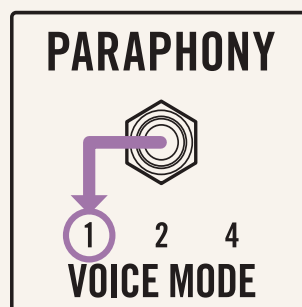
# 2-Operator Analog FM Synthesis

Now that we have a handle on how to use attenuators and mults to deepen our patches, let's realize a different goal: FM synthesis.

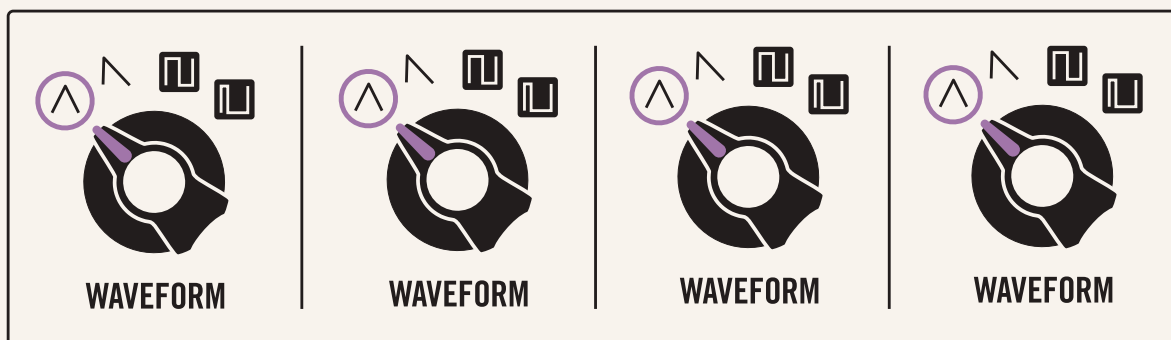
FM synthesis sits next to subtractive analog synthesis as one of the major synthesis methods available today. While FM exploded in the 1980s by harnessing the power of digital technology available at the time, the core concept of FM synthesis—frequency modulation—has been possible all the way back to the vintage Moog systems of the 1960s. With Matriarch we can create deep and flexible FM patches for a world of sounds not typically available on analog subtractive synthesizers.

Let's return to the initialized patch from the beginning of this guide as a starting point. We're going to use the oscillator bank as our source of carrier and modulation oscillators, allowing us to turn Matriarch into a 2-operator FM synth with two voices.

Switch **PARAPHONY** to 1 for now while we build our first 2-operator FM voice.

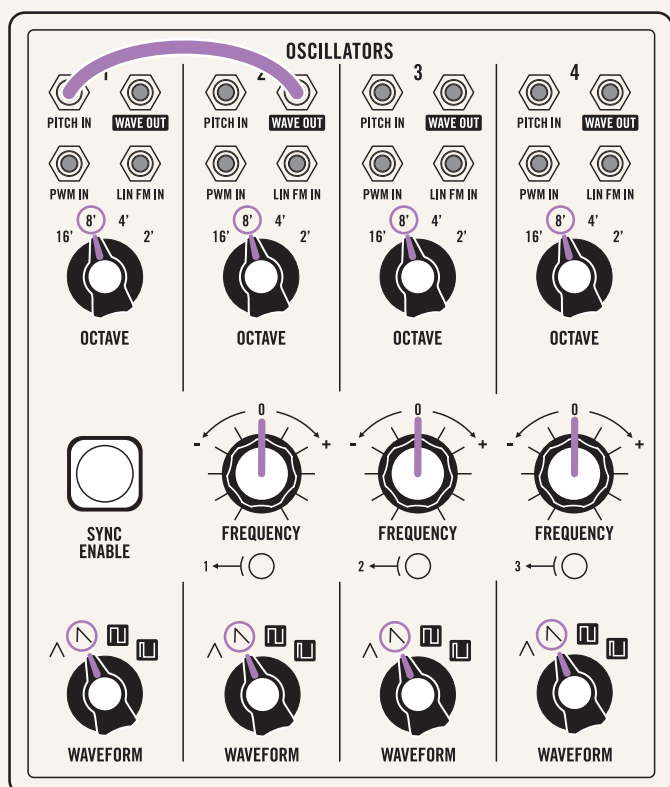


Given how harmonically rich FM synthesis is, sine waves are often used. We potentially have three sine wave oscillators at our disposal: the modulation oscillator and both filters self-resonating. Triangle waves work well, and using the oscillator bank makes things cleaner and more flexible. So, let's now switch all four **OSCILLATORS** to triangle waves.



## MAKE THIS CONNECTION

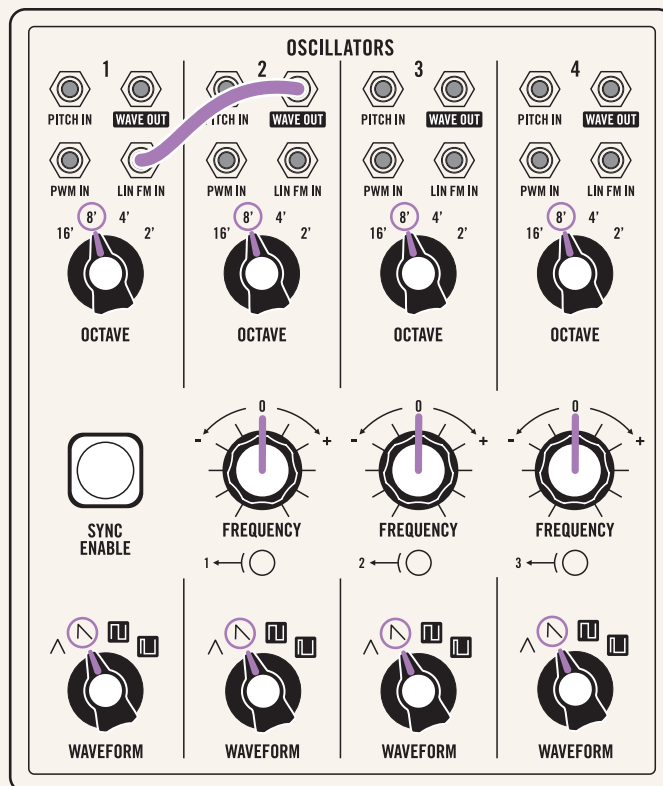
For one FM voice our goal is to use Oscillator 2 to Frequency Modulate (or FM) Oscillator 1. A crude way of doing this would be to patch Oscillator 2's **WAVE OUT** output to Oscillator 1's **PITCH IN** input.



Turn down all channels in the mixer except for **OSCILLATOR 1** and press a note. Compare how the sound changes as you press the key, removing the patch connection and then repatching. You'll notice that with Oscillator 2 patched to the **PITCH IN** the tone is way too low and pretty flabby. This has to do with the **PITCH IN** input having an exponential response, which works well for pitch and keyboard information, but not as well when doing FM synthesis.

## MAKE THIS CONNECTION

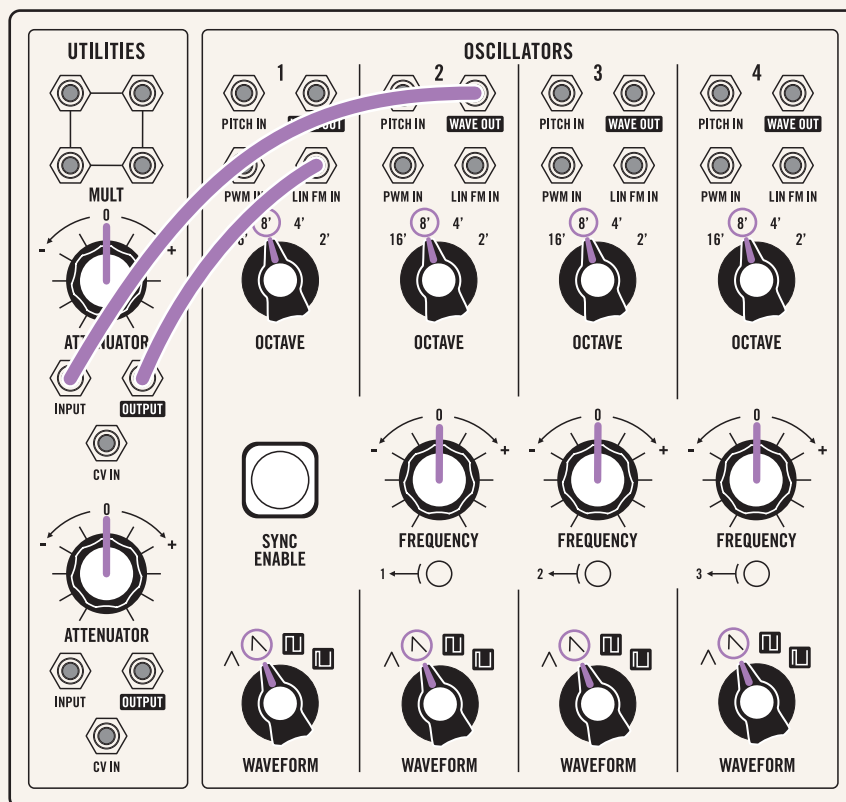
Instead try patching Oscillator 2 **WAVE OUT** output to Oscillator 1's **LIN FM IN** input.



You'll notice now a very bright tone—one full of overtones. By changing the value of the **OCTAVE** switch of Oscillator 2 you change the relationship between the carrier (Oscillator 1) and the modulator (Oscillator 2) and thus change the color of the sound. This might be too bright of a tone, however, and you'll want to adjust the FM depth. Just as before, it is time to use an attenuator.

## MAKE THIS CONNECTION

Patch Oscillator 2's **WAVE OUT** output to an **ATTENUATOR** input and the **ATTENUATOR** output to Oscillator 1's **LIN FM IN** input.



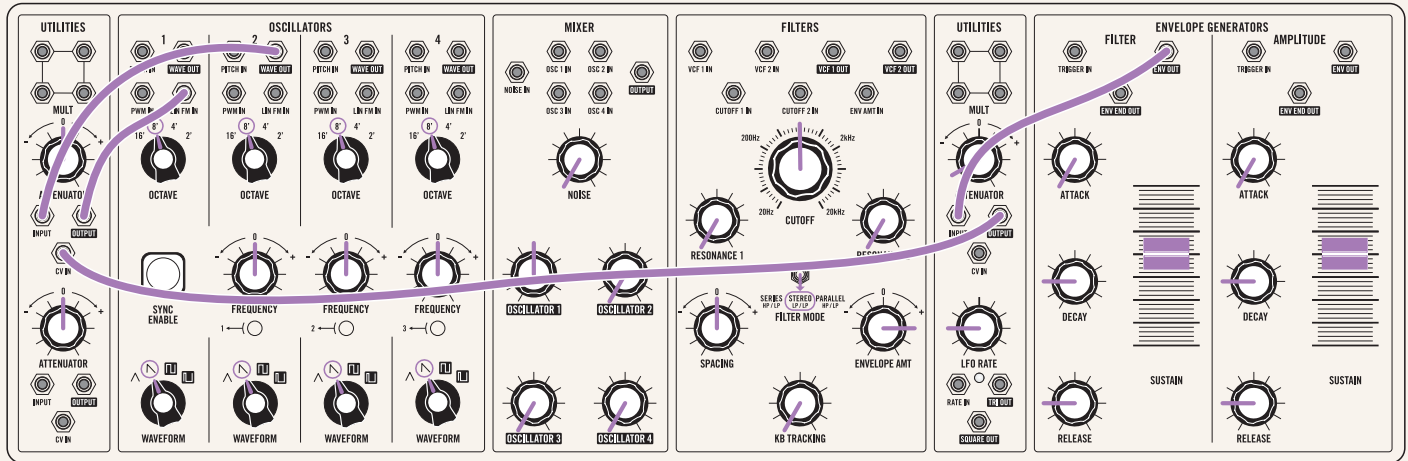
Now you can use the attenuator to dial in the depth of frequency modulation. You can even invert Oscillator 2 by moving the **ATTENUATOR** knob counterclockwise past noon, but in the case of this patch it doesn't make much of a difference.

A major feature of FM synths is dynamic depth FM synthesis—where the depth of modulation will vary over time—usually controlled by an envelope. Matriarch's attenuators easily let us achieve this since their CV inputs make them voltage controlled amplifiers! We will take the amplitude envelope and use that to control the depth of FM.



## MAKE THIS CONNECTION

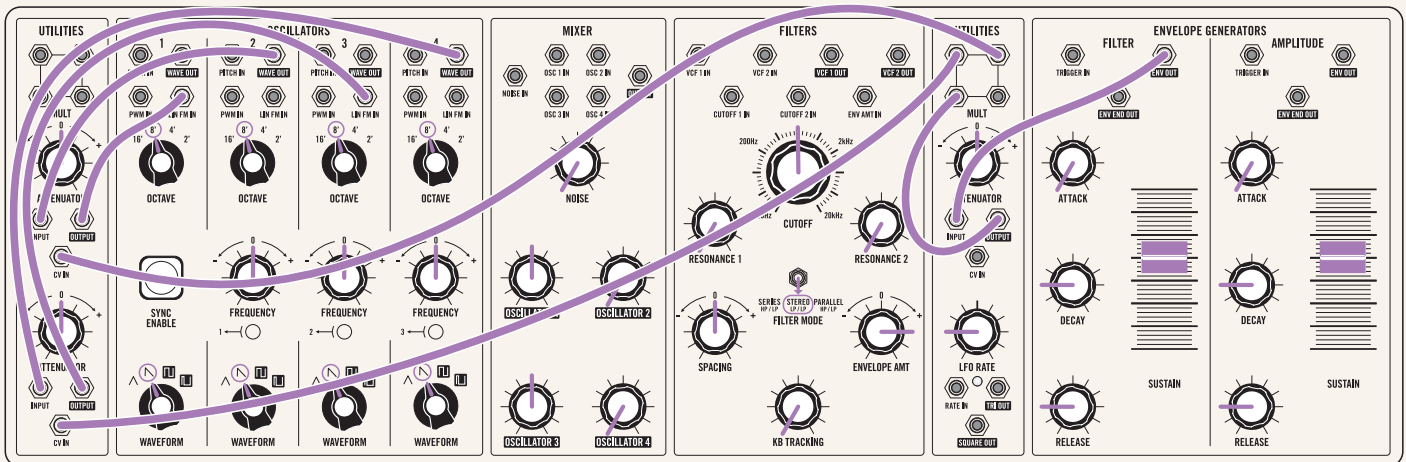
We could patch the **ENV OUT** directly to the **CV IN** of our attenuator, but by running the envelope itself through its own attenuator we can have even more control over the depth of FM.



The first attenuator sets the starting FM depth and the second sets the max FM depth. With the first attenuator at zero (noon) and the second all the way up we get tones that start with no FM, grow to full FM over the course of the envelope, and return back to no FM. With the first attenuator at maximum and the second all the way counter-clockwise (inverting the envelope) we get the opposite: tones that start with full FM, reduce to no FM at the height of the envelope, and grow back to full FM as the envelope decays. By playing with these two attenuators, the amplitude envelope parameters, and Oscillator 2's octave and detuning, we have an incredibly wide range of metallic, bright, clangorous, and buzzy sounds that change over time—perfect for feeding Matriarch's stereo filter and delay.

## MAKE THIS CONNECTION

Even better, we can make this a two-voice FM synth by setting up a similar patch with Oscillators 3+4. Turn up **OSCILLATOR 3** in the mixer, patch Oscillator 4 to Oscillator 3's **LIN FM IN** via our remaining attenuator, and mult the attenuated amplitude envelope to both FM depth attenuators. Switch **PARAPHONY** to 2 now—this will enable us to use Oscillators 1+2 for our first FM voice and Oscillators 3+4 for our second. Below is a full patch diagram for our two-voice 2-operator FM synthesizer:



# Further Exploration

Now that you have built some intuition for how Matriarch's patch points can be used to expand your tonal palette, feel free to start exploring and experimenting on your own. We've only just scratched the surface, and with some patch cables and your imagination Matriarch truly comes alive. We've included a supplementary patch book, outlining some of the patches in this guide and some alternate versions of them to play around with. Remember, though: there is no wrong way to patch Matriarch. Let your ears be your guide.

Register your Matriarch at [moogmusic.com](https://moogmusic.com) to receive additional Matriarch updates and assets straight to your inbox.

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