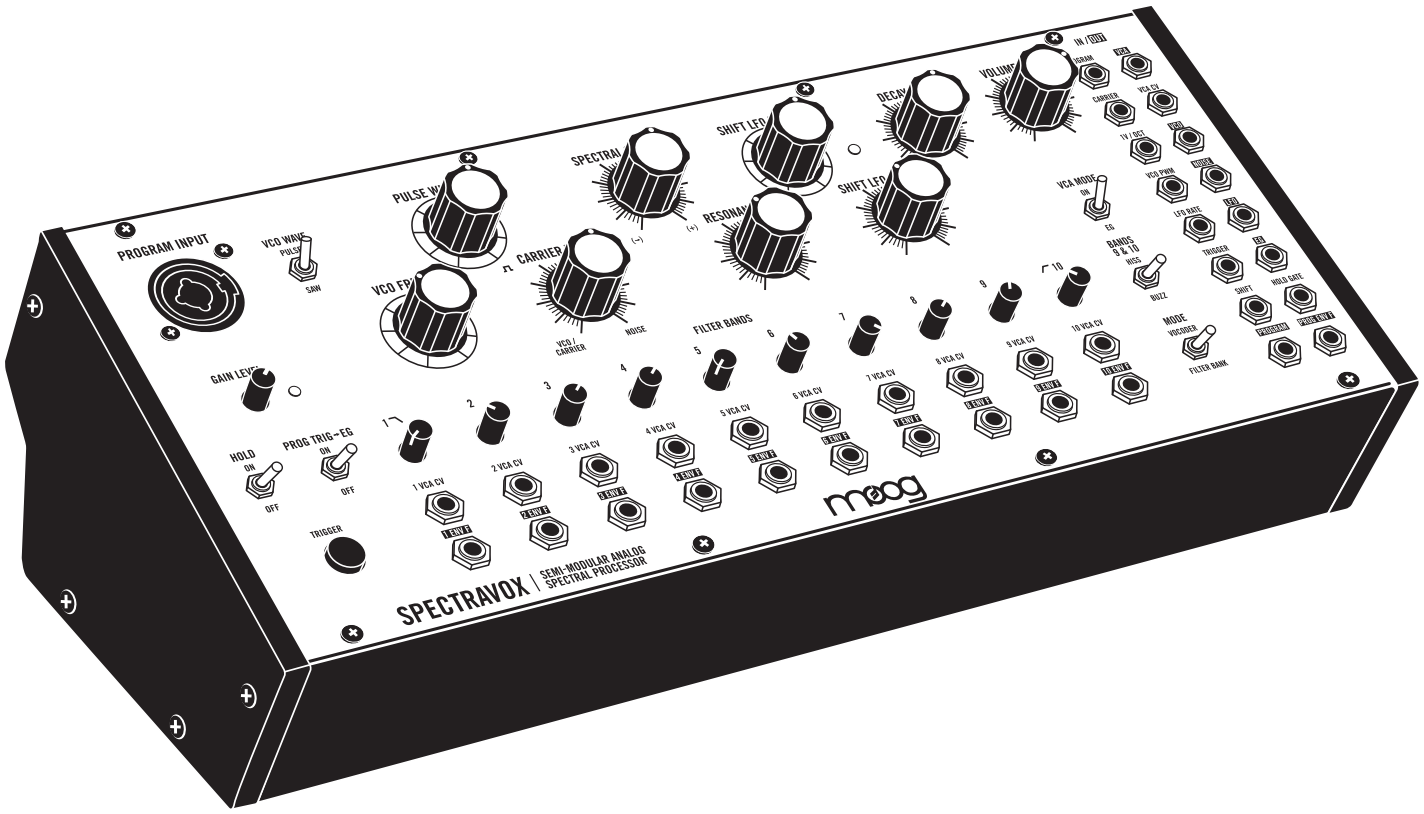
SPECTRAVOX

USER'S MANUAL


PROGRAM INPUT
VCO WAVE
PULSE
SAW
PULSE WIDTH
VCO FREQ
SPECTRAL
CARRIER
VCO / CARRIER
NOISE
RESONANCE
SHIFT LFO
DECAY
VOLUME
IN / OUT
PROGRAM
CARRIER
VCA CV
1V/OCT
VCA MODE
ON
EG
VCO PWM
LFO RATE
BANDS 9 & 10
MIX
BUZZ
TRIGGER
SHIFT
HOLD GATE
FREEZE
MODE
VOCODER
FILTER BANK
FILTER BANDS
GAIN LEVEL
HOLD
PROG TRIG-EG
TRIGGER
1 VCA CV
2 VCA CV
3 VCA CV
4 VCA CV
5 VCA CV
6 VCA CV
7 VCA CV
8 VCA CV
9 VCA CV
10 VCA CV
LEVEL
moog
SPECTRAVOX
SEMI-MODULAR ANALOG SPECTRAL PROCESSOR

“ I see my job as being one that must provide the artist with the capability of imparting complexity and dynamics to [their] music. ”

- Dr. Robert Moog -

IMPORTANT SAFETY INSTRUCTIONS

WARNING: WHEN USING ELECTRIC PRODUCTS, THESE BASIC PRECAUTIONS SHOULD ALWAYS BE FOLLOWED.

1. Read all the instructions before using the product.
2. Do not use apparatus near water—for example, but not limited to, near a bathtub, washbowl, or kitchen sink; in a wet basement; or near a swimming pool.
3. This product, in combination with an amplifier and headphones or speakers, may be capable of producing sound levels that could cause permanent hearing loss. Do not operate for a long period of time at a high volume level or at a level that is uncomfortable.
4. The product should be located so that its location does not interfere with its proper ventilation.
5. The product should be located away from heat sources such as radiators, heat registers, or other products that produce heat. No naked flame sources (such as candles, lighters, etc.) should be placed near this product.
6. Do not operate in direct sunlight.
7. The product should be connected to a power supply only of the type described in the operating instructions or as marked on the product.
8. The power supply cord of the product should be unplugged from the outlet when left unused for a long period of time or during lightning storms.
9. Care should be taken so that objects do not fall, and liquids are not spilled, into the enclosure through openings.

There are no user serviceable parts inside. Refer all servicing to qualified personnel only.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

— Reorient or relocate the receiving antenna.
— Increase the separation between the equipment and receiver.
— Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
— Consult the dealer or an experienced radio/TV technician for help.

CAUTION: Please note that any changes or modifications made to this product not expressly approved by Moog Music could void the user's authority granted by the FCC to operate the equipment.

A TRIBUTE TO OUR FRIEND AND COLLEAGUE GENE STOPP

Congratulations on your new Spectravox. We're excited that you have chosen this synthesizer to become a part of your sound and hope that it provides you with years of inspiration.

As our team develops every Moog instrument in house, each has its own unique origin story. Spectravox's story begins with my friend and colleague Gene Stopp, who we lost early in 2023. I'd like to take this opportunity to honor Gene and invite you to learn more about his work.

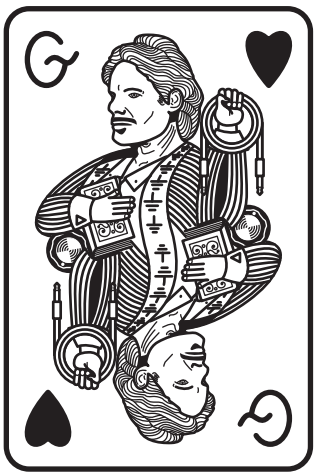
Gene Stopp was the Moog Engineer who led our effort to reintroduce our legacy modular systems, starting with the legendary Keith Emerson modular system, and continuing with the System 55, System 35, and Model 15 synthesizers.

In 2018 we began making plans for the 2019 Moogfest Engineering Workshop, and were throwing around ideas for possible products to design for the folks at the workshop to build. One day Gene, who had been working on the Moog Vocoder project, passed me in the hall and said, "I was thinking: what if you used the bandpass outputs of a bunch of state-variable filters to make a vocoder?" That question sent us down an excited and rapid back and forth, as well as confirmed our synth nerdiness, and we decided it would be worth trying. First, we decided to implement the synthesis section of the vocoder with voltage-controlled state-variable filters, so that that whole section could be swept up and down (what became the Spectral Shift feature of your Spectravox). Together we prototyped the concept of Spectravox—we discovered you CAN do this, and it sounds amazing. The 10 bands that seemed to be the natural size for the enclosure we were using coincided nicely with the 10 bands of the design that Bob Moog and Wendy Carlos developed to use for the "Ode to Joy" vocoder sound in Wendy's score for *A Clockwork Orange*, so we figured we were onto something special. In 2019, Gene helped get the project to the workshop, and with the help of the participants and our engineering colleagues we got over 100 of the Spectravoxes built and even patched together at the end for a monumental sound. He was instrumental in developing this instrument. Thank you, Gene.

Many of us at Moog were so lucky to get to work with Gene. He was a truly inquisitive soul who bettered our lives, and we will miss him dearly. With this instrument, his spirit and passion live on.

Thank you for inviting us to be part of your musical journey. May it range far and wide.

STEVE DUNNINGTION
VP, Product Development
Moog Music
March 2023



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UNPACKING & INSPECTION

Check the contents of the shipping carton. Be careful when unpacking your new Moog Spectravox so that nothing is lost or damaged. We recommend saving the carton and all packing materials in case you ever need to ship the instrument for any reason.

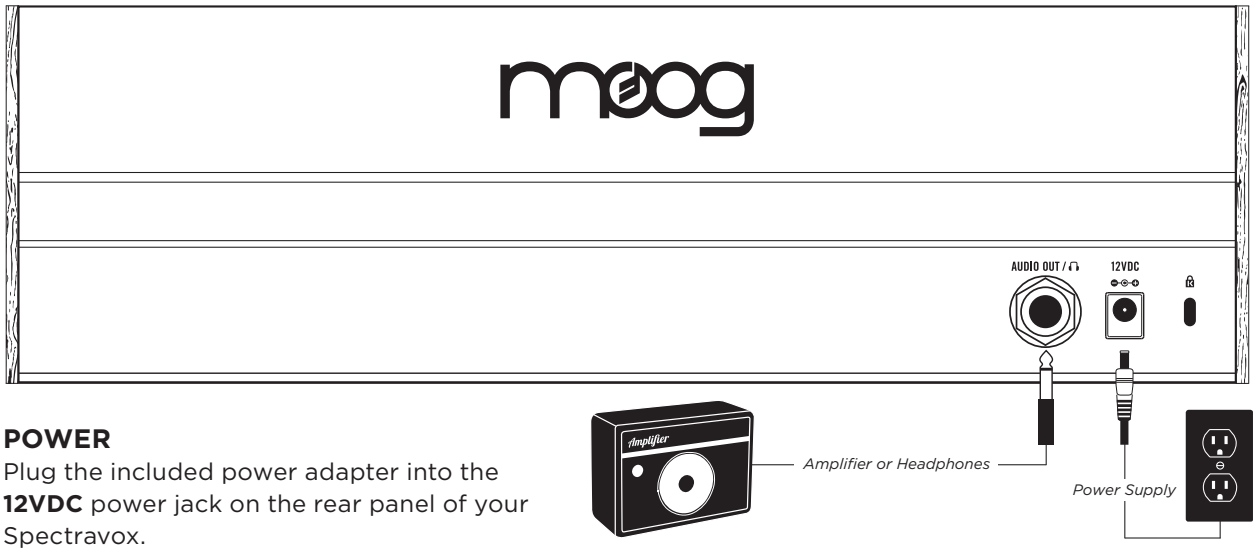
Spectravox ships with the following items:

1. Spectravox Semi-Modular Analog Spectral Processor
2. Power Supply
3. Patch Sheet Overlays
4. Owner's Manual
5. Patch Cables
6. Registration Card

What you will need:

1. Headphones with a 1/4" TRS plug, or a 1/4" TS instrument cable and an amplified speaker
2. A properly wired AC outlet

SETUP & CONNECTIONS



POWER

Plug the included power adapter into the **12VDC** power jack on the rear panel of your Spectravox.

NOTE: *There is no power switch on your Spectravox. Once connected to the power supply, the unit is on. Spectravox is an analog instrument and should be allowed a few minutes to warm up before use. In cases where it has been left in a cold car overnight, for example, it may take even longer for the oscillator tuning to stabilize. For optimized tuning do not operate your Spectravox in direct sunlight.*

AUDIO OUT / 🎧

With the Spectravox **VOLUME** knob turned all the way down (counterclockwise), plug one end of a 1/4" instrument cable into the Spectravox **AUDIO OUT** / 🎧 jack on the rear panel. Then plug the other end into an amplified speaker or mixing console input. This jack can also be used with a set of mono or stereo headphones, providing the same signal to each ear. Now, raise the **VOLUME** knob (clockwise) to bring the sound to an appropriate level.

WARNING: *Do not use a TRS (balanced) cable for line output applications, as this will cause phase cancellation and can produce a very weak signal.*

KENSINGTON SECURITY SLOT

Your Spectravox can be securely attached to a desk, stand, or other fixture by connecting a Kensington security device to this slot.

PROGRAM SECTION *PAGES 25 & 26*

1/4” TS + XLR Combo Jack input with preamplifier gain control, switchable envelope trigger, and hold.

CARRIER SECTION *PAGE 24*

Selectable Sawtooth/Pulse wave Voltage-Controlled Oscillator (VCO) with Pulse Width Modulation (PWM) and a VCO/Carrier and noise crossfader.

■ ABOUT SPECTRAVOX

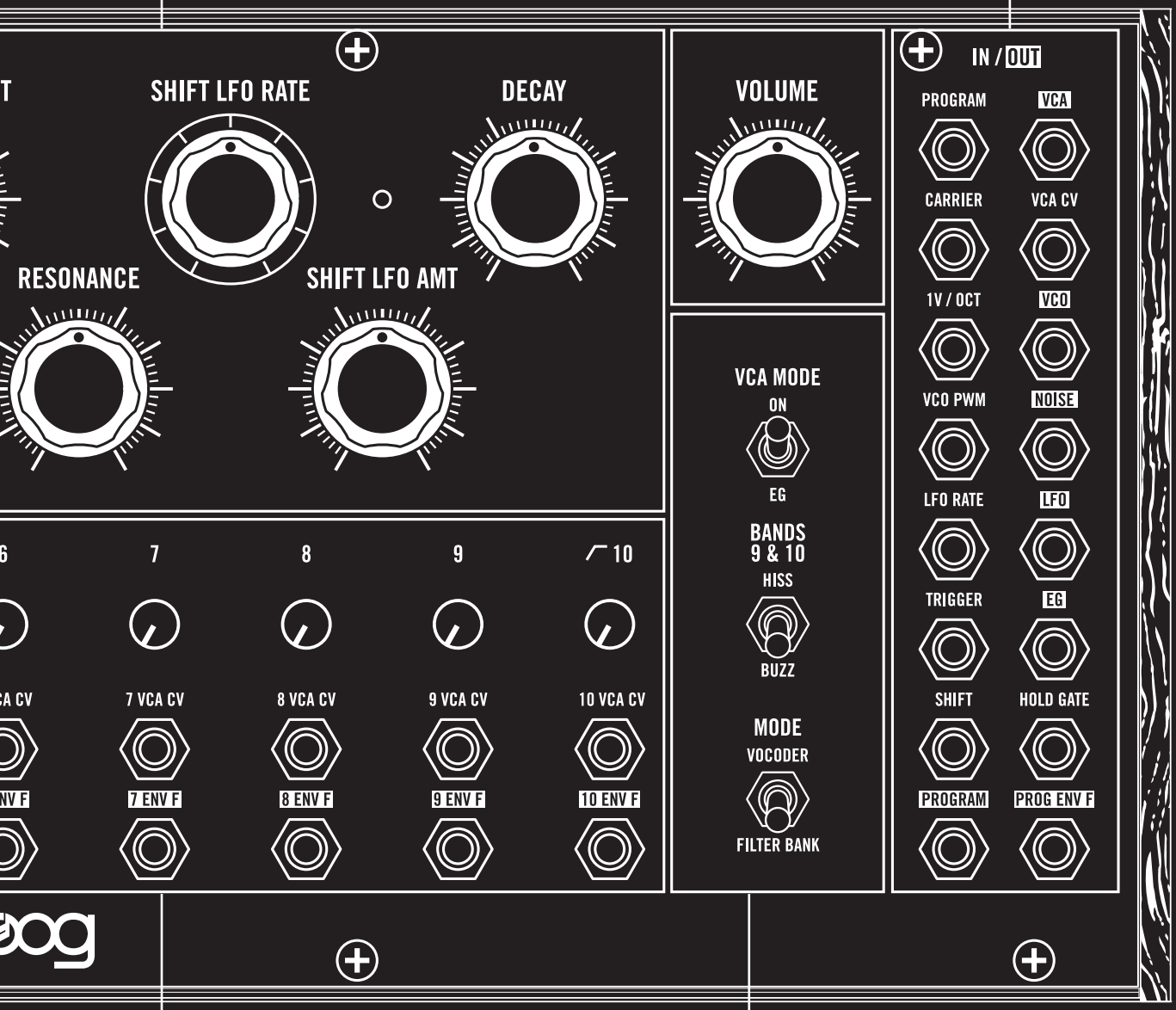
Spectravox is a semi-modular analog spectral processor based around a 10-band resonant filter bank that explores and expands the topology of the vocoder. Spectravox is both a standalone synthesizer voice with a sculptable frequency spectrum and a 10-band vocoder with integrated modulation, able to shift its filter bank across the audible spectrum. With a comprehensive patch bay and conforming to the 60HP Eurorack standard, Spectravox can be combined with the other Moog semi-modular instruments or inserted into any Eurorack setup.

SPECTRAL SHIFT *PAGE 27*

Shift all 10 filters up or down the frequency spectrum both manually and via LFO with rate and amount of shifting controls.

PATCH BAY *PAGE 29*

36-point modular patch bay with 17 outputs and 19 inputs



FILTER BANDS *PAGE 22*

10 resonant filters with individual level control, individual envelope follower outputs, and global control over resonance of all filters

MODE & VCA CONTROLS *PAGES 23, 24 & 28*

Select Filter Bank or Vocoding operation, adjust high bands for sibilance/intelligibility, and control VCA envelope decay.

SPECTRAVOX: HISTORIC INSPIRATION

HOMER DUDLEY AND THE VODER

In 1928 Homer Dudley, a researcher at Bell Labs in Manhattan, had a revelation. Sending telephone signals was costly—a wide bandwidth of data was needed to capture and transmit the fast fluctuations of a speech waveform. That meant that the mammoth task of laying a cable under the Atlantic Ocean for sending telephone calls between the United Kingdom and the United States would only be able to carry 14 channels of telephone calls. But if the bandwidth of speech could be reduced somehow, that cable could carry a lot more calls.

Dudley knew well the basic model of human speech. The vocal cords vibrate, and the shape of the mouth and tongue filter the sound of the vocal cords into vowel and consonant sounds. The sound generated by the vocal cords doesn't significantly change while speaking, however—all of the important work done to articulate words is performed by the mouth and tongue. So, while playing with the shape of his mouth and forming different words, Dudley realized that the motions of the lips and the mouth were much, much slower than the very fast oscillations of the vocal cords. If you could decouple the motions of the mouth from the vocal cords—if you could just send a signal that captured the way the mouth shapes a sound—then you would drastically reduce the bandwidth required to send a telephone call.

Dudley achieved this by running the speech signal through a bank of 10 bandpass filters. Each bandpass filter captured how the mouth shapes a particular band of frequencies. This way, the voice could be encoded into a handful of slow, low bandwidth signals, greatly reducing the bandwidth required to transmit speech. The **VO**ice en**CODER**—or **VOCODER**—was born. In order to demonstrate how the principle of the VOCODER could be used to synthesize speech, Dudley came up with the **VODER**—**V**oice **O**perating **DE**monstrato**R**. The **VODER**, a device that was played by well-trained telephone operators, took as its source signal either a sawtooth oscillator to mimic vocal cords (called **BUZZ**) or a noise generator to mimic the unvoiced, sibilant sounds such as 's' or 'sh' (called **HISS**). A switch bar on the operator's wrist switched between these two sources. 10 keys would then control the 10 bandpass filters, shaping the **BUZZ** and **HISS** into recognizable words and sentences. At the 1939 New York World's Fair the **VODER** was the star of the show—set up in the AT&T Pavilion right next to the famous Trylon and Perisphere.

WENDY CARLOS AND BOB MOOG BEGIN TO EXPERIMENT

History may not repeat itself, but it often rhymes, and 25 years later at the 1964 New York World's Fair a full vocoder (in place of the voder) was exhibited at the Bell Labs Pavilion. In the intervening years Dudley's invention, having captured the public's imagination in 1939, had been put into service during the outbreak of World War II as part of SIGSALY, the speech encryption system used for Allied communication. Now it captured the imagination of a young composer named Wendy Carlos.

Carlos met Bob Moog a year later—birthing one of the most influential partnerships between an engineer and an artist of the 20th century. Carlos acquired a large Moog modular synthesizer and achieved worldwide acclaim with her 1968 landmark LP *Switched-On Bach*, but she never forgot about the vocoder. Moog, too, had been fascinated by the vocoder and had tinkered with it in his spare time, and in the late 1960s the two began working on vocoders together.

Intelligibility had been the name of the game in the intervening years for vocoding. Defense departments and military contractors were interested in reproducing messages accurately and securely, and that meant more and more filter bands (and thus a much more expensive vocoder). Musicians, however, were more interested in a tool for creating interesting new sounds. Moog and Carlos went back to Dudley's 1930s research which led them to the voder: a more affordable machine that only had 10 filter bands and delighted people with its strange and futuristic sound.

WENDY CARLOS AND BOB MOOG BEGIN TO EXPERIMENT

(Continued)

As it happened, Moog already had a design for a 10-band filter bank: it was the Moog 907 Fixed Filter Bank, and it was one of the cornerstones of his modular synthesizer systems. A vocoder would need two of these 907 Fixed Filter Banks—modified such that they each had individual audio outputs for each filter band. These two filter banks were combined with 10 pairs of Moog 912 Envelope Followers and Moog 902 Voltage-Controlled Amplifiers. A vocal signal into one filter bank (the "analysis" filter bank) with an envelope follower connected to each filter band would capture the motions of the mouth and lips with each filter band. An entirely different sound (the "carrier") would be put through the second filter bank (the "synthesis" filter bank) and the level of each filter band would be controlled by the corresponding signals from the analysis filter bank, mapping the tonal shapes of the voice onto the carrier which was connected to the synthesis filter bank.

A CLOCKWORK ORANGE

This 10-band vocoder, built on and around the skeleton of the Moog modules Carlos was already familiar with, had a distinctive futuristic and musical sound that the more expensive, higher-resolution vocoders lacked: a warm, electronic tone animated by the human voice. With it, Carlos and her production partner Rachel Elkind immediately got to work sketching out ideas for electronic "vocal" pieces. Their first objective: Beethoven's Ninth Symphony.

While working on this vocoder treatment of Beethoven, Carlos was absorbed in the novel *A Clockwork Orange*, and soon discovered that Stanley Kubrick was working on a film version. Through Elkind she got in touch with Kubrick; he loved what he heard and decided to bring Carlos in to compose the rest of the soundtrack for the film.

VOCODER INFLUENCE

By the late 1970s, the vocoder sound had begun to permeate the mainstream with works like Kraftwerk's pioneering *Autobahn* (1974). Moog had developed a commercially available vocoder in collaboration with Harald Bode—a premium signal processor with 16 filter bands—and vocoders began popping up from other companies as well. Entering the 1980s, new genres such as electro and hip-hop were exploding across the US with the vocoder as a key part of their signature sound: Hashim's "Al Naafiysh (The Soul)," Cybotron's "Clear," and "Egypt, Egypt" by Egyptian Lover. Italo-disco artists embraced it on records such as Casco's "Cybernetic Love," and experimental artist Laurie Anderson saw a hit with her "O Superman" which featured the vocoder, her voice, and little else.

The sound of the vocoder never really left popular music—especially with the advent of digital technology, which could provide as many filters as one wanted at a low cost. But the cold exactness of a digital vocoder, while extremely intelligible, was brittle and couldn't bend and modulate alongside other pieces of gear. We recommend the book *How to Wreck a Nice Beach* by Dave Tompkins, published by Melville House Books (2011), for a deeper dive into vocoders.

SPECTRAVOX

Now, 52 years since the release of *A Clockwork Orange*, we have reached back into the past and, influenced by Wendy Carlos and Bob Moog's 10-band vocoder design, created Spectravox. The instrument is a bank of 10 filters with its filter frequencies set in accordance with those used for Homer Dudley's Voder from 1939. An ancient piece of technology reborn, Spectravox pushes the topology of the vocoder further by allowing all 10 filters to be shifted up and down the frequency spectrum. With control over the resonance of the filters as well as a built-in LFO, carrier signal of a Moog oscillator and noise source, and flexible routing, Spectravox is a fascinating new way to play with history.

UNDERSTANDING FILTER BANKS AND VOCODERS

FILTER BANKS

Electronic sounds, upon their widespread introduction into mainstream culture through the 1960s, were initially perceived as cold, strange, and alien. The early pioneers of synthesizers, Bob Moog among them, wanted synthesizers to not only create new sounds but also model existing acoustic sounds. Pure electronic tones emerging from a speaker, however, were a completely new experience to listeners, as no one had ever heard sounds that were not acoustic in nature. The electronic sounds lacked two aspects that always accompanied any acoustic sound: the tone of the room the sound is made in (reverb) and the tone of the resonant acoustic body itself.

The resonant fixed filter bank was created to solve the second problem—to shape the sound of an electronic tone and simulate a resonant body, like the wooden frame of a guitar, the skin and shell of a drum, or the physical body of a human singer. The Moog 907 Fixed Filter Bank was the essential tool in the early Moog modular systems to shape the spectral signature of a tone and thus give an electronic sound a simulated resonant, acoustic body. Spectravox, like the 907, contains 10 filters capable of sculpting the spectrum of sound, but its filters have variable resonance and can be jointly shifted through the frequency domain, greatly increasing the tonal possibilities.

VOCODERS

When we speak, our vocal cords begin to vibrate and create a tone. In order to form words, we move muscles in our mouth to filter the sound—to articulate certain vowel or consonant sounds. Open your mouth and make a long open "aaaah" sound. Keep your vocal cords vibrating and try to change that "aaaah" sound to an "iiiii" sound. Play around with your mouth like Homer Dudley did back in 1928—move to an open 'e' sound (like in the word "bet") and then to an "oooooh" sound. Notice how all the work is done by the muscles in your mouth—your vocal cords are always oscillating at the same pitch! The human mouth is in fact an extremely expressive resonant filter. A vocoder seeks to capture the movements of the mouth and impart the tonal characteristics of the mouth shape onto a second sound (called the "carrier"). In essence, by using a vocoder you are swapping your vocal cords with the carrier. You can take any sound (a synthesizer, a drum machine, the sound of an aircraft taking off) and shape it with the dynamics of your mouth!

The Wendy Carlos/Bob Moog vocoder, which is at the heart of Spectravox, was constructed out of a core of a few elements: two 10-band fixed filter banks (with matching frequency bands), 10 envelope followers, and 10 voltage-controlled amplifiers. The sound of a human voice (called the **PROGRAM**) is sent to the first bank of 10 filters (the analysis filter bank). The output of each individual filter band is sent to an envelope follower, which tracks the amplitude of the voice signal in that particular frequency band. The output of each individual envelope follower essentially encodes the motion of a muscle in the mouth—the way that muscle is filtering the sound at any given moment.

A second input (the **CARRIER**) is sent to the second bank (the "synthesis filter bank"). In this filter bank, however, the level of each individual filter is controlled by the envelopes from the analysis filter bank. The **PROGRAM** signal creates 10 different filter envelopes with the motions of the mouth, and those motions are used to control the shapes of the synthesis filter bank which is filtering the **CARRIER**. This is how a vocoder maps the motions of the mouth onto a completely different sound!

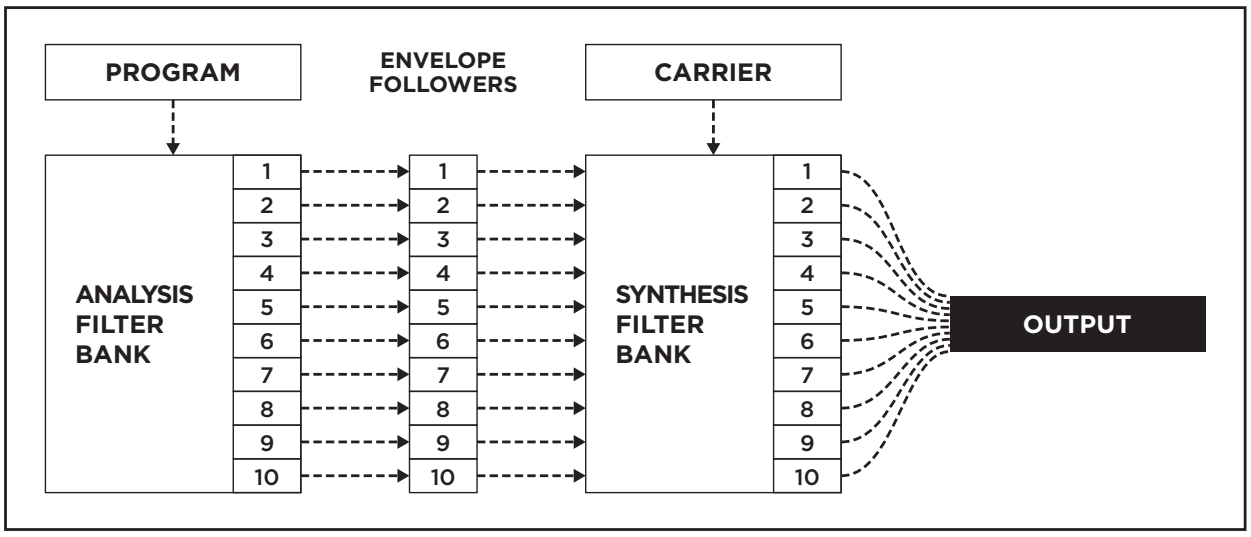


FIGURE: The **PROGRAM** is connected to the analysis filter bank, which breaks the **PROGRAM** sound up into 10 frequency bands. Each band is sent to an **ENVELOPE FOLLOWER** which converts the audio in each **PROGRAM** band into a slow moving control voltage. These control voltages are then used to control the level of each filter band in a synthesis filter bank. A different sound—the **CARRIER**—is fed through the synthesis filter bank—thus mapping the timbral characteristics of the **PROGRAM** onto the **CARRIER**.

EXPLORING SPECTRAVOX

Spectravox is a 10-band spectral processor whose modular nature means that its various components—an analysis filter bank with envelope follower outputs, a shifting synthesis filter bank with VCA inputs, and carrier generators—can all be used together or separately. This section will guide you through your Spectravox, touching on all of its controls and components, and hinting at the many ways you can explore these further.

There are two main modes for Spectravox, selectable by the **MODE** switch: **FILTER BANK** and **VOCODER**. To begin, let's explore Spectravox as a Filter Bank.

FILTER BANK

Let's begin by matching Spectravox to the figure above—an "initialized" state for using Spectravox as a filter bank. Set each **FILTER BAND** all the way down, **RESONANCE** all the way down, **SHIFT LFO AMT** all the way down, **VOLUME** mostly up, and make sure the **MODE** switch is set to **FILTER BANK** and the **VCA MODE** to **ON**. These are the most important settings for the moment, but match all your settings to the figure so that we're on the same page moving forward. Connect the rear **AUDIO OUT /🎧** of Spectravox to some kind of monitoring system if you haven't already (a mixer, an interface, or just some headphones). You won't hear anything just yet.

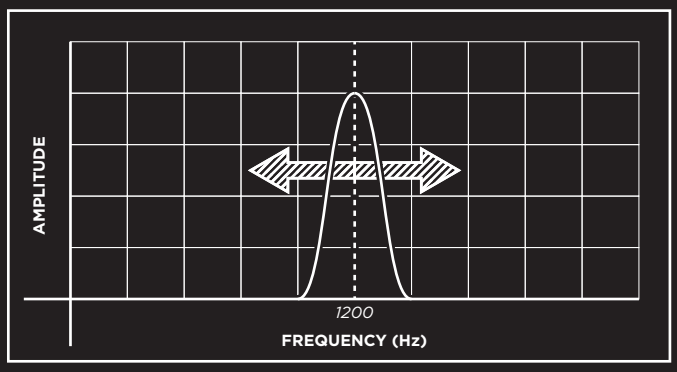
ONE FILTER

Now, begin to raise the level of filter **5**. As you raise the level to its maximum, you will hear sound fading in—this is the sound of the carrier (currently a mix between the **VCO** and **NOISE**) through filter band **5**.

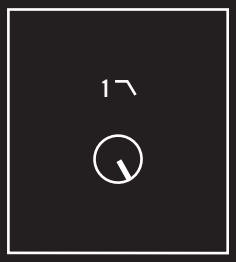
EXPLORING SPECTRAVOX *(Continued)*

Next, take the **SPECTRAL SHIFT** knob and slowly begin to move it up and down. You will hear the filter begin to move up and down the frequency spectrum.

Begin to raise the **RESONANCE** to its maximum and you will hear the filter band start to whistle on top of the bandpass filtered carrier sound.



Spectravox is a unique exploration of the topology of the vocoder due to its filter design. Whereas most previous analog filter banks have their filters fixed in place, all 10 filters of Spectravox can be shifted up and down the frequency spectrum! Additionally, its filters all have variable **RESONANCE**, which provides for colorful sound design possibilities.



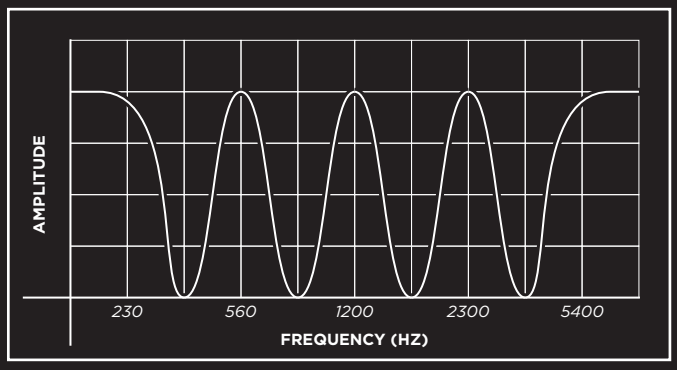
FIVE FILTERS

Set **SPECTRAL SHIFT** back to its initial position (12 o'clock) and bring the **RESONANCE** down while leaving filter **5** open. Now, begin to fade in filter **1**—a lowpass filter. You will notice the low frequency components of the VCO and low noise rumbles fade in.

Bring up filters **3**, **7**, and **9** as well—slowly, so that you hear the interesting harmonic shapes emerge as you adjust the spectral shape of the carrier. This is the power of a filter bank, allowing you to sculpt the frequency spectrum of a sound.

EXPLORING SPECTRAVOX *(Continued)*

FILTER BANK *(Continued)*



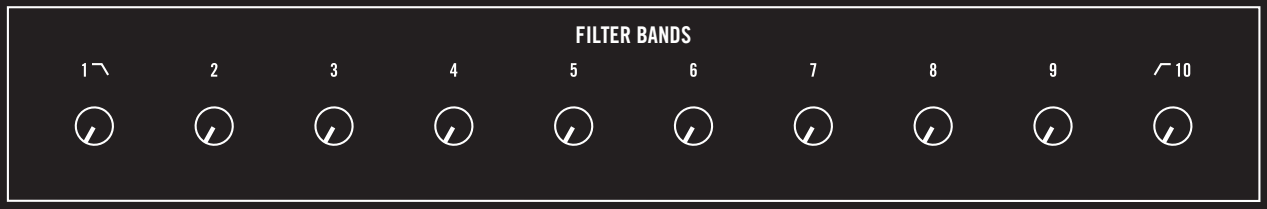
Play again with **RESONANCE** and **SPECTRAL SHIFT**. You will notice that all five filters move as you turn **SPECTRAL SHIFT**! This is the unique power of Spectravox: its filters are not fixed, but moveable.

Here you have something like a comb filter—a handful of filters evenly spaced apart, with their peaks looking somewhat like a comb. Now, begin to move the **SHIFT LFO AMT** knob up—just a little bit at first, until you hear these five filters start to bend up and down together. Keep moving the **SHIFT LFO AMT** knob up to increase the range that the **LFO** shifts the filters.

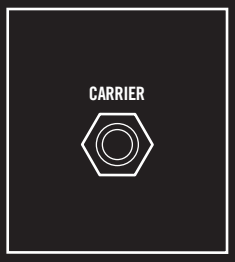
Move **SHIFT LFO RATE** up to increase the **LFO** rate, and move it down to decrease. Set the **SHIFT LFO RATE** down around eight o'clock and increase the **SHIFT LFO AMT** to around two o'clock to hear wide comb filter animation akin to a phaser effect. Shift the **CARRIER MIX** knob all the way counterclockwise to **VCO/CARRIER** to hear just the VCO, and as you move **RESONANCE** up you will hear a kaleidoscopic resonant sweep.

10 FILTERS AND BEYOND

From whatever sound is currently playing, start raising the bands of the other five filters (in this case filters **2**, **4**, **6**, **8**, and **10**). Keep sculpting your tone, playing with the **VCO FREQ**, **VCO WAVE** switch, **PULSEWIDTH** (only applies to the square wave), and **CARRIER MIX** to explore the wide timbral possibilities of Spectravox all on its own.



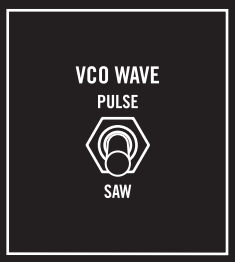
EXPLORING SPECTRAVOX *(Continued)*

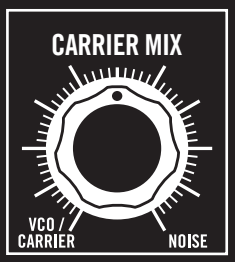


You can process any external instrument through Spectravox by patching that instrument's audio to the **CARRIER** input on Spectravox's patch bay. This will override the VCO on the **CARRIER MIX**—swapping the **VCO** for whatever audio is coming in through the **CARRIER**. By processing synthesizers such as Matriarch or Mother-32 you can create malleable new resonant textures. Running a drum machine (such as DFAM) through the Spectravox filter bank also sounds great, or try any audio from your phone!

NOTE: *When using Spectravox simply as a filter bank, we can take advantage of the* ***PROGRAM*** *input and use its 1/4"/XLR combo jack (or 3.5mm input in the patch bay) and preamp to add gain to line level signals that might be a bit too low for the* ***CARRIER*** *input. Patch your external signal into the* ***PROGRAM INPUT*** *combo jack and add gain with* ***GAIN LEVEL****. Then, on Spectravox's patch bay, take the* ***PROGRAM*** *output and patch it to the* ***CARRIER*** *input. This will send a stronger signal into the synthesis filter bank. In addition, you will have a global envelope follower from the* ***PROG ENV F*** *output and 10 (!!) band-limited enveloper follower outputs!*

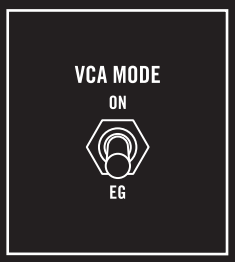
If this is a bit confusing at the moment, come back to it after we've walked through the Vocoding functionality and once you have a good grasp of the difference between the ***PROGRAM*** *and the* ***CARRIER.***





SPECTRAL SYNTHESIZER

Spectravox can be made to generate interesting percussive voices by setting the **RESONANCE** of all the filters to its maximum setting, "pinging" all 10 filters. You can try this out by setting the **VCO WAVE** to **SAW** and unpatching any inputs you currently have patched to the **CARRIER** input. Make sure **CARRIER MIX** is all the way down (pointing to **VCO/CARRIER**), and as you turn down the **VCO FREQ** as low as possible you will hear the resonant tone "break apart" into separate resonant filter pings. Sculpt these pinged percussive sounds with the **FILTER BAND** levels and **SPECTRAL SHIFT** control. You can insert triggers into the **CARRIER** input to ping the filters from external trigger/gate sequencers or keyboards to create rhythmic marimba-like tones.



Finally, raise the **VCO FREQ** back up into audio rate (12 o'clock, for instance) and move the **VCA MODE** switch to EG—the sound will disappear. Pressing the **TRIGGER** button will trigger an envelope whose decay is controlled by the **DECAY** knob. With its **1V/OCT** input for the **CV** and **TRIGGER** input for the envelope generator, you can use any external keyboard (Grandmother or Matriarch, for example) or sequencer (such as the sequencers found in Mother-32, DFAM, and Subharmonicon) to control and sequence Spectravox as its own sculptable resonant synth voice.

VOCODER

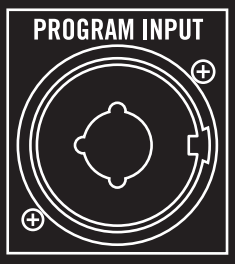
Now, let's explore Spectravox in **VOCODER** mode. Spectravox is not like contemporary vocoders—its lineage comes from the analog filter banks of Moog modular systems, and as such requires a bit more setup to get typical "vocoder" sounds. Even then, its sound is resonant and musical rather than precise and analytical. While contemporary vocoders are designed for high-resolution vocoding, the semi-modular nature of Spectravox makes it more of a playground to explore filter banks, formant tones, and dynamic spectral processing.

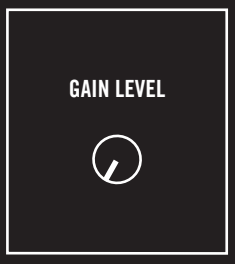
By moving the **MODE** switch to **VOCODER**, the outputs of all 10 **ENV F** outputs from the **PROGRAM** filter bank are patched internally to control the level of the 10 bands of the synthesis filter bank (which shapes the **CARRIER**). If you're unsure about how vocoders work, take a look at the Understanding Vocoders section of this manual to become better acquainted with some of the terms. Don't worry: as we go through the operation of Spectravox, these phrases will become more clear. The most important thing is that you are able to use Spectravox to create all the fun and interesting sounds you can imagine!

VOCODING WITH VOICE

Match your Spectravox to the settings diagramed above—an initialized vocoding patch. Connect a microphone to the 1/4" / XLR combo jack **PROGRAM INPUT**—or use a recording of human speech if you don't have a microphone handy. Spectravox's microphone preamplifier will work with un-powered microphones like dynamic or piezo microphones. It does not supply phantom power and cannot power condenser microphones or other microphones that require a bias voltage.

EXPLORING SPECTRAVOX *(Continued)*





With the settings on page 18 and Spectravox's output connected to a monitoring system (or headphones), you should hear a vocoded signal as you speak into your microphone! If you don't, make sure to adjust the **GAIN LEVEL** control below the **PROGRAM INPUT** so that the LED indicates a nice strong signal—bright red at the loudest parts of your voice.

Spectravox's sound is distinct, capturing rich analog vocal tones with its 10 filter bands. Speak and sing into Spectravox and listen to how it responds to the different shapes your mouth makes.

NOTE: *Just like Homer Dudley in 1939 and Wendy Carlos in 1970 had to do, the only way to get speech with any kind of intelligibility is to enunciate your words with the utmost precision and clarity!*

With our current settings the carrier signal is just the pulse **VCO** with **PULSE WIDTH** set to around 10 o'clock and with the **BANDS 9 & 10** switch set to **HISS**. This is ideal for a vocoded speech-like sound.

The **VCO** replicates the vibration of vocal cords and is the basis for voiced sounds. In English, all vowels, all diphthongs, and some consonant sounds are voiced. Notice how when you say the word "sent" your vocal cords vibrate only during the voiced parts of the word: during the 'e' and 'n' sounds. For the 's' at the beginning and the 't' at the end, your vocal cords stop vibrating and instead you make the sounds by pushing air through your teeth. These unvoiced sounds are best replicated by noise instead of by an oscillator.

The operators of the original Voder back in 1939 had a switch called **HISS/BUZZ** to switch the carrier signal between noise and a VCO for unvoiced or voiced tones. Spectravox does this automatically with the **BANDS 9 & 10** switch set to **HISS**—replacing the carrier with noise in the highest two filters (9 & 10) whenever an unvoiced tone is detected in the **PROGRAM** signal. Setting this switch to **BUZZ** simply sends the same **CARRIER** signal in all of the other bands to the top two bands as well. Play around with the **BANDS 9 & 10** switch as you speak different words into Spectravox and listen to the difference when you pronounce sibilant sounds like 's' or plosives like 't' and 'd.'

NOTE: *You can always introduce a little* ***NOISE*** *by fading some in with the* ***CARRIER MIX*** *control to add some raspiness to your synthetic voice.*

You can turn **SPECTRAL SHIFT** down from 12 o'clock just a little bit to simulate a formant shift to a deeper voiced person, or increase it a little bit above 12 o'clock to simulate an upwards formant shift to a higher voiced person.

EXPLORING SPECTRAVOX *(Continued)*

VOCODER *(Continued)*

The **HOLD** switch in the **PROGRAM** section allows you to take a snapshot of certain vocal formations and hold them. Remember, inside Spectravox there are two filter banks. The **PROGRAM** is fed into the analysis filter bank, which outputs 10 envelope follower signals for each of the 10 bands. The envelope followers are sent to control the synthesis filter bank, which shapes the **CARRIER**. When you set **HOLD** to **ON**, the 10 envelope follower signals will pause and hold wherever they currently are until the **HOLD** switch is turned **OFF**. Make an "aaaah" sound and turn the **HOLD** switch **ON** and Spectravox will hold that "aaaah" shape.

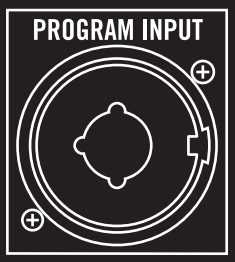
While modulating a static **CARRIER** signal with Spectravox is a lot of fun, you can start playing around with the **CARRIER** for more diverse tones. Adjust the **VCO FREQ**, or better yet, play it with a keyboard/sequencer by connecting a keyboard CV output (such as on Grandmother or Matriarch) or sequencer (using Mother-32, DFAM, or Subharmonicon) to the **1V/OCT** input.

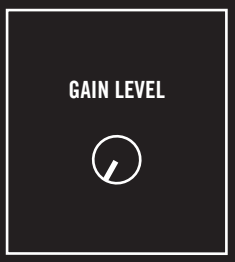
You can also use the **CARRIER** input on the patch bay to swap Spectravox's internal carrier generator with any external sound. Map your voice's movement onto chords from Matriarch for classic vocoder sounds, or map it onto shifting tonal sounds from Subharmonicon or an external Eurorack-level signal.

NOTE: *The **CARRIER** input expects a +4dBu line level audio signal. 10V peak to peak signals from Eurorack systems may need attenuation to avoid distortion.*

PLAYING WITH THE PROGRAM

You don't have to use a microphone as your **PROGRAM** source. While Spectravox is a **VO**ice en**CODER**, any source rich in harmonic movement will be analyzed by the analysis filter bank and mapped onto the carrier.





A favorite of ours is to use a drum machine—try a DFAM if you have one, or any other drum machine you might have! Plug its output in to the **PROGRAM INPUT** and raise the **GAIN LEVEL** so you see a strong movement in the indicator LED. The drum machine will shape the carrier signal with rhythmic movements of the resonant filter bank. Sibilant hi-hats will shape the higher frequencies while kick drums and toms will open and close the lower frequencies. Play with **RESONANCE** for more extreme filter coloring, **SPECTRAL SHIFT** to sweep the filter bank up and down, and add the **SHIFT LFO** for modulation!

SUMMARY

In this walkthrough we have covered many of the core features of Spectravox, both in its **FILTER BANK** and **VOCODER** modes. Exploring each feature of Spectravox on its own helps build familiarity with the instrument, but of course demonstrates only a very small terrain of its deep sound design capabilities. With the panel controls alone you can use the **SHIFT LFO** to add a strange broadband vibrato to your vocoded voice or turn your marimba percussion instrument into a vibraphone with the **FILTER BANK**.

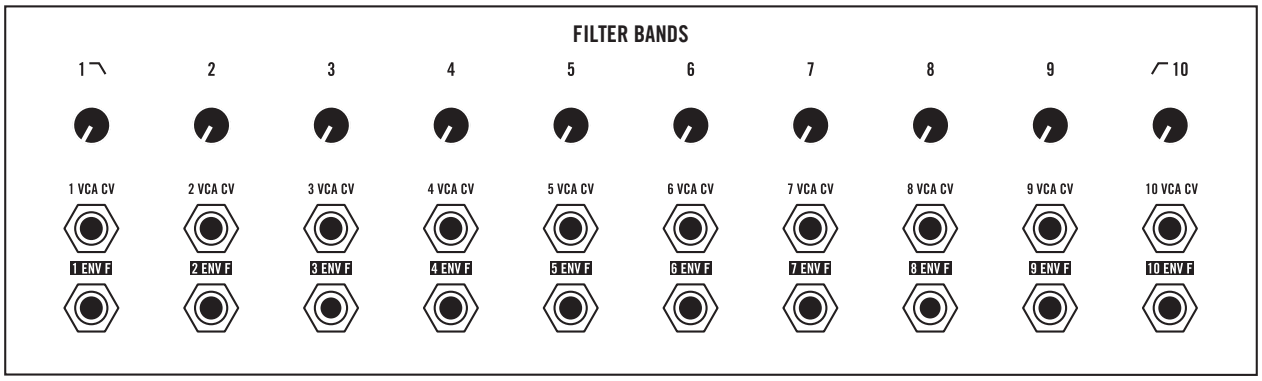
Now is also a good time to begin exploring the many possibilities of the patch bay. We've only begun to scratch the surface of Spectravox's functionality! Try patching the **LFO** and **EG** outputs to various filter band **VCA CV** inputs while in **FILTER BANK** mode for dynamic spectral processing. Or, while using Spectravox in **VOCODER** mode, try remapping the vocoder, patching various filter bank **ENV F** outputs to different band **VCA CV** inputs to scramble the frequency spectrum.

Next, we'll cover all of the panel controls and functions of Spectravox in more detail.

PANEL CONTROLS & FUNCTIONS

FILTER BANDS

The core of Spectravox is its filter bank: a lowpass filter (filter 1), highpass filter (filter 10), and eight bandpass filters spaced equally between (filters 2-9). In fact, Spectravox contains two filter banks: one which analyzes the **PROGRAM** signal (the analysis filter bank) and one which filters the **CARRIER** signal (the synthesis filter bank). When **SPECTRAL SHIFT** is set to zero (i.e., 12 o'clock on the panel control) the 10 analysis filter bands and synthesis filter bands are all aligned.



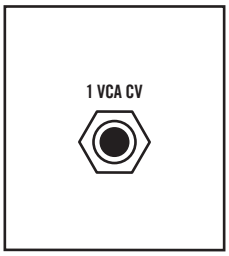
1 LEVEL (2 LEVEL, etc.) *(Filter level controls are indicated on panel by their number.)*
Each filter in the synthesis filter bank has a control for its level—attenuating the amplitude of that particular frequency band. With this control all the way down, that particular frequency band will be filtered out of the **CARRIER** signal. In **FILTER BANK** mode each is a level control, while in **VOCODER** mode each is an attenuator for its paired **ENV F**. All 10 filters are mixed at their relative levels and sent downstream to the **VCA**.

The center frequencies for the bandpass filters (and cutoff frequencies for the lowpass and highpass filter, respectively) are based on Homer Dudley's original work on the Vocoder and Voder in 1939 and are listed below. They are the center/cutoff frequencies for the synthesis filter bank when **SPECTRAL SHIFT** is set to 12 o'clock (and is not being modulated) and they are the center/cutoff frequencies for the analysis filter bank at all times.

FILTER:	FREQUENCY:	TYPE:	BAND INPUTS:	BAND OUTPUTS:
1	230 Hz	Lowpass	1 VCA CV	1 ENV F
2	320 Hz	Bandpass	2 VCA CV	2 ENV F
3	560 Hz	Bandpass	3 VCA CV	3 ENV F
4	830 Hz	Bandpass	4 VCA CV	4 ENV F
5	1200 Hz	Bandpass	5 VCA CV	5 ENV F
6	1700 Hz	Bandpass	6 VCA CV	6 ENV F
7	2300 Hz	Bandpass	7 VCA CV	7 ENV F
8	3200 Hz	Bandpass	8 VCA CV	8 ENV F
9	4500 Hz	Bandpass	9 VCA CV	9 ENV F
10	5400 Hz	Highpass	10 VCA CV	10 ENV F

PANEL CONTROLS & FUNCTIONS *(Continued)*

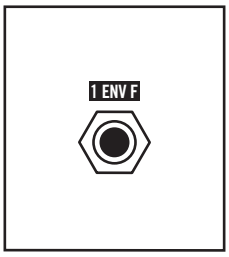
FILTER BANDS *(Continued)*



1 VCA CV (2 VCA CV, etc.)

A control voltage patched to this input will control the level of the associated filter band in the synthesis filter bank. In **VOCODER** mode, the matched **ENV F CV** output from the analysis filter bank is internally patched to its paired synthesis filter.

CV INPUT: 0V to +8V



1 ENV F (2 ENV F, etc.)

This is a control voltage output from the analysis filter bank that tracks the amplitude of the associated frequency band in the **PROGRAM** signal. In **VOCODER** mode it is internally patched to its associated synthesis filter **VCA** input.

CV OUTPUT: 0V to +8V

NOTE: *In* ***VOCODER*** *mode each analysis filter* ***ENV F*** *output is internally patched to its paired synthesis filter* ***VCA CV*** *input, but you can reroute these any way you like! Playing with these routings can create strange vocal effects. See some of the* ***PRESETS*** *later in the manual for examples.*

BANDS 9 & 10

This switch reproduces the **HISS/BUZZ** switch originally used by the Voder operators in 1939 and changes the functionality of bands 9 & 10 in the synthesis filter bank.

Set to **BUZZ**, band 10 is a bandpass filter and bands 9 & 10 receive their audio input from the **CARRIER MIX** (just like all of the other filters). The levels of bands 9 & 10 are controlled by their corresponding analysis filter bank envelope follower outputs.

Set to **HISS**, band 10 is a highpass filter and bands 9 & 10 receive pure white noise as their audio input instead of the **CARRIER MIX** signal (which is sent to the lower eight filters). Additionally, the level control for bands 9 & 10 are replaced by a simple on/off signal generated by analysis filters 9 & 10.

NOTE: *The* ***ENV F*** *outputs for bands 9 & 10 of the analysis filter bank still function as normal and can be patched to* ***9 VCA CV/10 VCA CV*** *while in* ***HISS*** *mode to override the on/off behavior.*

TIP: BUZZ *is best for when using Spectravox as a filter bank, as your* ***CARRIER*** *is sent to all 10 filters.* ***HISS*** *is best when using Spectravox as a vocoder since its changes increase speech intelligibility and capture sibiliant and plosive sounds better than when set to* ***BUZZ****.*

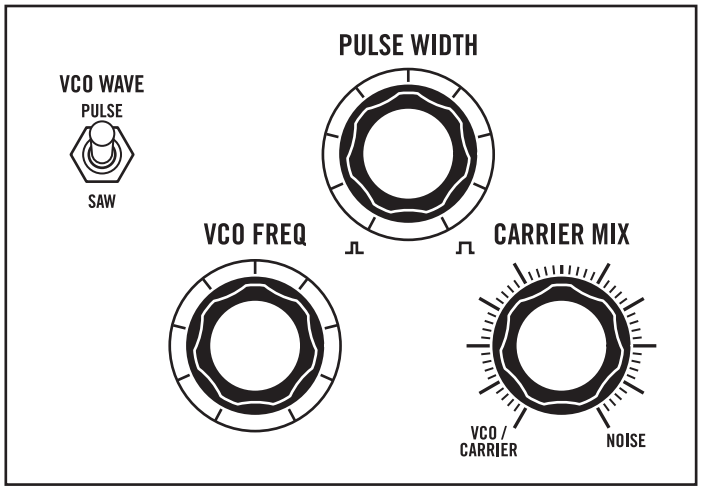
FILTER BANDS *(Continued)*

MODE
This switches internal routing between the analysis and synthesis filter banks.

Set to **VOCODER**, each of the analysis filter envelope follower outputs are internally routed to control the level of its paired filter in the synthesis filter bank (filter **1 ENV F** is internally patched to filter **1 VCA CV**, filter **2 ENV F** is internally patched to filter **2 VCA CV**, etc.). In **VOCODER** mode, therefore, the spectral shape of the **PROGRAM** signal controls the level of the filters in the synthesis filter bank, shaping the frequency spectrum of the **CARRIER**.

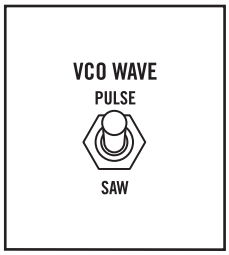
Set to **FILTER BANK**, these internal routings are disconnected. The synthesis filter band levels are controlled only by their respective level controls and **VCA CV** inputs and are unaffected by the envelope followers (which are still present at their respective **ENV F** outputs). This way, the synthesis and analysis filter banks can be used completely independently.

CARRIER



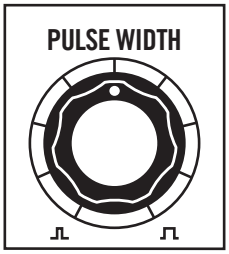
The **CARRIER** section of Spectravox generates a **CARRIER** signal which is sent to the synthesis filter bank and then sent to the **VCA** section and output. It consists of a variable waveshape **VCO**, a **NOISE** source, and **CARRIER MIX**.

VCO FREQ
This sets the frequency of Spectravox's **VCO**—from low sub-audio frequencies at a minimum to around 2 kHz at maximum.



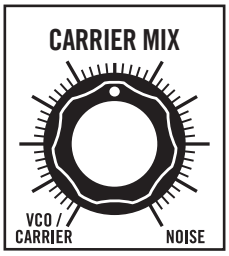
VCO WAVE
This sets the waveshape of the **VCO**—either a sawtooth wave or a pulse wave.

CARRIER *(Continued)*



PULSE WIDTH

This sets the pulse width of the **VCO** when **PULSE** is selected via the **VCO WAVE** switch. Turning **PULSE WIDTH** results in a pulse width of about 1% duty cycle at a minimum to about 50% at maximum.



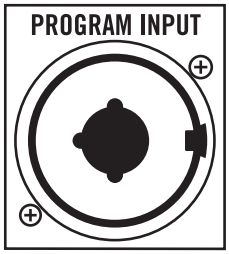
CARRIER MIX

With crossfader blending between the **VCO** signal and the **NOISE** signal, the resulting mix is sent into the synthesis filter bank. Patching a signal to the **CARRIER** input on the patch bay will replace the **VCO** signal with whatever signal is present at the **CARRIER** input.

PROGRAM

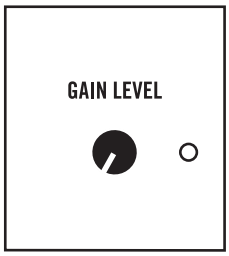
The **PROGRAM** section of Spectravox sends the signal connected to the **PROGRAM INPUT** into the analysis filter bank—whose outputs are the 10 envelope followers (**1 ENV F, 2 ENV F ... 10 ENV F**). The **PROGRAM** signal thus animates the synthesis filter bank when Spectravox is in **VOCODER** mode.

PROGRAM *(Continued)*



PROGRAM INPUT

A 1/4" / XLR combo jack input, the **PROGRAM INPUT** can accept signals from microphones or line level audio. Spectravox's microphone preamplifier will work with un-powered microphones like dynamic or piezo microphones. It does not supply phantom power and cannot power condenser microphones or other microphones that require a bias voltage.



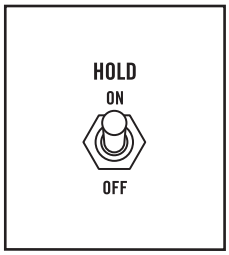
GAIN LEVEL

This sets the gain of the signal at **PROGRAM INPUT** (or the auxiliary **PROGRAM** input in Spectravox's patch bay on the right). Adjust **GAIN LEVEL** so the LED shows a strong bright red light at the loudest parts of the **PROGRAM** signal and shows a dim red light during quieter parts.

PROG TRIG -> EG

When **ON**, this triggers the envelope generator of Spectravox whenever the **PROGRAM** signal exceeds a certain threshold.

***NOTE**: In addition to the 10 band-limited envelope followers of Spectravox's analysis filter bank, there is also a global **PROG ENV F** that tracks the amplitude of the entire unfiltered **PROGRAM** signal (post **GAIN LEVEL**). The **PROG ENV F** is available at its associated output on the patch bay and is used to generate the **PROG TRIG**.*



HOLD

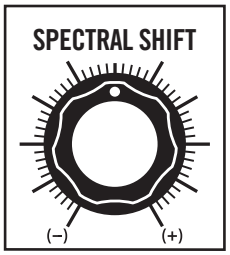
Every filter in the analysis filter bank has a sample and hold circuit that, when **HOLD** is switched **ON**, will hold each envelope follower at its current voltage. Switching **HOLD** to **OFF** will release each envelope follower to continue tracking each band in the analysis filter bank.

***TIP:** Use the **HOLD** feature to capture certain vowel sounds! Say "aaaah" into a microphone connected to the **PROGRAM INPUT** and flip **HOLD** to **ON** to hold all 10 filters in the "aaaah" shape.*

SPECTRAL SHIFT

SPECTRAL SHIFT is an innovative feature that sets Spectravox apart from all other analog vocoders. Throughout the initial vocoding work done by Homer Dudley in the 1920s, its refinements through the years by the Department of Defense, and its musical refinements by Wendy Carlos, Bob Moog, and many other electronics manufacturers, the filter bands of a vocoder were always fixed in place. Because of the unique design of Spectravox's filters, however, they contain variable **RESONANCE** and their center frequencies can be moved up and down the frequency spectrum via **SPECTRAL SHIFT**.

The ability to move the Spectravox filters and adjust their resonance makes Spectravox an extremely powerful spectral processing tool. Only the synthesis filters move via **SPECTRAL SHIFT**—the analysis filters stay at their fixed frequencies—so you can use **SPECTRAL SHIFT** to map and shape sounds diagonally across the frequency spectrum. Adding to the sound design possibilities, **SPECTRAL SHIFT** may be modulated via an internal triangle wave **LFO** or externally via CV.

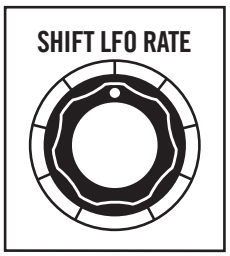


SPECTRAL SHIFT

This sets the position of all 10 synthesis filters. At zero (12 o'clock) all 10 synthesis filters are located at the frequencies listed above in the **FILTER BANDS** section and are therefore aligned with all 10 analysis filters. Moving **SPECTRAL SHIFT** above 12 o'clock jointly shifts all 10 filters up the frequency spectrum, while moving **SPECTRAL SHIFT** below 12 o'clock shifts them down. **SPECTRAL SHIFT** moves all 10 filters simultaneously—they are always fixed in place in relation to each other.

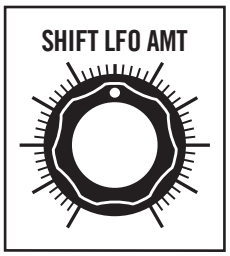
RESONANCE

This controls the resonance of all 10 filters in the synthesis filter bank jointly. Turning **RESONANCE** up will increase the emphasis of each filter, adding more energy at each filter's center frequency. At maximum **RESONANCE** each filter will have a prominent resonant peak and be near (but not at) self-oscillation. Turn **RESONANCE** down to decrease the resonant peak of all 10 filters.



SHIFT LFO RATE

This sets the rate of the internal triangle **LFO** used to modulate **SPECTRAL SHIFT**. Range is very slow (approximately 0.05 Hz) at its minimum and audio rate (around 500 Hz) at its maximum.

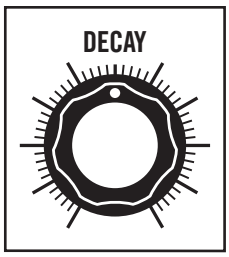


SHIFT LFO AMT

This sets the depth of modulation of **SPECTRAL SHIFT** by the **SHIFT LFO**. At a minimum **SPECTRAL SHIFT** is unaffected by the **LFO** and at a maximum the **SHIFT LFO** sweeps **SPECTRAL SHIFT** over a very wide range.

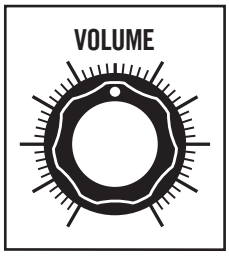
VCA & ENVELOPE GENERATORS (EG)

The signal from all 10 synthesis filters are mixed together and sent to a Voltage-Controlled Amplifier (**VCA**) which is controlled by a decay-only envelope generator (EG). The result is finally sent to the output of Spectravox. The envelope generator may be triggered by the **TRIGGER** button, the **TRIGGER** CV input, or from the program signal via the **PROG TRIG -> EG** switch.



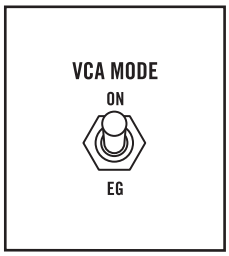
DECAY

This sets the decay time for the envelope generator used to control the **VCA**. The envelope generator produces a percussive envelope with no attack time and variable decay from around 1 milliseconds to greater than 5 seconds.



VOLUME

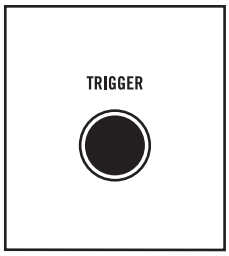
This sets the level of the signal at the **AUDIO OUT** /🎧 and **VCA** outputs.



VCA MODE

This sets whether the **VCA** is controlled by the envelope generator (**EG**) or whether the **VCA** is always fully open (ON).

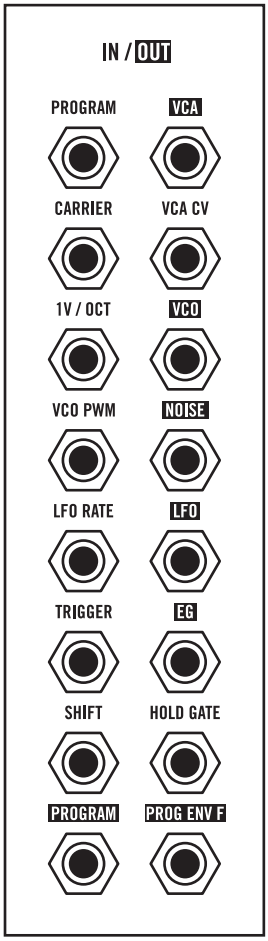
NOTE: *When **EG** mode is selected, the **VCA CV** input on the patch bay acts as an amplitude control for the envelope—essentially a velocity input!*



TRIGGER

Pressing **TRIGGER** will trigger a new envelope in the envelope generator.

THE PATCH BAY



Spectravox contains an extensive patch bay with 36 modular patch points: 19 inputs (white text on black) and 17 outputs (black text on white). As an extremely flexible semi-modular spectral processor and vocoder Spectravox is ready to make deep connections with all sorts of analog gear via control voltage and Eurorack-level audio over 3.5mm jacks. Nearly every panel control can be modulated via the patch bay, which occupies the rightmost side of Spectravox as well as the bottom underneath the **FILTER BANDS** section.

In this section we will go over every patch point—from right to left as we travel down the patch bay.

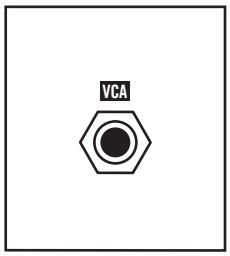
INPUTS:	**OUTPUTS:**	**BAND INPUTS:**	**BAND OUTPUTS:**
PROGRAM	VCA	1 VCA CV	1 ENV F
CARRIER	VCO	2 VCA CV	2 ENV F
VCA CV	NOISE	3 VCA CV	3 ENV F
1V/OCT	LFO	4 VCA CV	4 ENV F
VCO PWM	EG	5 VCA CV	5 ENV F
LFO RATE	PROGRAM	6 VCA CV	6 ENV F
TRIGGER	PROG ENV F	7 VCA CV	7 ENV F
SHIFT		8 VCA CV	8 ENV F
HOLD GATE		9 VCA CV	9 ENV F
		10 VCA CV	10 ENV F

ROW ONE

PROGRAM INPUT

An audio input here goes through the **GAIN LEVEL** in the **PROGRAM** section and is sent to the analysis filter bank. Identical to the **PROGRAM INPUT** in the **PROGRAM** section.

AUDIO INPUT: -1.7V to +1.7V (Line Level)



VCA OUTPUT

This is the Spectravox main audio output at Eurorack level (10 Vpp).

AUDIO OUTPUT: -5V to +5V (10V peak to peak)

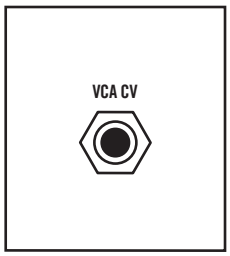
THE PATCH BAY *(Continued)*

ROW TWO

CARRIER INPUT

This is an input for external audio which replaces the **VCO** on the left of the **CARRIER MIX** knob. Use this to process external signals via Spectravox's synthesis filter bank. The **CARRIER INPUT** Accepts line level signals.

AUDIO INPUT: -1.7V to +1.7V (Line Level)



VCA CV INPUT

This CV input to control the level of the Voltage-Controlled Amplifier (**VCA**). CV signal here is multiplied with signal selected by **VCA MODE** switch (either **ON** or **EG**), acting as a velocity control when in **EG** mode.

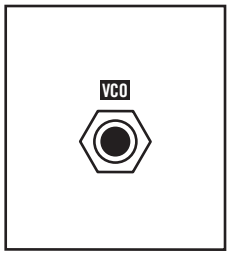
CV INPUT: 0V to +8V

ROW THREE

1V/OCT INPUT

This calibrated CV input controls the frequency of the **VCO** following the 1V/Oct standard. Summed with the setting of the **VCO FREQ** panel control.

CV INPUT: -5V to +5V

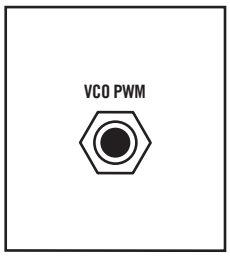


VCO OUTPUT

This is the audio output for the **VCO**.

AUDIO OUTPUT: -5V to +5V (10V peak to peak)

ROW FOUR



VCO PWM INPUT

This CV input to control the pulse width of the **VCO** (when **VCO WAVE** is set to **PULSE**). A control voltage sweep from –5 volts to +5 volts covers the range of the **PULSE WIDTH** potentiometer. (Set **PULSE WIDTH** to 12 o'clock for full sweep via this input.)

CV INPUT: -5V to +5V

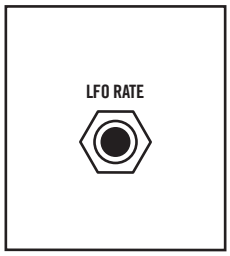
THE PATCH BAY *(Continued)*

ROW FOUR *(Continued)*

NOISE OUTPUT
This is the audio output for the white **NOISE** generator.

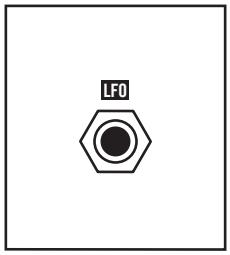
AUDIO OUTPUT: -5V to +5V (10V peak to peak)

ROW FIVE



LFO RATE INPUT
This CV input controls the rate of the **SHIFT LFO**. With this input, -5 volts to +5 volts covers 10 octaves.

CV INPUT: -5V to +5V



LFO OUTPUT
This is the CV output for the **SHIFT LFO**.

CV INPUT: -5V to +5V

ROW SIX

TRIGGER INPUT
This is a CV input to trigger the envelope generator (**EG**). A rising edge triggers the envelope.

CV INPUT: 0V to +10V

EG OUTPUT
This is the CV output for the envelope generator (**EG**).

CV OUTPUT: 0V to +8V

THE PATCH BAY *(Continued)*

ROW SEVEN

SHIFT INPUT

This CV input for **SPECTRAL SHIFT** is used to jointly move the synthesis filters up and down the frequency spectrum. A positive signal input here increases the center frequencies of the filters and is summed with panel setting of **SPECTRAL SHIFT** and **SHIFT LFO** settings.

CV INPUT: -5V to +5V

HOLD GATE INPUT

A gate high (approx. +2.5V threshold) in this input engages the sample and hold circuits on all 10 analysis filter bank envelope followers—holding them at their current levels until the gate goes low.

CV INPUT: 0V to +10V

ROW EIGHT

PROGRAM OUTPUT

This is the Audio output of the **PROGRAM** signal post amplification via **GAIN LEVEL** knob.

AUDIO OUTPUT: -5V to +5V

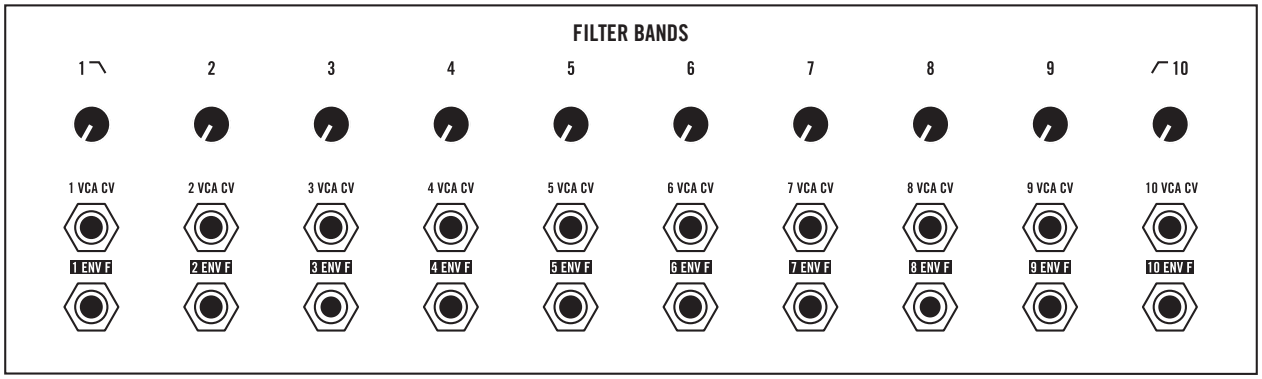
PROG ENV F OUTPUT

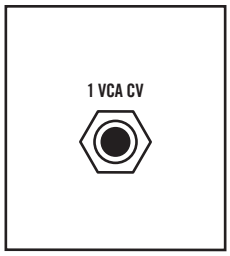
This is the CV output for the **PROGRAM** envelope follower. The envelope filter follower outputs a CV proportional to the amplitude of the full spectrum **PROGRAM** signal (after amplification via **GAIN LEVEL**). The **PROG TRIG** is generated from the **PROG ENV F** output.

CV INPUT: 0V to +8V

THE PATCH BAY *(Continued)*

FILTER BANDS ROW





1 VCA CV (2 VCA CV, etc.)

A control voltage patched to this input will control the level of the associated filter band in the synthesis filter bank. In **VOCODER** mode, the matched **ENV F CV** output from the analysis filter bank is internally patched to its paired synthesis filter.

CV INPUT: 0V to +8V

1 ENV F (2 ENV F, etc.)

This is a control voltage outputs from the analysis filter bank that tracks the amplitude of the associated frequency band in the **PROGRAM** signal. In **VOCODER** mode it is internally patched to its associated synthesis filter **VCA** input.

CV OUTPUT: 0V to +8V

USING SPECTRAVOX AS A EURORACK MODULE

Your Spectravox can be removed from its case and easily installed into a Eurorack system as a 60HP module. Before doing this, it is important to note that Spectravox draws a maximum of 450 mA from a +12V supply. It does not use the -12V supply at all. Make sure there is enough headroom on the +12V supply in your system to power Spectravox.

NOTE: *You will need to know the current rating of the system's +12VDC supply and the current draw of the +12VDC supply from all modules in the system combined. The sum of all current draw at +12VDC should never exceed the power supply rating. It is good practice to leave some headroom to reduce stress on the supply.*

Moog Music accepts NO responsibility or liability for improperly installed modules.

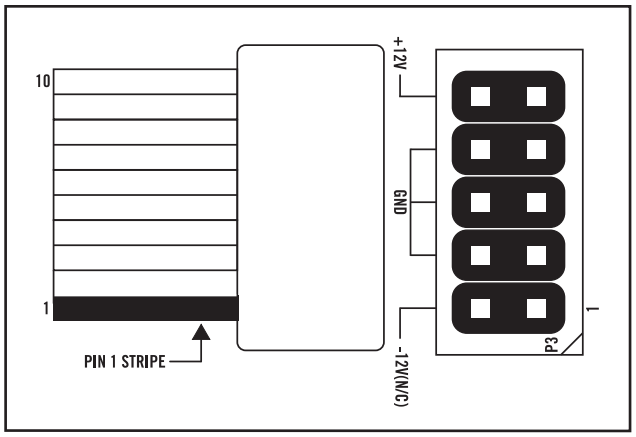
HOW TO INSTALL SPECTRAVOX IN A EURORACK SYSTEM

1. Disconnect external power from the unit.

2. Remove the eight black M3 screws on the front panel and keep them somewhere safe. You will need them again.

3. Slowly lift the panel from the case, so that you can see the two cables going to the front panel module.

4. Disconnect these two cables from the front panel. The module is now free from its enclosure.



5. Look at the back of your Spectravox. There is a 10-pin power header on the back of the PCB that accepts a 10-pin Eurorack power ribbon cable (not included).

6. Connect PIN-1 (-12V) of the power ribbon cable to PIN-1 of the Spectravox Eurorack power header. The darkened wire (typically red) on the ribbon cable indicates the PIN-1 (-12V) side of the cable.

7. After power is connected, your Spectravox may be installed into the rails of the Eurorack system case with the eight black M3 screws removed in Step 2.

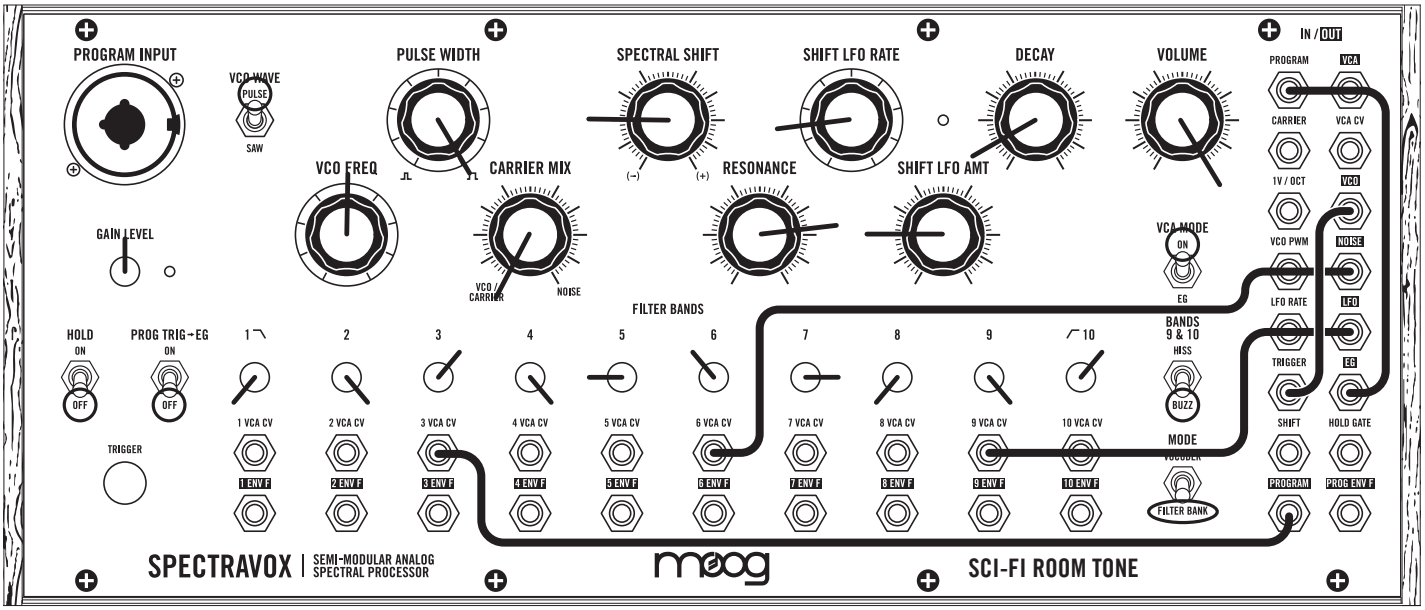
8. Once fully installed, you may power up your Eurorack system.

PRESETS

Spectravox is a semi-modular analog instrument and therefore does not contain any presets—the settings on the panel and patch connections made all determine how it functions at any given time. Use the following patch ideas as jumping off points to explore the world of spectral processing, filter banks, and vocoding, and to interface Spectravox with external instruments.

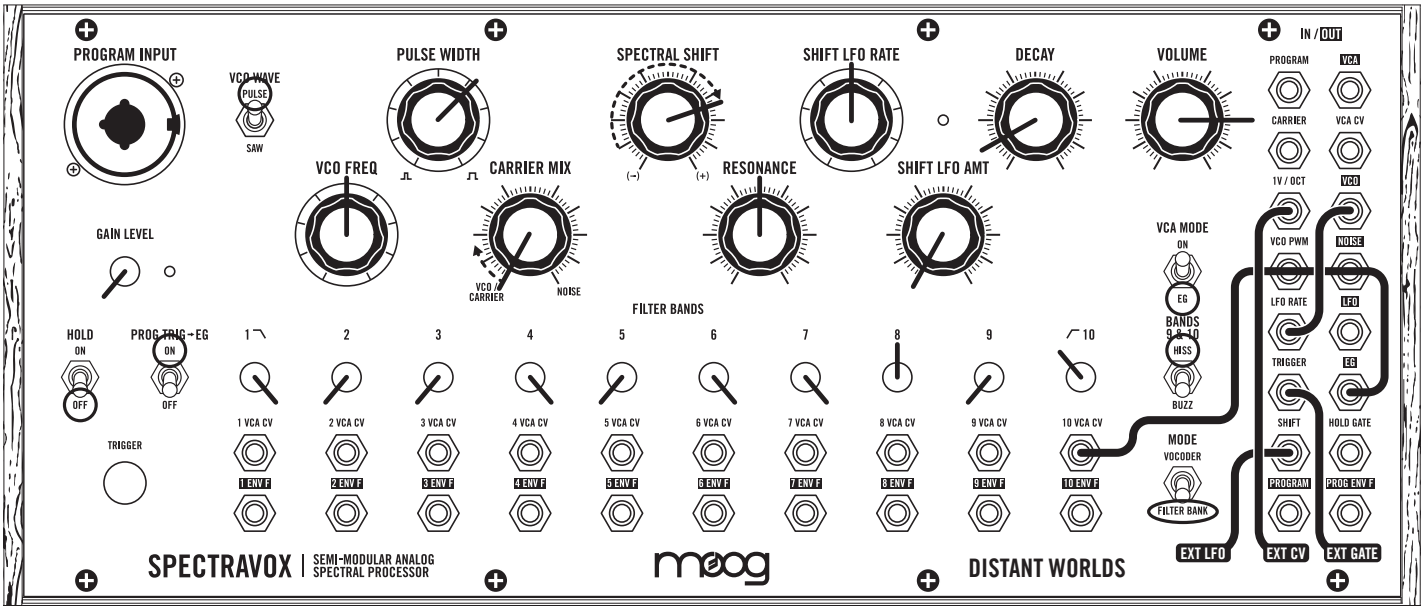
Additional presets and blank patch sheets can be downloaded when you register your instrument at www.moogmusic.com.

SCI-FI ROOM TONE



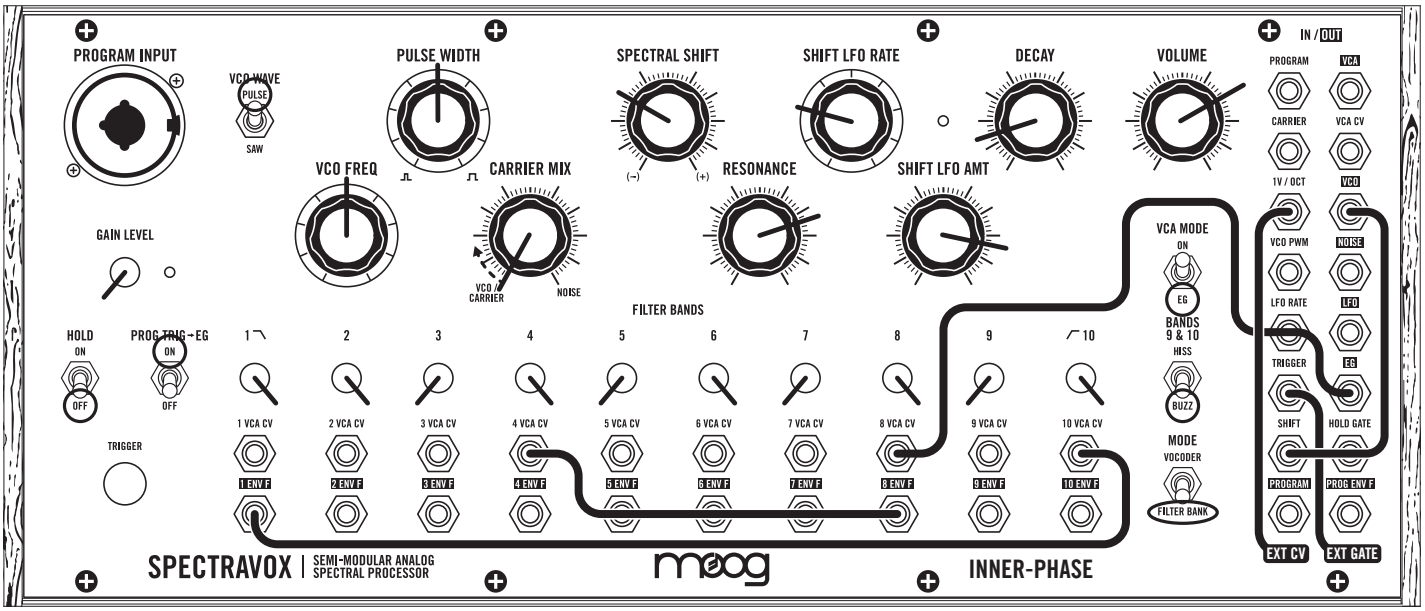
NOTES:
Adjust **VCO FREQ** and **SPECTRAL SHIFT** to create different ambient tones. Adjust filter band **6** to add more noise.

DISTANT WORLDS



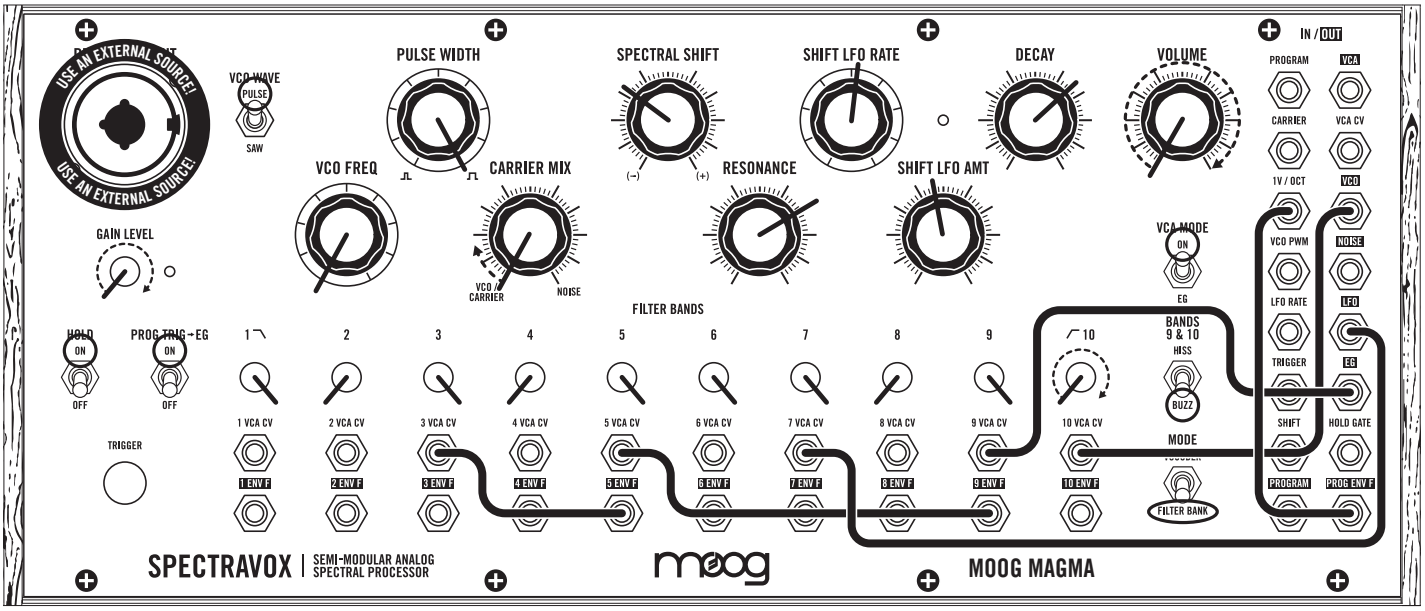
NOTES:
Connect **CV/GATE** outputs from an external source into **1V/OCT (CV)** and **TRIGGER (GATE)**.
Adjust **PULSE WIDTH** to sit at a “fifth” harmonic. Adjust **SPECTRAL SHIFT** for dramatic phase shifting FX.

INNER-PHASE



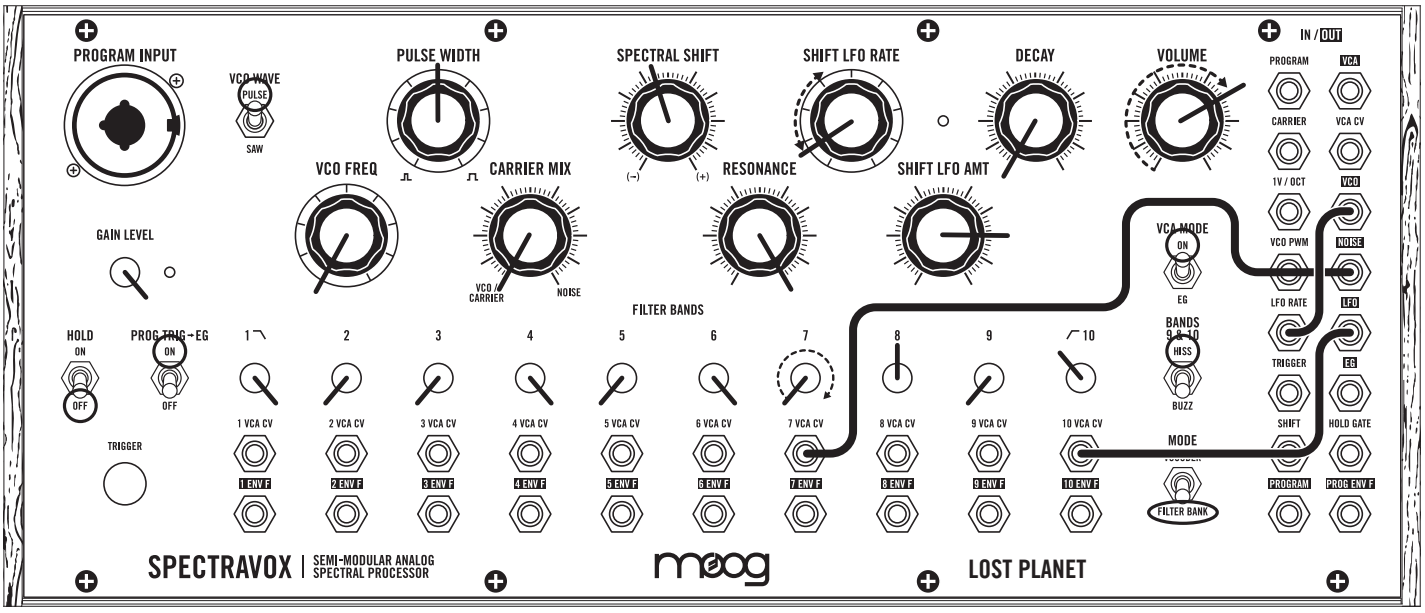
NOTES:
Connect **CV/GATE** outputs from an external source into **1V/OCT (CV)** and **TRIGGER (GATE)**.
Adjust **SPECTRAL SHIFT** for a variety of harmonics and colors.
Adjust **DECAY** for longer tones if playing from a keyboard.
Adjust **SHIFT LFO RATE** for speed of sweeps or ring modulation.

MOOG MAGMA



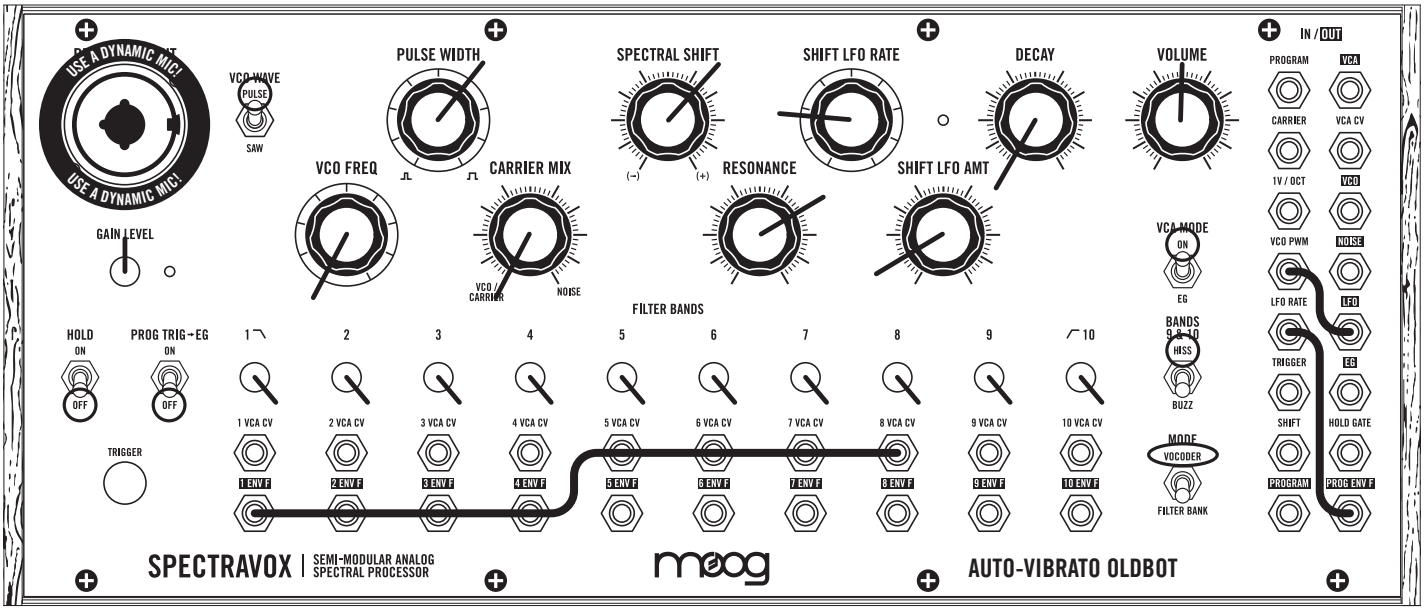
NOTES:
Use an external source such as a synthesizer, guitar, cassette, or phone.
Slowly increase **VOLUME**, momentarily adjust **CARRIER MIX** into **NOISE**.
Slowly increase **GAIN LEVEL** of **PROGRAM INPUT** for a variety of feedback FX.
Simultaneously adjust **SPECTRAL SHIFT** and **SHIFT LFO RATE** for different rhythm intervals.
Patch an external modulation source for wider variations.

LOST PLANET



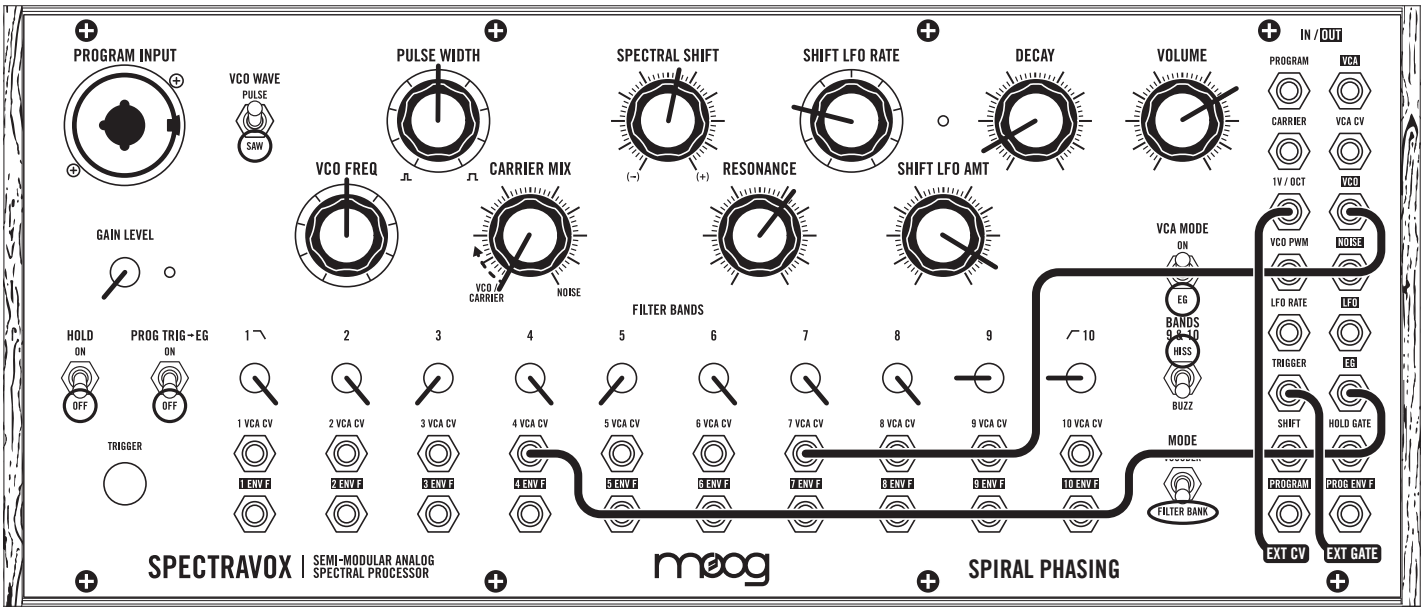
NOTES:
This is a self-generated patch. No external devices are needed.
Adjust **7 VCA CV** for “snare drum.”
Adjust **SHIFT LFO RATE** for different patterns.
Adjust **10 VCA CV** for “hi-hat.”

AUTO-VIBRATO OLDBOT



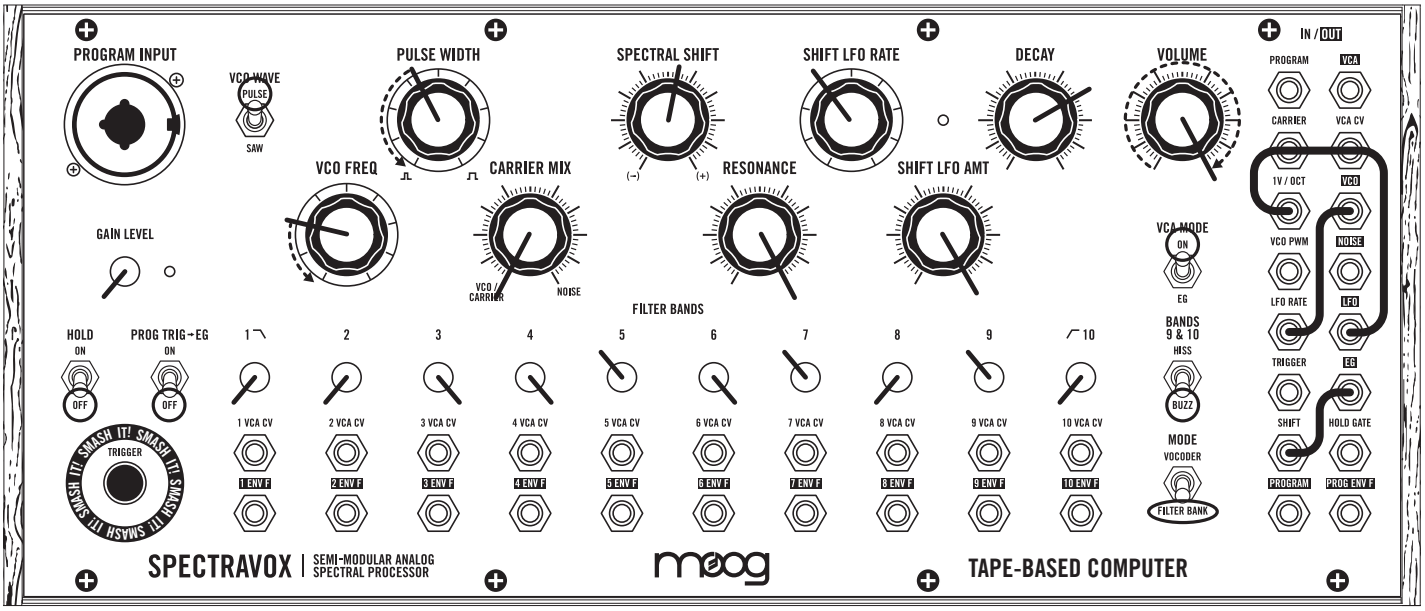
NOTES:
Speak or sing louder in the microphone for a faster robot vibrato.
Adjust **SPECTRAL SHIFT** up or down to change the robot’s age.
Swap the cable connecting **1 ENV F** to **8 VCA CV** to different **ENV F/VCA CV** pairs to explore how scrambling the vocoder filter banks changes the tonal characteristics.

SPIRAL PHASING



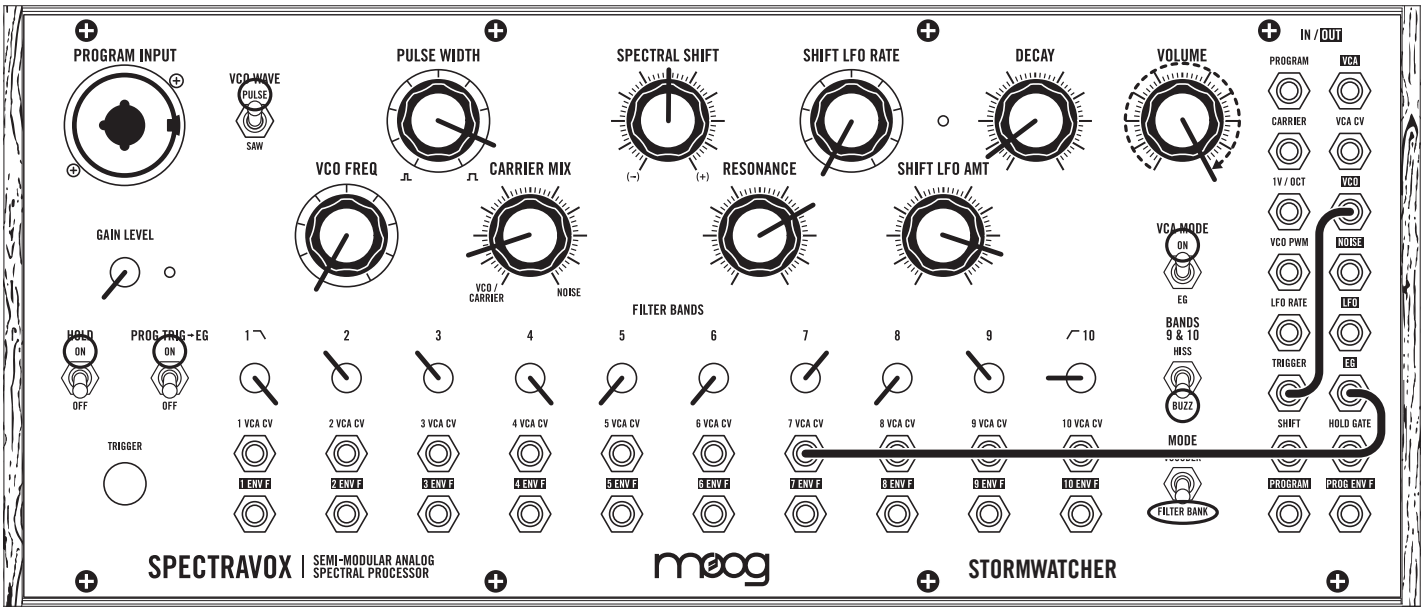
NOTES:
Connect **CV/GATE** outputs from an external source into **1V/OCT (CV)** and **TRIGGER (GATE)**.
Adjust **SPECTRAL SHIFT** various harmonics/peaks.
Adjust **SHIFT LFO RATE** for phaser speed.

TAPE-BASED COMPUTER



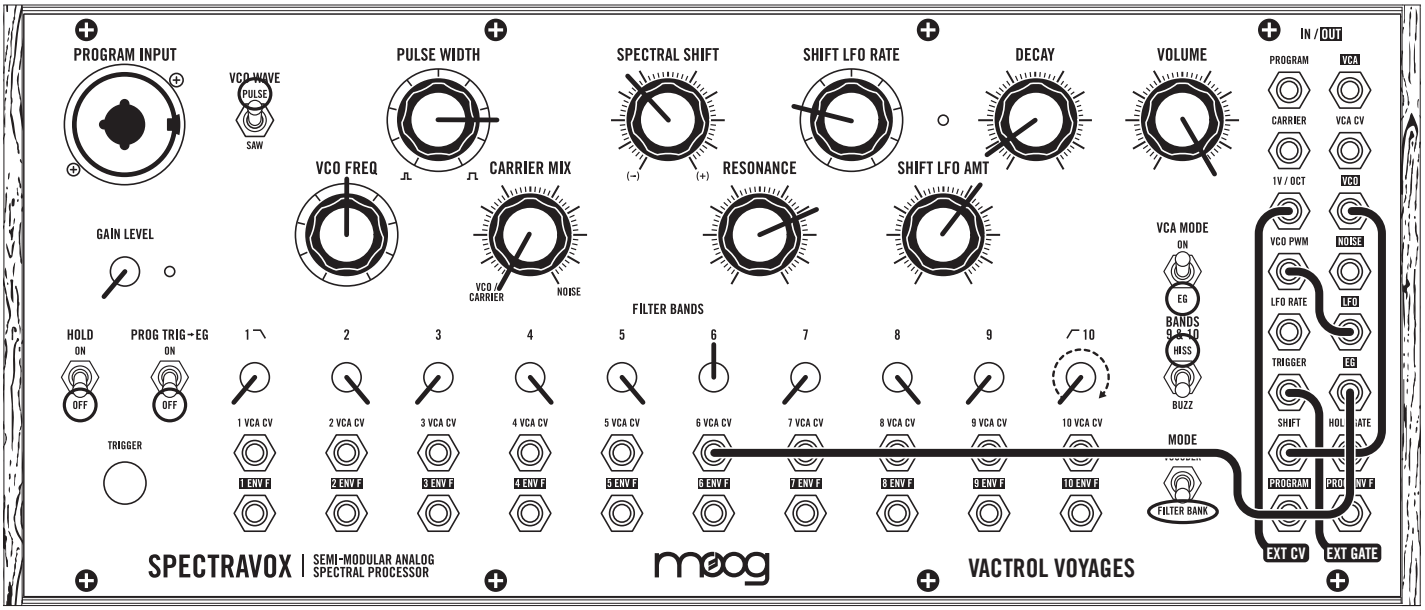
NOTES:
Adjust **PULSE WIDTH** for wild modulation.
Adjust **VCO FREQ** for shapes.
Adjust **SHIFT LFO AMT** for various sequences.
Adjust **SPECTRAL SHIFT** for different contour.
Manually **TRIGGER** for various extreme effects.

STORMWATCHER



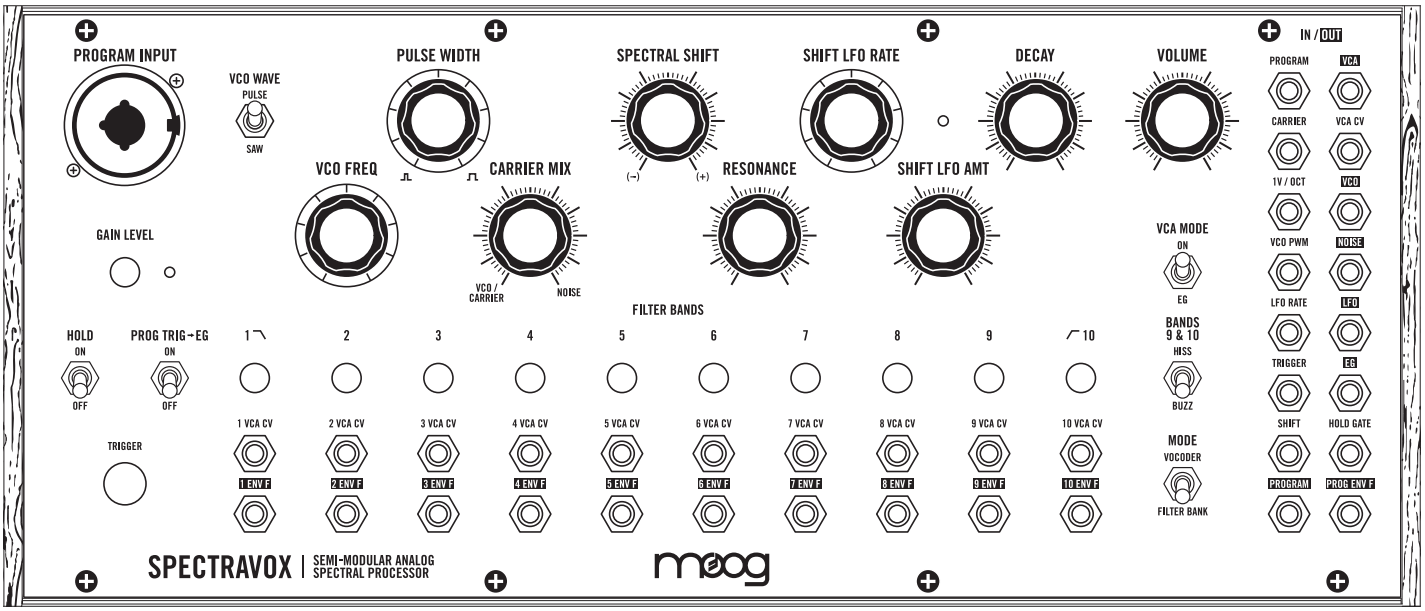
NOTES:
Explore this self-generative patch for soundscapes.
Adjust **7 VCA CV** for “helicopter” volume/distance.
Adjust **SHIFT LFO RATE** for sweep speed.
Stereo echo and reverb recommended.
Switch **VCO WAVE** from **PULSE** to **SAW**. Then adjust **VCO FREQ** for various patterns/speed.

VACTROL VOYAGES



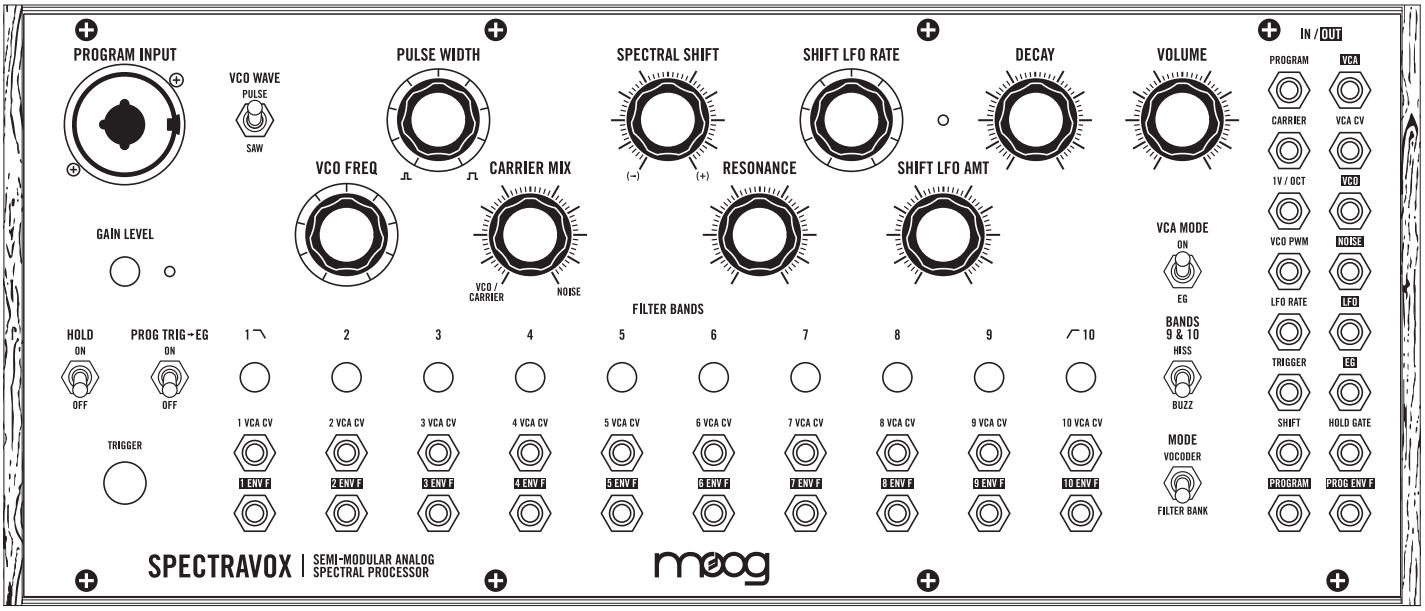
NOTES:
Connect **CV/GATE** outputs from an external source into **1V/OCT (CV)** and **TRIGGER (GATE)**.
Experiment with placement of the **SPECTRAL SHIFT** for interesting harmonic contours.
Slightly adjusting the **DECAY** will produce dramatic results.
Experiment with patching an **LFO**, **ENVELOPE**, or **VELOCITY** sequence into the **SHIFT** input for excellence.

PRESET NAME:



NOTES:

PRESET NAME:



NOTES:

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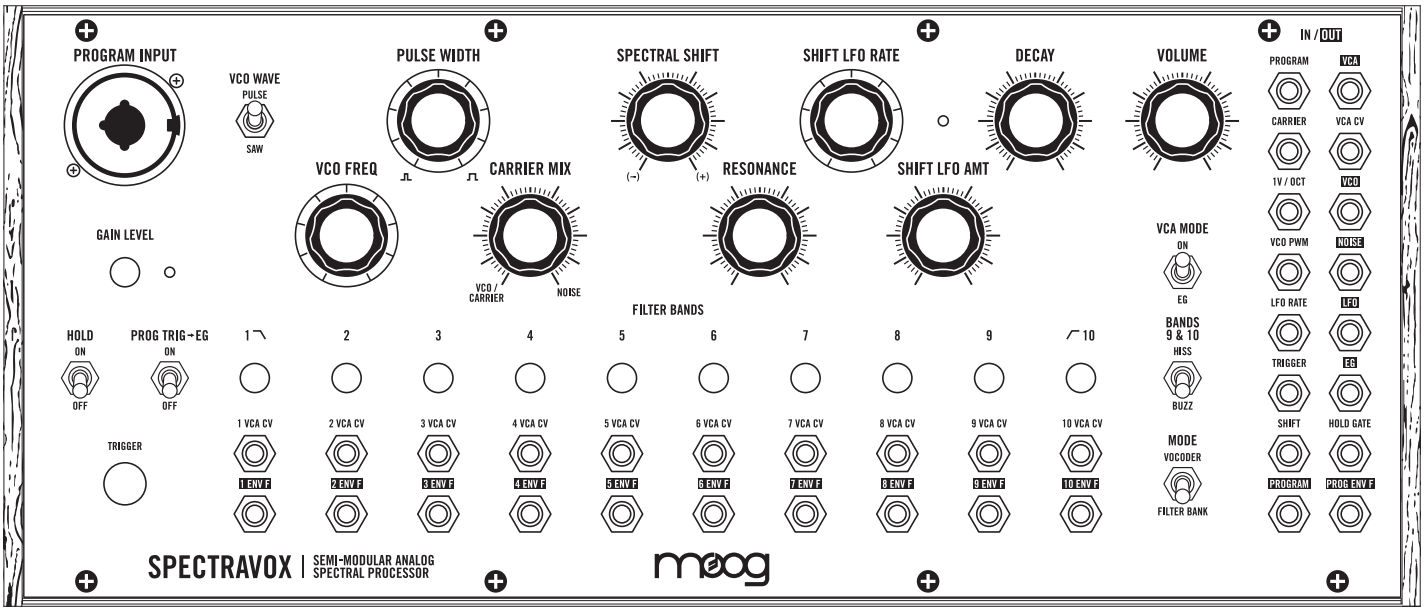
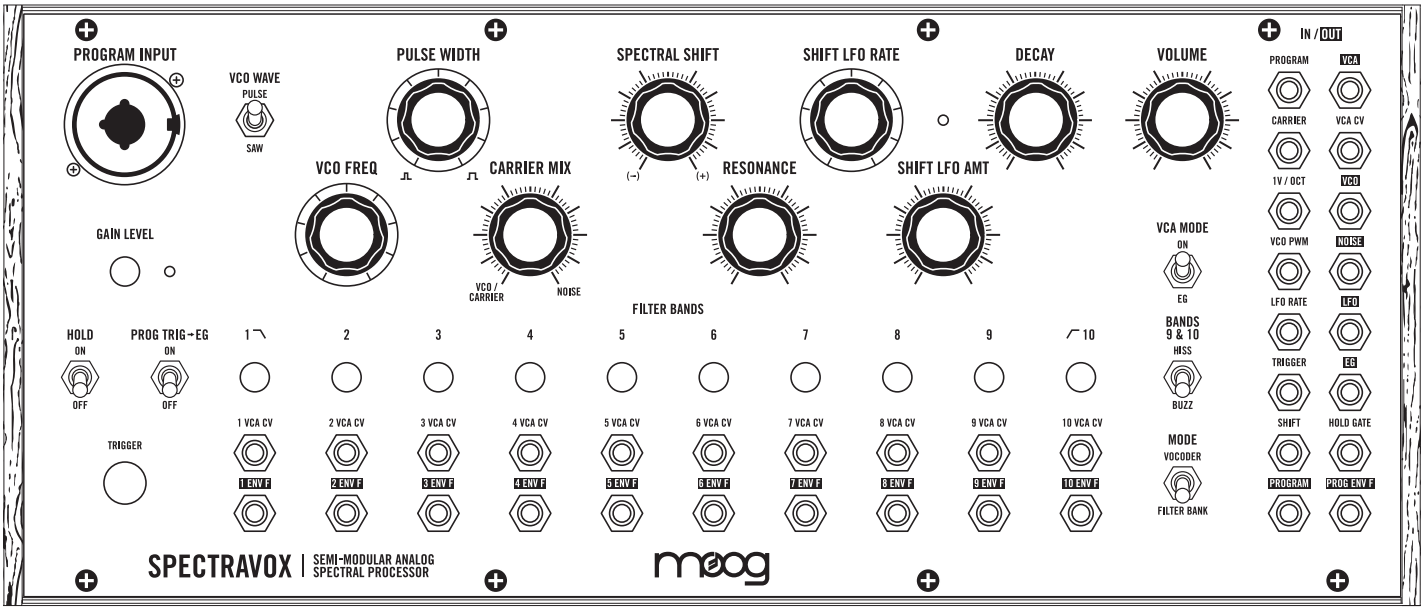


NOTES:

PRESET NAME:



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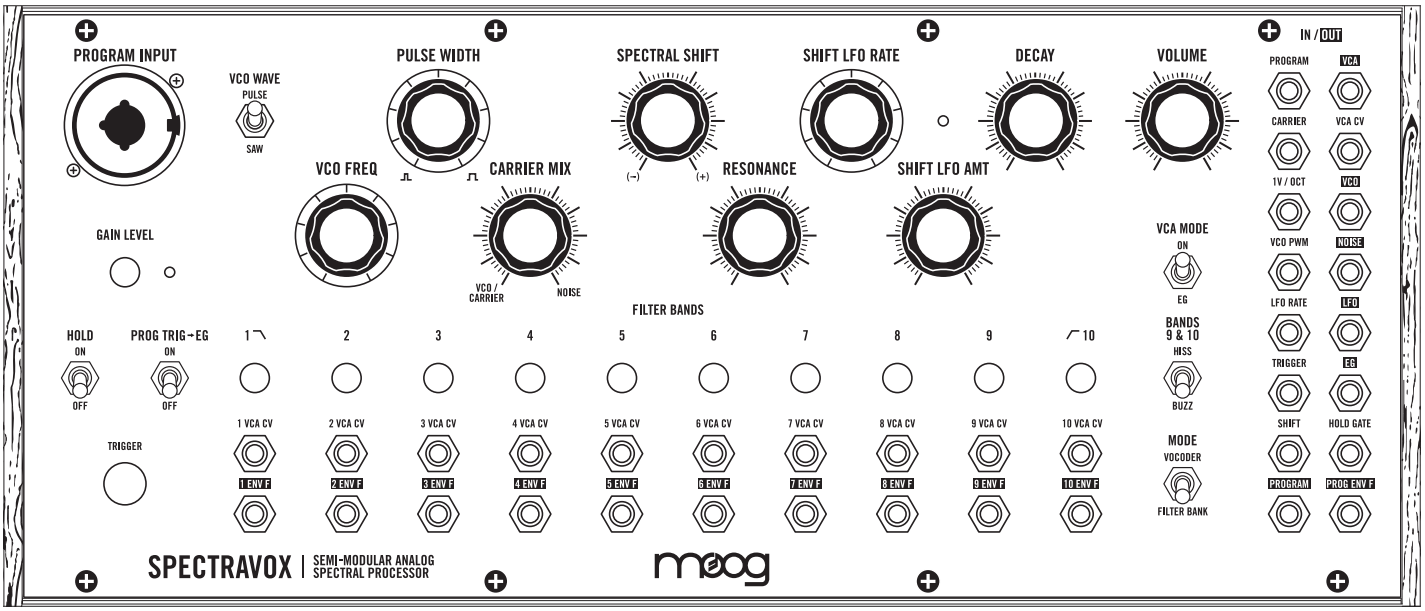

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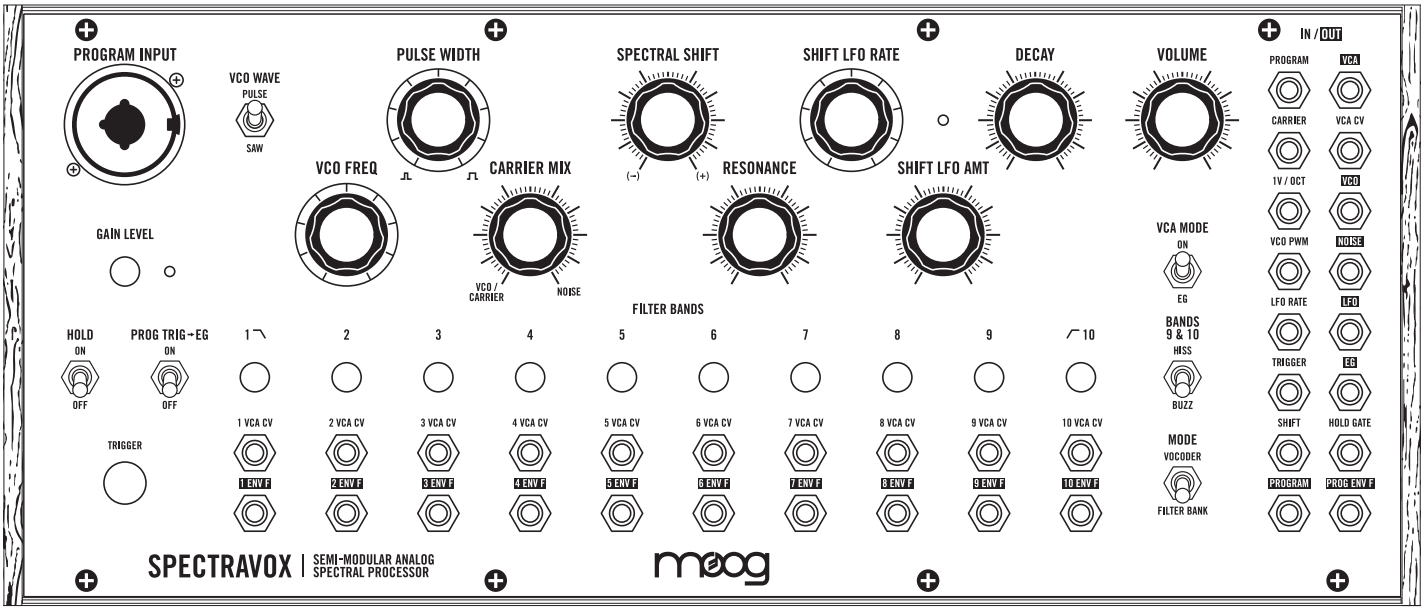

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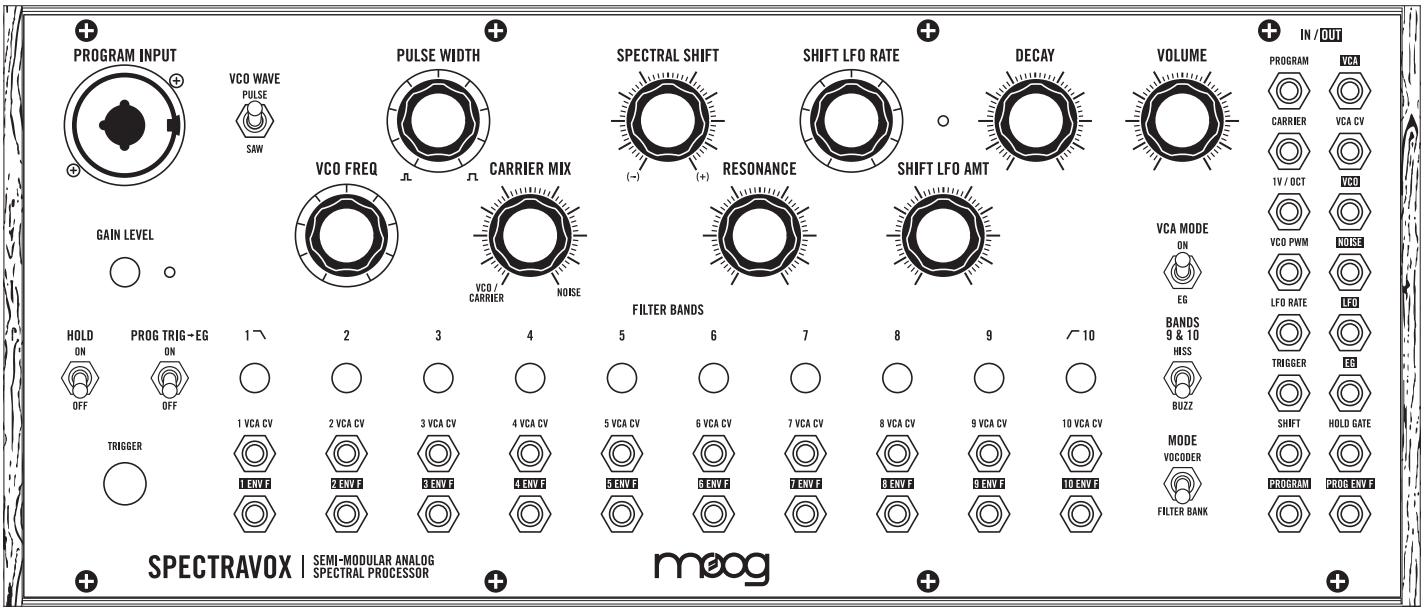
PRESET NAME:



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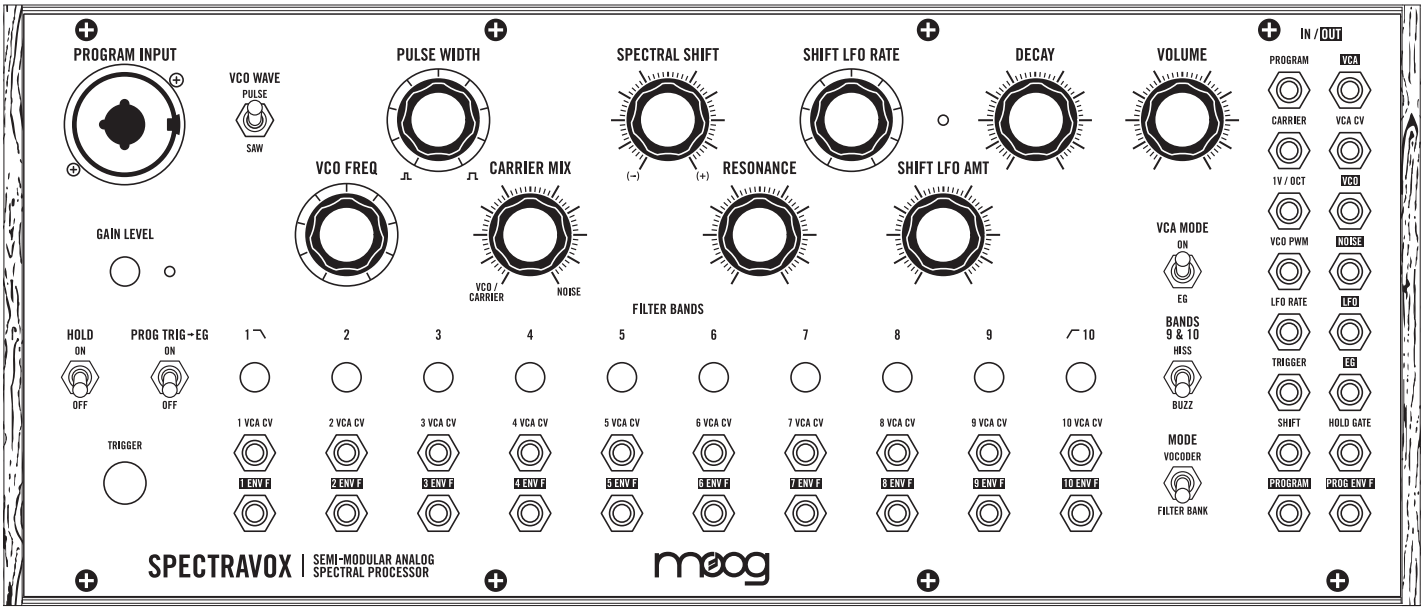

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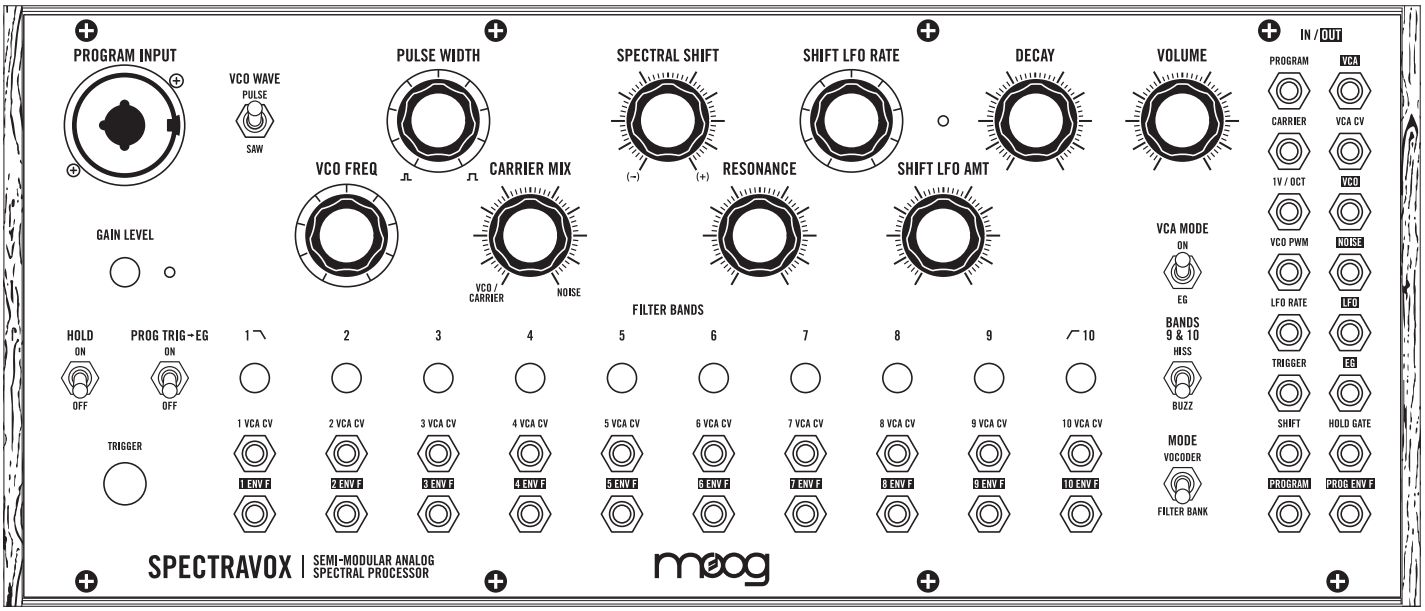

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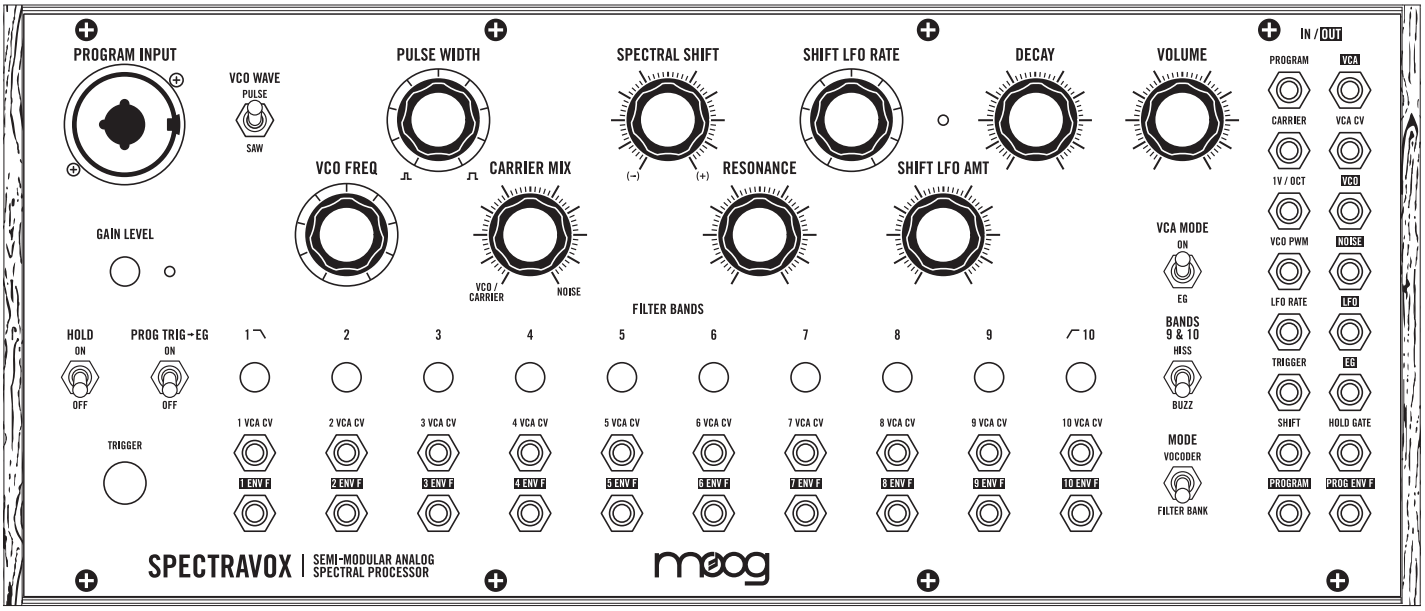

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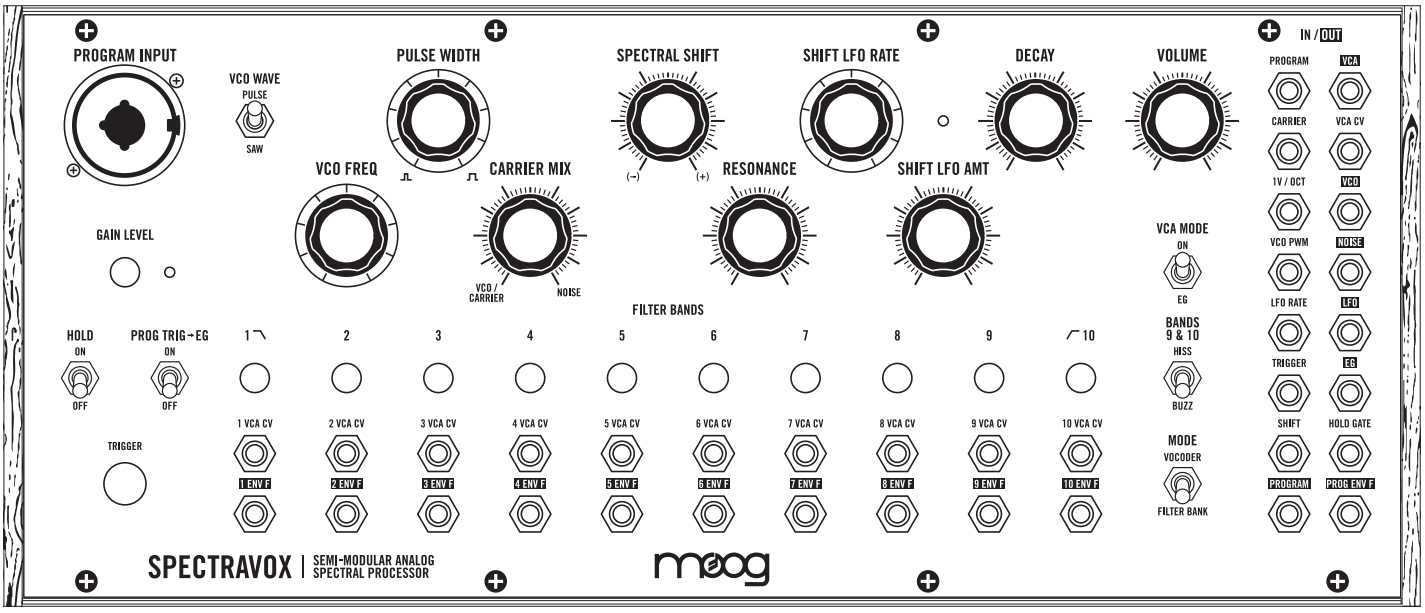

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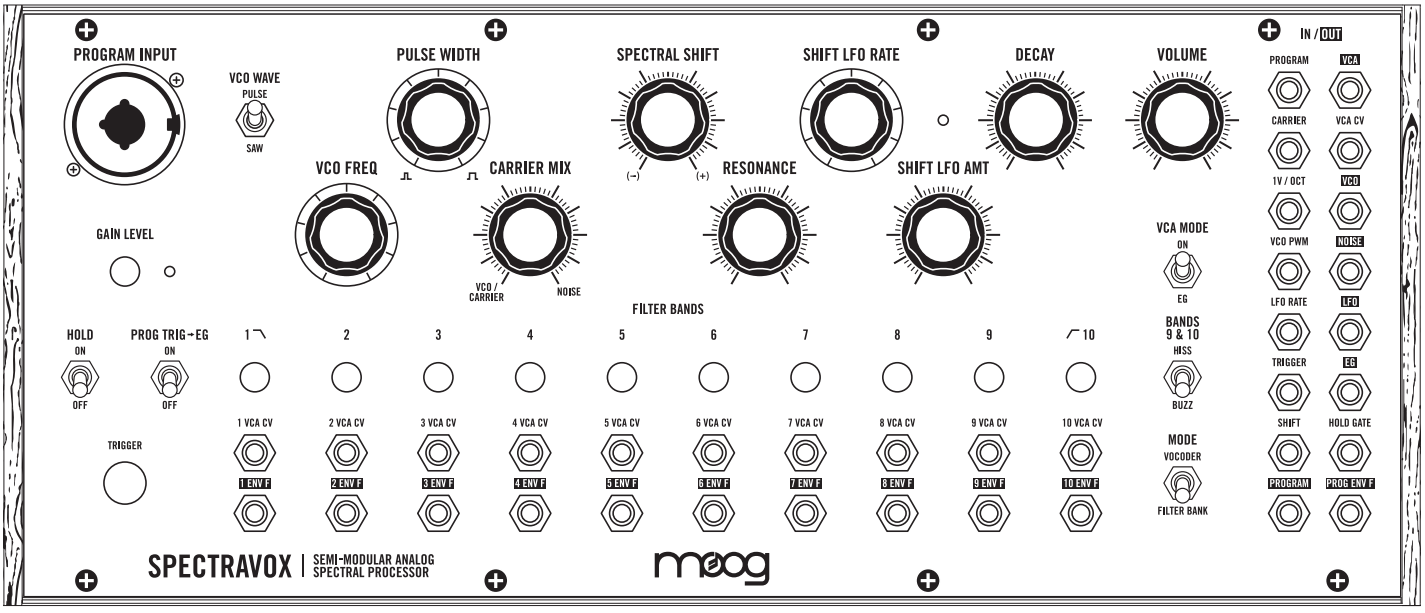

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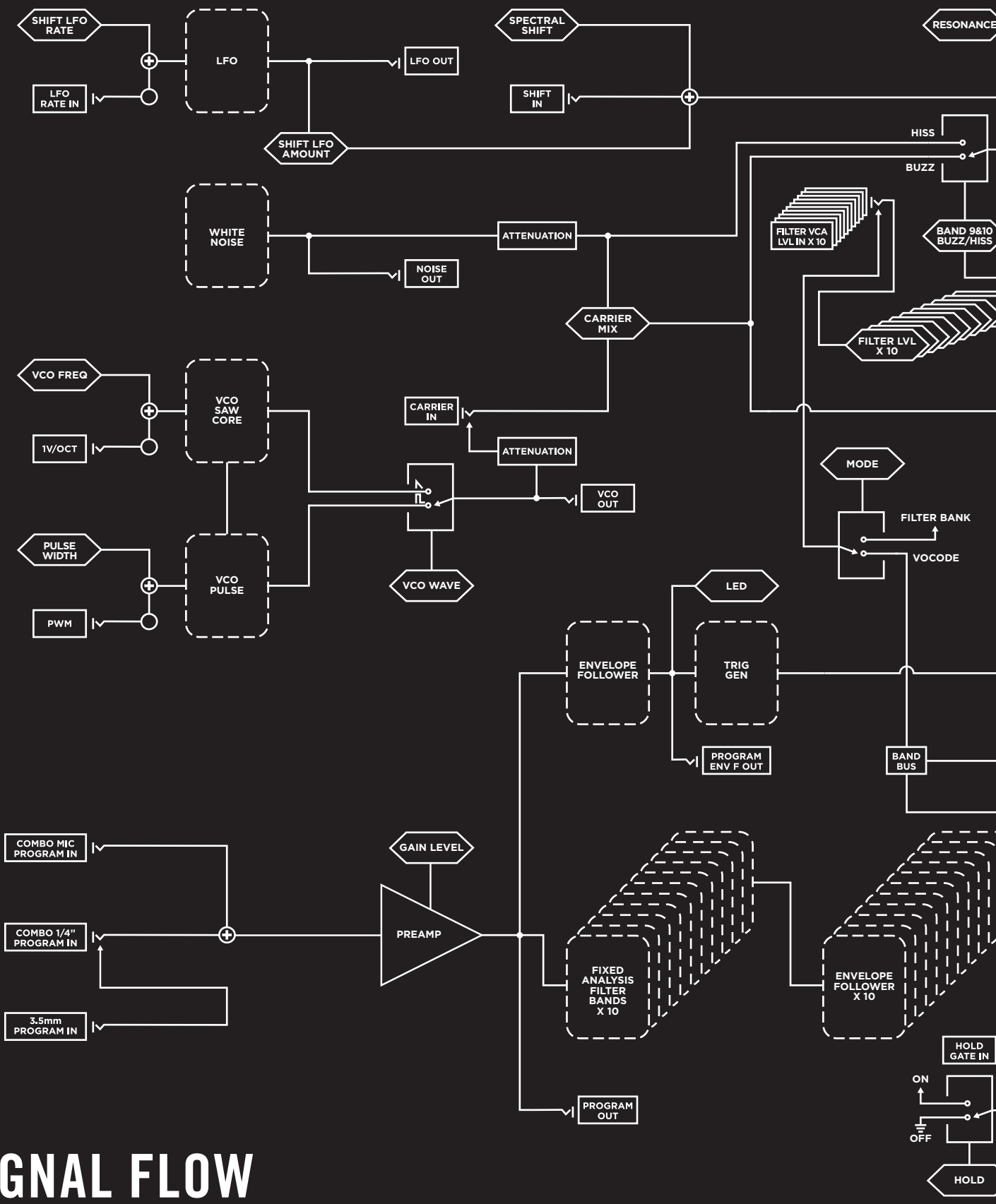
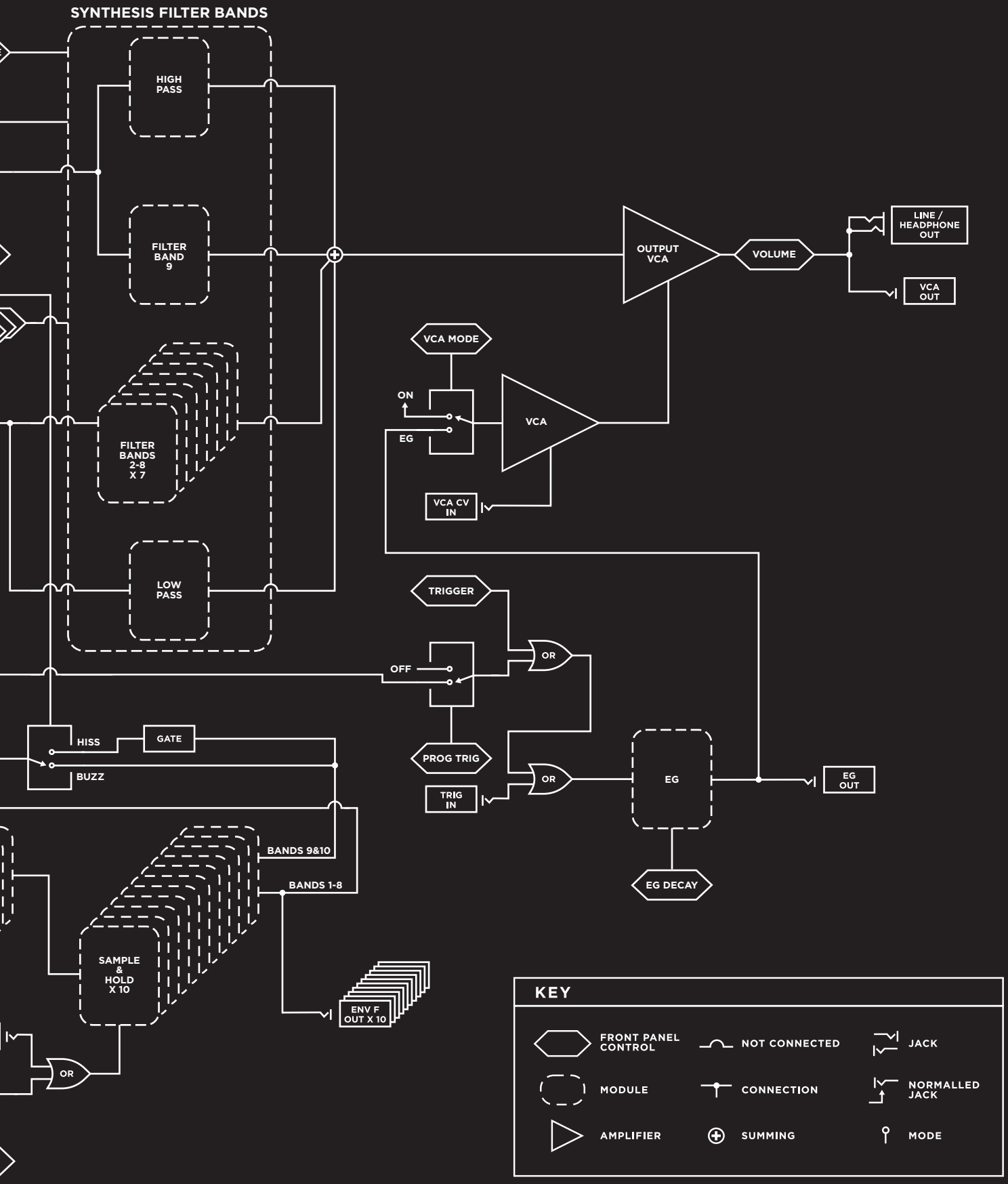

SHIFT LFO RATE
LFO RATE IN
LFO
LFO OUT
SHIFT LFO AMOUNT
SPECTRAL SHIFT
SHIFT IN
RESONANCE
HISS
BUZZ
WHITE NOISE
NOISE OUT
ATTENUATION
FILTER VCA LVL IN X 10
BAND 9&10 BUZZ/HISS
CARRIER MIX
FILTER LVL X 10
VCO FREQ
1V/OCT
VCO SAW CORE
CARRIER IN
ATTENUATION
VCO OUT
MODE
FILTER BANK
VOCODE
PULSE WIDTH
PWM
VCO PULSE
VCO WAVE
LED
ENVELOPE FOLLOWER
TRIG GEN
PROGRAM ENV F OUT
BAND BUS
COMBO MIC PROGRAM IN
COMBO 1/4" PROGRAM IN
3.5mm PROGRAM IN
GAIN LEVEL
PREAMP
FIXED ANALYSIS FILTER BANDS X 10
ENVELOPE FOLLOWER X 10
HOLD GATE IN
ON
OFF
HOLD
PROGRAM OUT

SIGNAL FLOW


SYNTHESIS FILTER BANDS
HIGH PASS
FILTER BAND 9
FILTER BANDS 2-8 X 7
LOW PASS
OUTPUT VCA
VOLUME
LINE / HEADPHONE OUT
VCA OUT
VCA MODE
ON
EG
VCA
VCA CV IN
TRIGGER
OR
OFF
HISS
GATE
BUZZ
PROG TRIG
TRIG IN
OR
EG
EG OUT
EG DECAY
BANDS 9&10
BANDS 1-8
SAMPLE & HOLD X 10
ENV F OUT X 10
OR
KEY
FRONT PANEL CONTROL
NOT CONNECTED
JACK
MODULE
CONNECTION
NORMALLED JACK
AMPLIFIER
SUMMING
MODE

SPECIFICATIONS

ANALOG SOUND ENGINE
SOURCES: VCO, White Noise Generator
FILTER: 10 variable resonance voltage-controlled filters—1 Lowpass Filter, 8 Bandpass Filters, 1 High-pass Filter
ENVELOPES: VCA EG (Decay)

ANALOG ANALYSIS ENGINE
SOURCES: Ext. Input via 1/4" / XLR combo jack or 3.5mm jack with preamplifier
ANALYSIS FILTER BANK: 10 fixed filters—1 Lowpass Filter, 8 Bandpass Filters, 1 Highpass Filter with envelope followers on each band

PATCH BAY
JACKS: 36 x 3.5mm
INPUTS: 19 Input Jacks
OUTPUTS: 17 Output Jacks

REAR PANEL
AUDIO: 1⁄4" TRS Headphone or 1⁄4" TS Instrument
POWER: Power Supply connection
SECURITY: Kensington Lock slot

DIMENSIONS
SIZE (WxDxH): 12.57" x 4.21" x 5.24"
WEIGHT: 3.5 lbs

POWER SUPPLY (INCLUDED)
STYLE: Wall adapter; barrel connection; center-pin positive
INPUT: 100 – 240VAC; 50 Hz – 60 Hz
OUTPUT: +12VDC; 1200mA

POWER CONSUMPTION
TYPICAL: 4.8 Watts

EURORACK SPECS
CURRENT DRAW: 450mA (maximum) from +12VDC (10-pin header)
MOUNTING DIMS: 60HP (1.5" Module Depth)

ACCESSORIES
The following accessories are available for purchase at authorized Moog dealers and select offerings at www.moogmusic.com:

KNOB KIT FOR KNURLED POTS (QTY 25)
2-TIER VERTICAL RACK KIT
3-TIER VERTICAL RACK KIT
4-TIER VERTICAL RACK KIT
6" 3.5 mm CABLE PACK (QTY 5)
12" 3.5 mm CABLE PACK (QTY 5)
104-HP POWERED EURORACK CASE
BACKUP POWER SUPPLY

SERVICE & SUPPORT INFORMATION

MOOG'S STANDARD WARRANTY

Moog warrants its products to be free of defects in materials or workmanship and conforming to specifications at the time of shipment. The Warranty Period is one year from the date of purchase. If, in Moog's determination, it has been more than five years since the product shipped from our factory, it will be at Moog's discretion whether or not to honor the warranty without regard to the date of the purchase. During the Warranty Period, any defective products will be repaired or replaced, at Moog's option, on a return-to-factory basis. This warranty covers defects that Moog determines are no fault of the user.

The Moog Limited Warranty applies to USA purchasers only. Outside the USA the warranty policy and associated service is determined by the laws of the country of purchase and supported by our local authorized distributor. A listing of our authorized distributors is available at www.moogmusic.com.

If you purchase outside of your country, you can expect to be charged for warranty as well as non-warranty service by the service center in your country.

RETURNING YOUR PRODUCT TO MOOG MUSIC

You must obtain prior approval in the form of an RMA (Return Material Authorization) number from Moog before returning any product. Email techsupport@moogmusic.com for the RMA number or call us at +1 (828) 251-0090. All products must be packed carefully and shipped with the Moog supplied power adapter. Spectravox must be returned in the original inner packing including the cardboard inserts. The warranty will not be honored if the product is not properly packed. Once you have received the RMA number and carefully packed your Moog Spectravox, ship the product to Moog Music with transportation and insurance charges paid, and be sure to include your return shipping address.

MOOG MUSIC
160 Broadway St.
Asheville, NC 28801

WHAT WE WILL DO

Once received, we will examine the product for any obvious signs of user abuse or damage as a result of transport. If the product was abused, was damaged in transit, or is out of warranty, we will contact you with an estimate of the repair cost. If warranty work is performed, Moog will ship and insure your product to your United States address free of charge.

HOW TO INITIATE YOUR WARRANTY

Please initiate your warranty online at www.moogmusic.com/register. If you do not have web access, please call (828) 251-0090 to register your product.

CARING FOR SPECTRAVOX

Clean Spectravox with a soft, dry cloth only—do not use solvents or abrasive detergents. Heed the safety warnings at the beginning of the manual. Do not drop the unit.

AN IMPORTANT NOTE ABOUT SAFETY: *There are no user serviceable parts in Spectravox. Refer all servicing to qualified personnel only.*

Phone: +1 (828) 251-0090 | Email: info@moogmusic.com | Website: www.moogmusic.com

Devoted to the Design and Manufacture of Electronic Instruments for the Musician