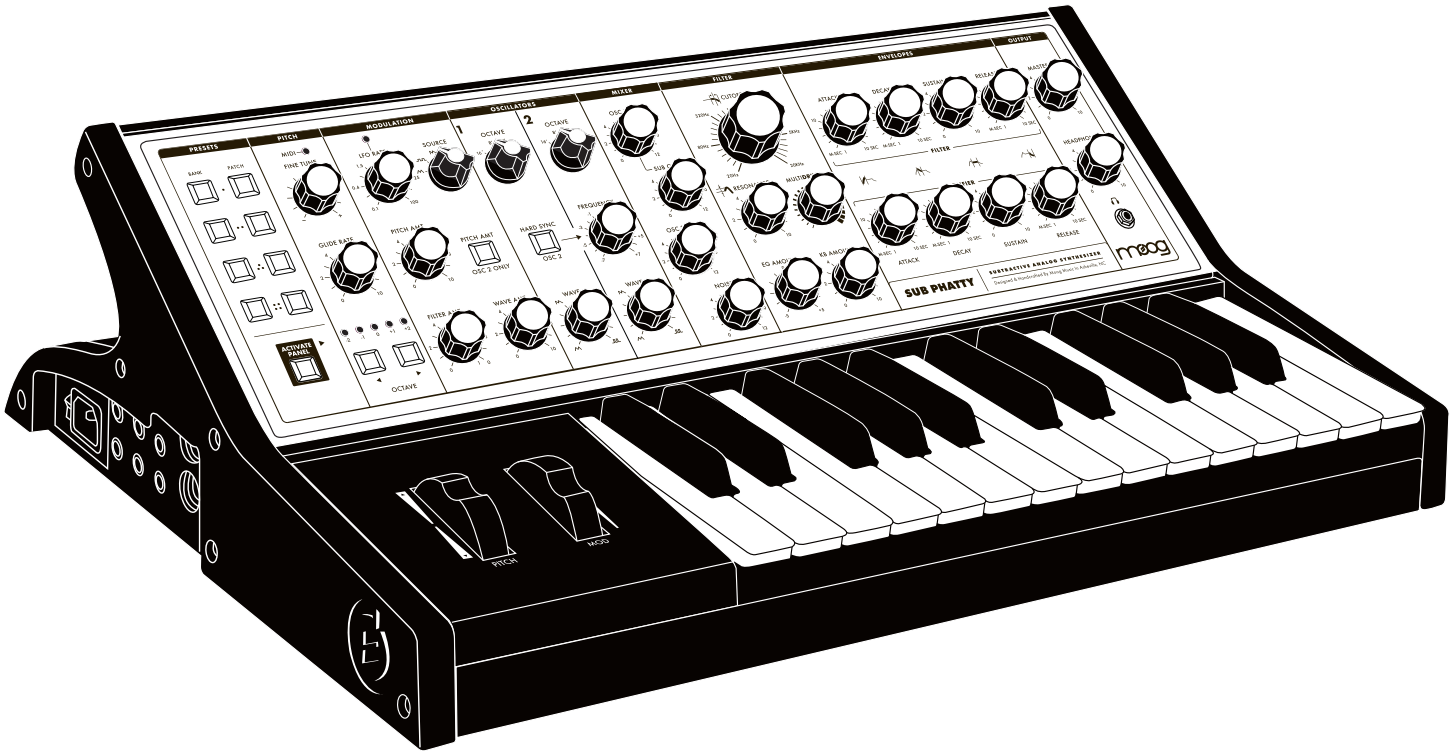
SUB PHATTY

USER'S MANUAL


PRESETS
PITCH
MODULATION
OSCILLATORS
MIXER
FILTER
ENVELOPES
OUTPUT
SUB PHATTY
moog
PITCH
MOD

I CAN FEEL WHAT'S GOING ON INSIDE A PIECE OF ELECTRONIC EQUIPMENT. IT'S SOMETHING BETWEEN DISCOVERING AND WITNESSING. ····· **DR. 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 this product near water - for example, near a bathtub, washbowl, kitchen sink, in a wet basement, or near a swimming pool or the like.

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.

6. The product should be connected to a power supply only of the type described in the operating instructions or as marked on the product.

7. The power-supply cord of the product should be unplugged from the outlet when left unused for a long period of time.

8. Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

9. The product should be serviced by qualified personnel when:
    a. The power supply cord or the plug has been damaged.
    b. Objects have fallen, or liquid has been spilled onto the product.
    c. The product has been exposed to rain.
    d. The product does not appear to operate normally or exhibits a marked change in performance.
    e. The product has been dropped or the enclosure damaged.

INSTRUCTIONS PERTAINING TO RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS.
Do not open the chassis. There are no user serviceable parts inside. Refer all servicing to qualified personnel only.

GROUNDING INSTRUCTIONS: This product must be grounded. If it should malfunction or breakdown, grounding provides a path of least resistance for electrical current to reduce the risk of electric shock. This product is equipped with a cord having an equipment grounding connector and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

DANGER: Improper connection of the equipment-grounding connector can result in a risk of electric shock. Check with a qualified electrician or serviceman if you are in doubt as to whether the product is properly grounded. Do not modify the plug provided with this product – if it will not fit in the outlet, have a proper outlet installed by a qualified electrician.

TABLE OF CONTENTS

UNPACKING AND INSPECTION

Check the contents of the shipping carton

Be careful when unpacking the Sub Phatty so that nothing is lost or damaged. Moog recommends saving the carton and all packing materials in case you ever need to ship the instrument for any reason.

The Moog Sub Phatty ships with the following items:

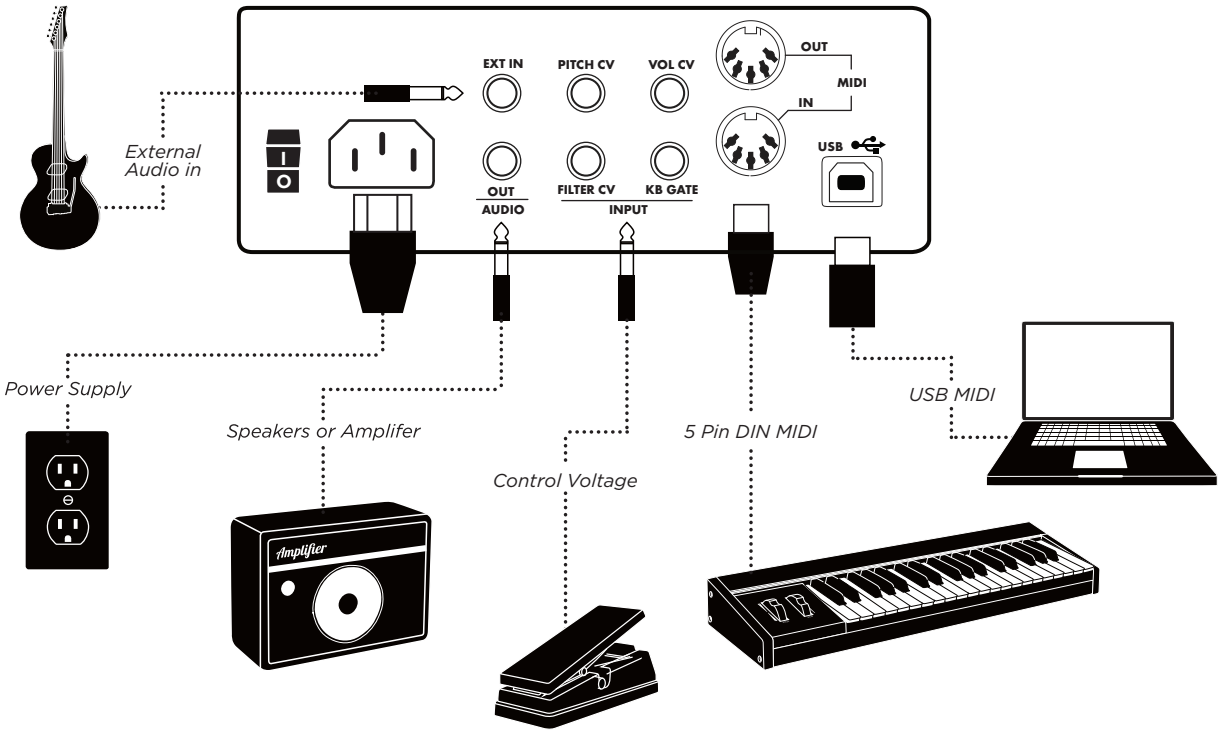
1. Sub Phatty synthesizer
2. Power cord
3. Owner's manual
4. Registration card

What you will need:

1. A stand or table sufficient to support the Sub Phatty
2. Either a 1/4 inch instrument cable and amplified speakers or headphones with a 1/4" inch plug
3. A properly wired AC outlet

SETUP AND CONNECTIONS

Place the Sub Phatty on a stable surface such as a table or keyboard stand at a height suitable for playing comfortably.



POWER

Plug one end of the supplied AC cord into the standard IEC power connector on the Sub Phatty's left-side panel. Plug the other end into an AC outlet. The Sub Phatty's universal power supply will operate with 50 or 60Hz AC power sources ranging from 100 to 240 volts. Flip on the power switch located next to the power connector.

NOTE: *It may take as long as 60 seconds for the Sub Phatty to warm up before oscillator tuning has stabilized if you've left it outside on a cold night. (Although its oscillators are surprisingly stable, the Sub Phatty is an analog synthesizer, after all.)*

AUDIO OUT

With the **MASTER VOLUME** turned all the way down, plug one end of a 1/4 inch instrument cable into the Sub Phatty's unbalanced **AUDIO OUT** jack and the other end into an amplified speaker or mixing console input. Adjust the level by slowly turning the **MASTER VOLUME** knob clockwise while playing the keyboard.

If you'll be using headphones, plug them into the headphones jack (on the front panel's bottom-right corner) with **HEADPHONE VOLUME** turned all the way down. Adjust the level by slowly turning the **HEADPHONE VOLUME** knob clockwise while playing the keyboard. Note that **MASTER VOLUME** must be turned up as well.

EXTERNAL AUDIO IN

Located just above the **AUDIO OUT** jack, the jack labeled **EXT IN** allows the Sub Phatty to shape and filter external sounds. This is an unbalanced input that accepts a line-level signal. You can adjust the audio level using Shift mode (see page. 25) or the plug-in editor.

NOTE: *You must press a key to pass external audio through the Sub Phatty. You also can use a Moog FS-1 footswitch, or any 1/4" cable to open the gate. Simply connect to the 1/4" Gate jack.*

USB

To use the Sub Phatty with a computer, connect one end of a USB cable to the Sub Phatty's USB port and the other end to an available USB port on your computer. The Sub Phatty supports MIDI I/O over USB, but not audio data.

MIDI

Using the Sub Phatty with an external MIDI device requires one or two MIDI cables. To use the Sub Phatty as a MIDI controller, connect one end of a MIDI cable to the Sub Phatty's **MIDI OUT** jack and the other end to another device's **MIDI IN** jack.

To control the Sub Phatty from an external MIDI controller, connect one end of a MIDI cable to the Sub Phatty's **MIDI IN** jack and the other end to an external controller's **MIDI OUT** jack. By default, the Sub Phatty is set to transmit and receive MIDI data on MIDI Channel 1.

CONTROL VOLTAGE IN

The **PITCH CV, FILTER CV,** and **VOL CV** inputs each accepts an expression pedal (such as the Moog EP-2) or a control voltage signal from 0 to +5 volts. If you connect an expression pedal to **VOL CV**, you can use your foot to control the Sub Phatty's output level. If you connect an expression pedal to **FILTER CV,** you can sweep the filter cutoff in the same manner. The **PITCH CV** and **FILTER CV** inputs are calibrated so that a one-volt change in the control voltage will result in a one-octave change in frequency.

The **KB GATE** input accepts a +5 volt signal, which causes the Sub Phatty's envelopes to trigger.

OVERVIEW AND FEATURES

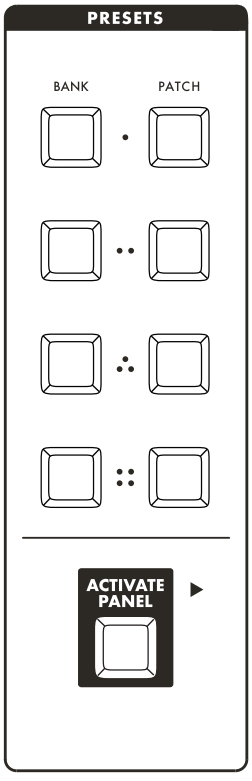
The Sub Phatty is a monophonic analog synthesizer, very much in the tradition of other classic Moog synthesizers. It is housed in a sturdy case containing a 25-note, velocity-sensitive keyboard, with a front panel that delivers plenty of hands-on controls for designing, saving, and retrieving your own sounds. Like many instruments, the Sub Phatty is monophonic, meaning that it plays one note at a time. It offers a 100% analog audio signal path with two exceptionally stable voltage-controlled oscillators, a square-wave suboscillator, a noise generator, two ADSR envelope generators, and a voltage-controlled, ladder-type lowpass filter capable of self-oscillation. One feature that makes the Sub Phatty unique is MultiDrive, a variable multistage drive circuit that delivers overdrive and distortion. Virtually every function on the Sub Phatty has its own knob, and every knob sends MIDI Control Change (CC) data.

Although the Sub Phatty's straightforward signal path and traditional one-knob-per-function user interface make it ideal for beginning synthesists, it is an excellent addition to any electronic musician's studio setup or live performer's stage rig. Thanks to its MIDI capabilities, you can easily layer the Sub Phatty with other sound sources or integrate it into a multitrack DAW-based studio. The external audio input lets you use it to process sounds from other instruments or microphones.

The Sub Phatty's internal patch memory stores 16 user-rewritable presets. The free editor/librarian/controller plug-in allows your computer to store as many presets as you like and provides a graphical user interface for programming your own sounds.

Like other synths in the Voyager and Little Phatty families, the Sub Phatty has syncable audio oscillators with continuously variable waveforms, as well as a low-frequency oscillator (LFO) that syncs to MIDI clock and offers a choice of modulation waveforms. In addition to a mono audio output with a dedicated volume knob, the Sub Phatty has a front-panel headphone output with a separate volume knob.

PRESETS PANEL



BANK AND PATCH BUTTONS

The Sub Phatty ships with 16 presets, and you can replace any of them with your own patches. (The word patch is a holdover from modular synthesis, which requires patch cords to connect the various modules.)

Patches are arranged in four banks, each containing four presets. On the front panel's left side, you'll see two rows of buttons in the **PRESETS** section. Use the row on the left to select banks and the row on the right to select presets within those banks. For example, to select preset 1 in bank 2, first press the second button on the left and then press the first button on the right. You can tell at a glance which preset is active because the corresponding **BANK** and **PATCH** buttons will be illuminated. If you select a new bank, the new **BANK** button will pulsate slowly until a new patch is selected.

Take your time, listen to all the presets, and turn some knobs to get a feel for how you can use them to alter the sounds. Whenever you want to go back to the original stored preset, just select it again using the same **BANK** and **PATCH** buttons.

*NOTE: The **PRESETS** section's buttons also provide access to Shift mode, which allows you to activate "under the hood" features from the Sub Phatty's front panel. (To learn more, see page 23.)*

SAVING PRESETS

Saving presets is a two-finger maneuver. Just remember that whenever you save a preset to a particular location, the preset previously stored in that location will be deleted.

To save your changes, press and hold the **BANK** button corresponding to the bank in which you want to store your new preset. While holding the **BANK** button, press the **PATCH** button corresponding to the location in which you want to store it, hold both buttons for at least one second, and then release them.

NOTE: *Both buttons will flash and then go solid again to indicate that your new preset has been stored.*

If you release both buttons before one second has elapsed, both buttons will continue flashing. By pressing and holding the **ACTIVATE PANEL** button as they're flashing, you can listen to the preset currently stored in the selected location to make sure it's the one you want to replace. Releasing **ACTIVATE PANEL** returns to your unsaved patch. At this point, you can either finish saving your preset by repeating the save procedure or cancel saving by pressing any of the **BANK** buttons.

ACTIVATE PANEL

Pressing the **ACTIVATE PANEL** button puts the Sub Phatty in Panel mode. Pressing it again returns the Sub Phatty to Preset mode. In Panel mode, the front-panel settings determine the sound rather than a stored preset. The current position of each knob and the status of four buttons determine the sound coming out of the Sub Phatty. Dialing up sounds in Panel mode is exactly like dialing up sounds in a classic synth without patch memory, but when you're finished sculpting your sound, you can save your work. Saving a preset stores all the settings that define your new sound.

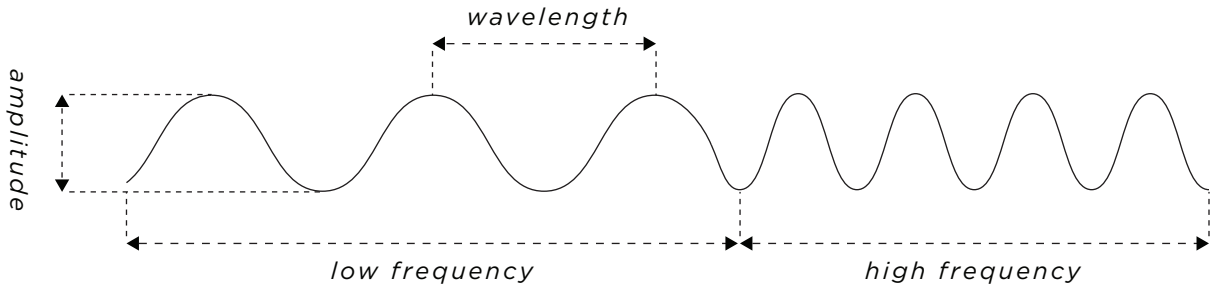
To learn how to create your own patches in Panel mode, continue reading this manual.

BASICS OF SOUND

If you're new to the world of music synthesis, it helps to have at least a rudimentary understanding of music and acoustics. Even if you know this stuff like the back of your hand, it never hurts to approach it from a fresh perspective.

Several qualities distinguish one musical sound from another, including pitch, loudness, duration, and timbre. Being able to manipulate those qualities allows you to turn raw sound into music.

Simply put, sound occurs when a vibrating object causes the air around it to vibrate. That object could be a guitar string, a loudspeaker, or anything capable of rapid movement. An individual vibration is called a wave or cycle, and the rate of vibration is called frequency. Frequency determines the sound's pitch, and pitch determines how high or how low you perceive the sound on a musical scale. Frequency is measured in Hertz (abbreviated Hz), which describes the actual number of times that something vibrates every second. One thousand cycles per second is called a kilohertz (kHz).



BASICS OF SOUND CONT.

Amplitude—the intensity of vibration—determines a sound's loudness. A high-amplitude sound is loud, and a low-amplitude sound is soft. A vibrating source's loudness depends on the amount of air it displaces, and that depends on how hard it vibrates.

It's difficult for anyone to identify a musical instrument simply by the pitch or loudness of the sounds it makes. Every musical sound also has a characteristic tone color or timbre (pronounced tam'–br, as in tamborine, not tim'–br, as in a tree falling). Differences in timbre make it possible to distinguish one instrument from another.

If you analyze a single cycle of a musical sound, you can perceive it as a complex combination of simple sine waves, each wave different in frequency and amplitude. When their frequencies are whole-number multiples of each other (and in musical sounds, they usually are), those simple waves are called harmonics. A sound's timbre depends on its harmonic content. The first harmonic—the one with the lowest frequency and usually the greatest amplitude—determines its pitch. Higher harmonics are often called overtones. Normally, the higher the overtone's frequency, then the weaker its amplitude.

When those harmonics are combined in a musical sound, a single cycle of that sound has a specific shape, which synthesists call a waveform. Just as the frequencies and relative amplitudes of the sound's harmonics determine its waveform, the waveform determines the sound's timbre.

Instead of producing sounds acoustically the way vibrating objects do, synthesizers generate electrical signals that are amplified and converted to sound. Just as sound has frequency and amplitude, so does the kind of alternating current produced by a synthesizer. An analog synthesizer's primary sound source is called an oscillator.

The oscillator's waveform, of course, determines the sound's harmonic content. Some waveforms are rich in harmonics, while others have relatively few. Depending on the waveform, some overtones may be absent altogether. Waveforms with lots of overtones, such as sawtooth and square waves, are harmonically the most complex. Waveforms with fewer overtones, such as triangle and narrow pulse waves, are harmonically less complex.

Rather than building up waveforms one harmonic at a time, the way a Hammond organ does, analog synthesizers like the Sub Phatty provide the means to shape and filter complex, harmonically rich waveforms to selectively remove, reduce, or emphasize specific harmonics—a technique called subtractive synthesis.

KB: *Keyboard (Pitch Voltage)*

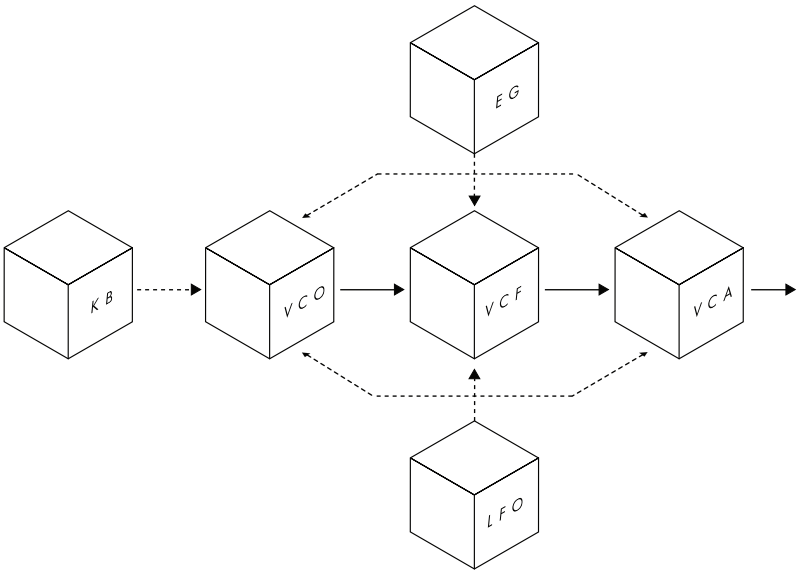
VCO: *Voltage Controlled Oscillator*

VCF: *Voltage Controlled Filter*

EG: *Envelope Generator*

LFO: *Low Frequency Oscillator*

VCA: *Voltage Controlled Amplifier*



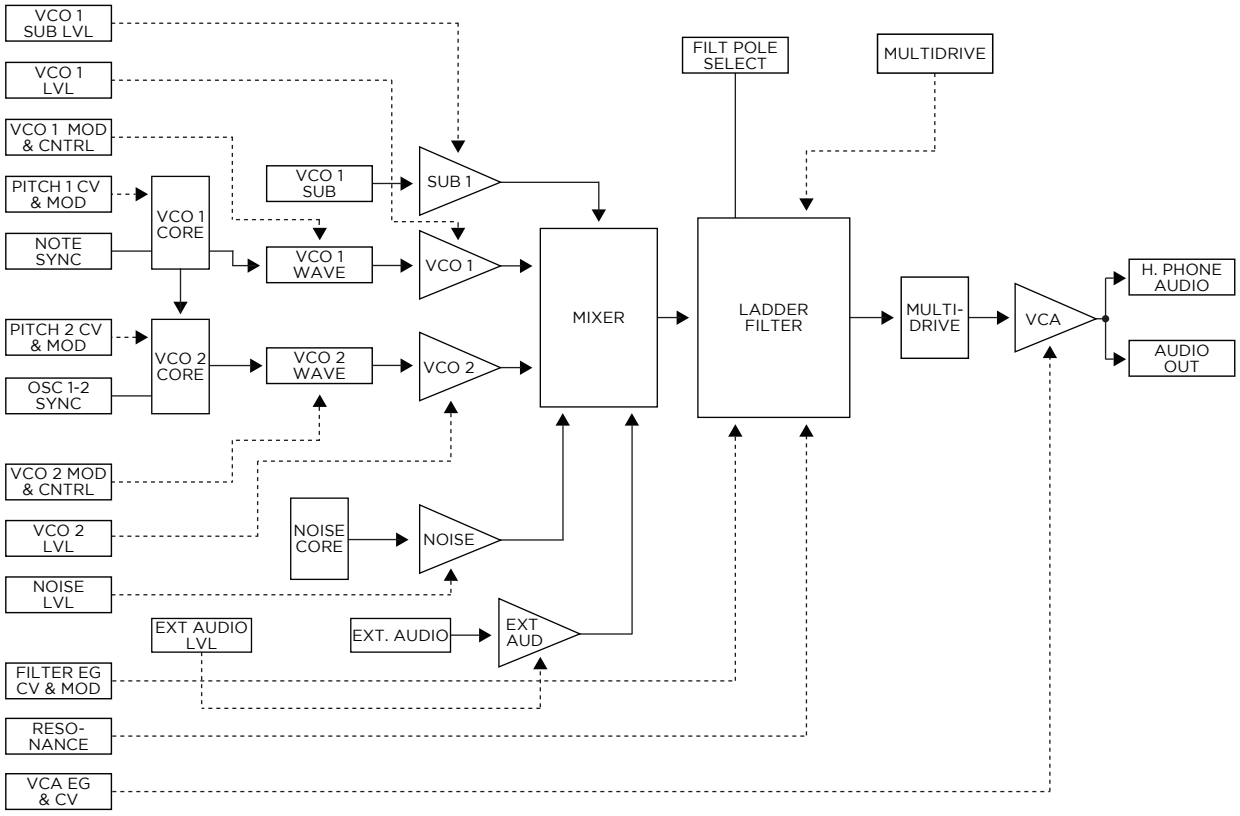
The Subractive Synthesis Model

The oscillators, filter, modulators, and other parts are connected in the most useful ways for producing and modifying electronic signals that result in sounds. Unlike on a modular synthesizer, many connections between the Sub Phatty's various parts are hardwired, meaning that it is not possible to change the routing of the pathways that connect them.

The electrical signals within a synthesizer are either audio signals or control signals, depending on the pathway they follow. Typically, an audio signal begins with an oscillator and passes through the filter on its way to the audio output. Control signals are used to change things, like the pitch, timbre, waveshape, or loudness of an audio signal.

Any time a signal controls something, no matter whether it's controlling an audio signal or another control signal, we say that it modulates it. In synth-speak, you could say that a steering wheel modulates a car's direction and the accelerator pedal modulates its speed. When you play the Sub Phatty's keyboard, the key you press modulates the instrument's pitch. You can modulate filter cutoff by turning a knob manually, or you can apply a control signal from a low-frequency oscillator or envelope to modulate it electronically. It's worth noting that a control destination can be modulated by more than one control source.

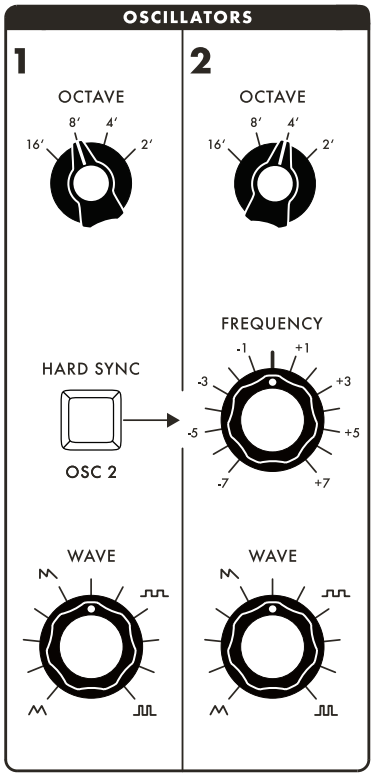
The diagram below illustrates how the Sub Phatty generates sound. It shows the flow of audio signals, represented by solid lines, and control signals, represented by dotted lines.



You can control the Sub Phatty using control voltages and MIDI commands. When the Sub Phatty receives either a control signal from the onboard keyboard or a Note On command from an external MIDI source, it responds by sending a gate signal to trigger the envelopes and a control voltage (CV) to control oscillator pitch. The envelopes respond by sending control signals to the amplifier and filter.

Every knob and button on the Sub Phatty transmits MIDI data. This functionality is useful for recording your knob turns and button presses into a computer-based DAW, as well as for controlling external devices using the Sub Phatty's front-panel controls. All the settings that make up a patch are called its parameters, which is simply another name for settings.

OSCILLATORS



OVERVIEW

Oscillator 1 and oscillator 2 are the Sub Phatty's primary sound sources. They generate four basic waveforms: triangle, sawtooth, square, and pulse.

The triangle wave consists of odd-numbered harmonics only. Its fundamental is very strong, and its overtones are very weak, making it less harmonically complex than other waveforms. By mixing a triangle from one oscillator with a more complex wave from the other, you can emphasize one particular harmonic without mucking things up with unwanted overtones.

An unfiltered sawtooth wave is much brighter, because it contains all the natural harmonics. As the harmonics ascend in frequency, they grow weaker in amplitude. Sawtooth waves are useful for synthesizing bass, simulating brass instruments, and more.

Although a pulse wave contains only odd-numbered harmonics, it offers the most flexibility because you can change the balance of those odd-numbered harmonics by changing its shape. Think of a pulse-wave oscillator as a switch you can turn off and on hundreds or thousands of times per second. In a single pulse wave, the "switch" is either on or off. Its pulse width is the proportion of the wave that's on, usually expressed as a percentage. A square wave is simply a pulse wave with 50% pulse width, meaning that in a single cycle, it is on half the time and off half the time. If its frequency is 440Hz, that means it goes on and off 440 times every second, and the result you hear is the pitch A above middle C. Every pulse width has its own characteristic sound, because each has a unique harmonic structure, making a variety of basic timbres possible.

Unlike most synths, which simply switch between basic waveforms, the Sub Phatty allows you to gradually change the oscillator's output from one waveform to another, so it can generate something partway between a sawtooth and a square wave, for example. We refer to such controls as *continuously variable* because there are no discrete steps between settings.

In normal operation, either the keyboard or external MIDI data controls oscillator pitch. You can also apply the LFO or the filter envelope to modulate oscillator pitch and waveform.

OSCILLATOR CONTROLS

OCTAVE: Use this knob to control either oscillator's pitch range. Pitch range is expressed in feet, a throwback to the age of pipe organs, when a pipe's physical length determined its pitch. The Sub Phatty's **OCTAVE** knobs cover four pitch ranges corresponding to four octaves. The lowest setting is 16', and the highest setting is 2'.

WAVE: Use this knob to vary either oscillator's waveform from triangle to sawtooth to square to narrow pulse wave. Turning the knob clockwise from the triangle to sawtooth position increases the oscillator's harmonic content. Continuing to turn it to the square-wave position weakens and then eliminates even-numbered harmonics while strengthening odd-numbered harmonics. Turning it from the square to narrow-pulse position changes its harmonic content further by weakening the overtones relative to the fundamental frequency.

FREQUENCY: This knob is used to fine-tune oscillator 2's pitch within its selected range. The knob's range is seven semitones higher or lower than its center position. At its center position, oscillator 2 is tuned to oscillator 1. Turning it just slightly out of tune with oscillator 1 can yield interesting detuned or phasing effects.

HARD SYNC OSC 2: This button locks oscillator 2's phase to oscillator 1, eliminating any phase differences between them. The **HARD SYNC OSC 2** button illuminates when it's engaged.

When both oscillators are in sync, every time that oscillator 1 begins a new cycle, it forces oscillator 2 to begin its cycle at the same instant, regardless of whether its previous cycle is complete. As a result, hard sync forces oscillator 2's waveform to take on a different shape—typically one with greater harmonic complexity. Because oscillator 2 is in sync with oscillator 1, their combined harmonic content depends on their pitch relationship, so that changing oscillator 2's frequency will have an immediate effect on timbre. For that reason, modulating oscillator 2's frequency opens up some outstanding waveshaping opportunities when **HARD SYNC OSC 2** is engaged.

NOTE: *If oscillator 1's frequency is higher than oscillator 2's, oscillator 2 will be unable to complete its cycle, resulting in little or no output from oscillator 2.*

TRY THIS

PATCH INITIALIZATION

1. Press the **ACTIVATE PANEL** button.
2. In the **FILTER** section, turn the **CUTOFF** knob all the way up, the **EG AMOUNT** knob to center position, and the remaining knobs all the way down.
3. In the **ENVELOPES** section, turn the **SUSTAIN** knobs all the way up and the remaining knobs all the way down.
4. Set the **OCTAVE** knobs for both oscillators to 16' and center the **OSCILLATOR** section's remaining knobs. The **HARD SYNC OSC 2** and **PITCH AMT OSC 2 ONLY** buttons should be turned off.
5. In the **MODULATION** section, turn the **LFO RATE** to 8 and the remaining knobs all the way down. Make sure the **MOD** wheel is turned all the way down, too.
6. Next to the **PRESETS** section, **FINE TUNE** and **OCTAVE** should be centered and **GLIDE RATE** should be all the way down.
7. Finally, turn all the **MIXER** knobs fully counterclockwise.

When you play the keyboard with these settings, you shouldn't hear anything. This procedure initializes the front panel and gives you a starting place for creating your own patches and exploring the Sub Phatty's capabilities.

EXPLORE THE OSCILLATORS

After patch initialization, turn up the **OSC 1** knob in the **MIXER** section. Listen carefully as you play the keys while slowly turning oscillator 1's **WAVE** knob to the triangle, sawtooth, square, and pulse positions. Listen to what happens when you turn the **WAVE** knob quickly while playing.

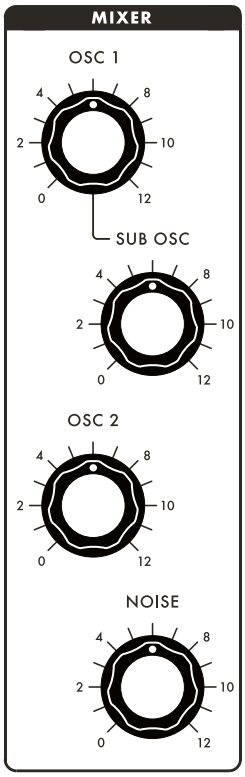
Now turn up oscillator 2 in the mixer. While holding a key, turn oscillator 2's **FREQUENCY** knob to adjust its tuning relative to oscillator 1. Notice the varied effects of adjusting them slightly out of tune, ranging from obvious beating between the pitches to mild phasing between the slightly detuned oscillators.

If you turn the **FREQUENCY** knob all the way up, you'll hear oscillator 2 tuned seven semitones (an interval of a perfect 5th) higher than oscillator 1. If you turn it all the way down, it will be seven semitones lower than oscillator 1. *(For extra credit, try to tune them a major 3rd and a perfect 4th apart, too.)* Now tune the oscillators as close to unison as you can by turning the knob to its center position again.

TRY THIS

OSCILLATOR SYNC
With the **HARD SYNC OSC 2** button engaged, you can step through the harmonic series by turning oscillator 2's **FREQUENCY** knob. To begin, make sure both oscillators are turned up in the mixer. Turn both **OCTAVE** knobs to their lowest settings, and then press the **HARD SYNC OSC 2** button so that it's illuminated. Begin with the **FREQUENCY** knob turned fully counterclockwise and slowly turn it while listening for how the overtones change. Using your ears, try to step through each harmonic one at a time. Now turn oscillator 2's **OCTAVE** knob to its 8', 4', and 2' settings and slowly turn the **FREQUENCY** knob again to hear the harmonic series in successively higher octaves.

MIXER



OVERVIEW
The mixer lets you combine audio signals from each of the Sub Phatty's four internal inputs. Each has a dedicated knob for controlling its relative level. In addition to level knobs for each oscillator, the mixer has level knobs for the sub oscillator and noise generator. When a level knob is turned fully counterclockwise, its input is effectively turned off. Turning it clockwise from 0 increases the level until it reaches its maximum at 12. Settings higher than 6 overdrive the filter, meaning that you can specify which sources are distorted and which simply pass through the filter.

MIXER CONTROLS
OSC 1: Use this knob to control oscillator 1's level. Settings higher than 6 push the level beyond unity, imparting gentle filter distortion. A setting of 6 or below delivers a clean signal to the filter.

OSC 2: Use this knob to control oscillator 2's level. Settings higher than 6 push the level beyond unity, imparting gentle filter distortion. A setting of 6 or below delivers a clean signal to the filter.

SUB OSC: Use this knob to control the sub oscillator's level. Settings higher than 6 push the level beyond unity, imparting gentle filter distortion. A setting of 6 or below delivers a clean signal to the filter.

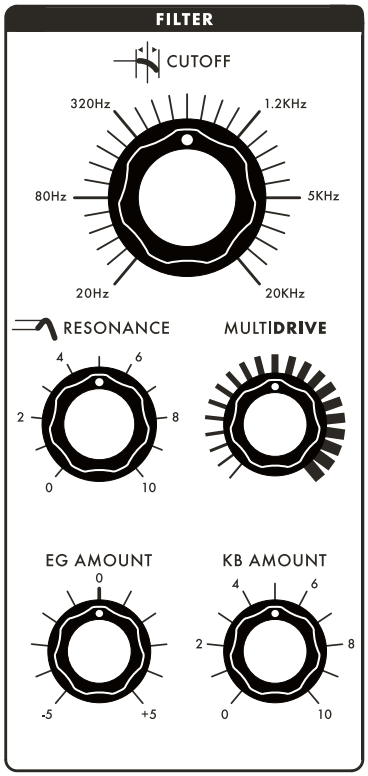
The Sub Phatty's sub oscillator is always tuned exactly one octave below oscillator 1's pitch, and its waveform is always a square wave. Typically, the sub oscillator adds a solid foundation to the Sub Phatty's sound. It is especially useful for crafting monstrous Moog bass patches.

NOISE: Use this knob to control the Sub Phatty's noise generator level. Settings higher than 6 push the level beyond unity, imparting gentle filter distortion. Noise is useful for programming punchy percussion and other unpitched sounds.

Whereas an oscillator generates a pitched waveform, noise is an unpitched sound source. Just as white light contains all colors of the visual spectrum in equal proportion, white noise contains a random distribution of all audible frequencies. Every frequency has equal amplitude. We hear white noise as a constant ssshh sound, like an FM radio between stations. Because of the way our brains respond to white noise, the higher frequencies sound more prominent than the lower ones.

The Sub Phatty's noise generator produces a signal called pink noise. Pink noise has equal amplitude in every octave, making it sound deeper than white noise—more like the sound of a waterfall. Most synthesists consider pink noise more useful than white noise.

FILTER



OVERVIEW

The number and relative strengths of a sound's harmonic frequencies determine its tone color or timbre. The Sub Phatty contains a filter for removing certain frequencies from audio signals. Because filtering gives you control over an audio signal's harmonic content, it physically alters the waveform being filtered.

The Sub Phatty has a classic Moog lowpass ladder filter with four selectable slopes (see Hidden Parameters on pg.26). Lowpass filters pass all frequencies up to a point called the cutoff frequency and gradually roll off, or attenuate, frequencies above that point. You can change the cutoff manually using a knob, or you can change it by applying a signal from a control source such as an envelope or LFO.

Turning the cutoff all the way down closes the filter so that nothing passes through it. Raising the cutoff opens the filter. As you turn the **CUTOFF** knob clockwise from its lowest position, first you'll hear only the audio signal's lowest frequencies, and then the timbre will grow gradually brighter. The filter envelope, in combination with the **CUTOFF** knob's setting, is the filter's primary control source.

Another characteristic of the Sub Phatty's filter is resonance. Resonance increases the level of audio frequencies closest to the cutoff frequency by making the filter roll off frequencies less gradually. It regenerates those frequencies by feeding them back to the filter. Turning up the resonance emphasizes harmonics closest to the cutoff frequency and exaggerates any changes to the cutoff frequency.

FILTER CONTROLS

CUTOFF: Use this knob to change the filter's cutoff frequency. Its lowest setting is 20Hz, which effectively closes the filter and doesn't allow any audio to pass through. Its highest setting is 20kHz, which opens the filter completely and allows all audio to pass through.

RESONANCE: Use this knob to control how much signal is routed from the filter's output back to its input. Turning it clockwise increases the resonance, causing a peak in amplitude at the cutoff frequency. Settings above 7 cause the filter to self-oscillate.

MULTIDRIVE: MultiDrive is the Sub Phatty's distortion processor, offering effects ranging from asymmetrical, tube-like warmth to aggressive hard clipping, with a smooth continuous transition in between. The **MULTIDRIVE** knob controls how hard you drive the OTA and FET stages, which are located between the filter and the amplifier in the signal path. The higher the setting, then the more aggressive the clipping effect. Varying amounts of MultiDrive can give your sounds a distinct tonal edge, as well as make them more responsive to changes in filter resonance, waveform, and oscillator level.

EG AMOUNT: Use this knob to control how much the filter envelope modulates the filter's cutoff frequency. In other words, **EG AMOUNT** controls the depth of the envelope generator's effect on the filter.

Notice that the **EG AMOUNT** knob is bipolar, meaning that its control value is positive when it's turned up and negative when it's turned down. Turning it clockwise from center causes the envelope to raise the cutoff frequency from the **CUTOFF** knob's setting. Turning it counterclockwise from center causes the envelope to lower the cutoff frequency from the **CUTOFF** knob's setting.

FILTER CONTROLS CONT.

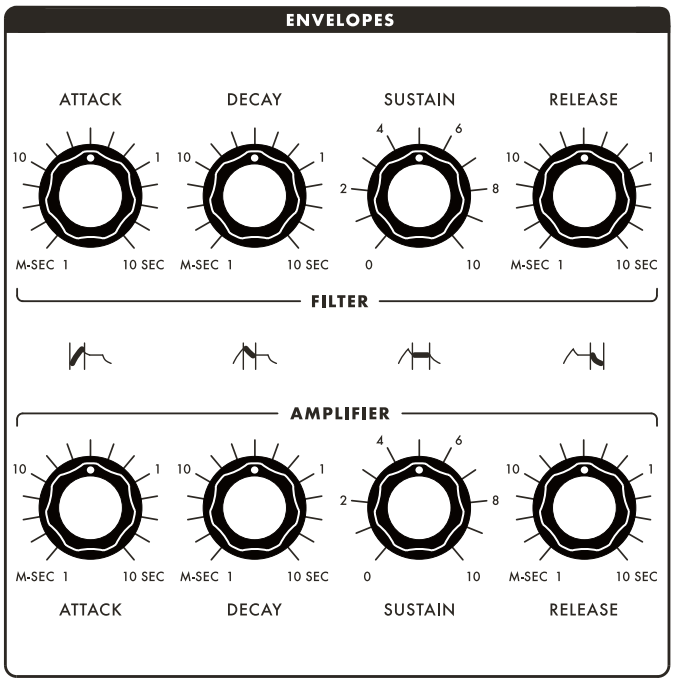
The depth of the envelope's effect on the cutoff frequency also depends a lot on the **CUTOFF** setting. If the setting is very high and you adjust the **EG AMOUNT** to raise it further, then the envelope will have little effect. The lower the cutoff frequency, then the more the envelope will be able to modulate it. On the other hand, if the setting is very low and you adjust the **EG AMOUNT** to lower it further by turning the knob counterclockwise, again, the envelope will have little effect.

KB AMOUNT: Use this knob to specify how much the filter cutoff tracks the keyboard; that is, how much the keyboard pitch affects the filter's lowpass frequency. With **KB AMOUNT** turned up halfway, the filter cutoff will follow the keyboard pitch at a 1:1 ratio centered around middle C (MIDI note 60). **KB AMOUNT** at maximum sets a 2:1 ratio for filter keyboard tracking.

ENVELOPES

OVERVIEW

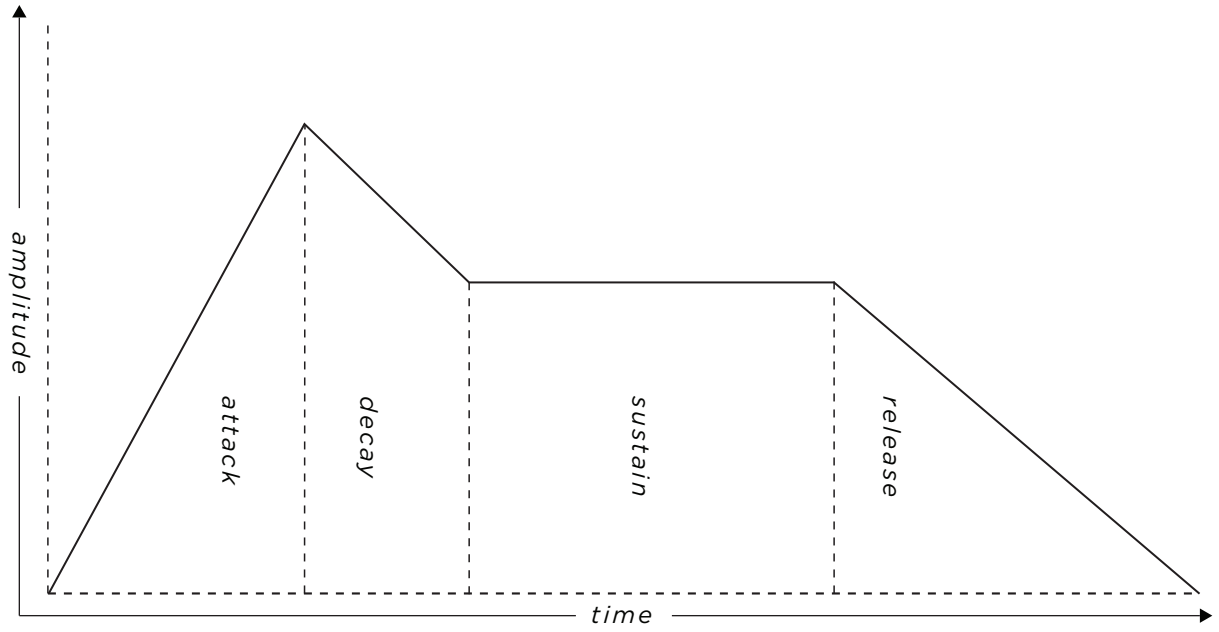
When you make any sound, it may take a moment for that sound to reach its maximum amplitude and brightness. This initial moment is called the sound's attack. An attack may be gradual (like a cymbal roll), abrupt (like a cymbal crash), or anything in between. The attack often tells us more about how an instrument is played than any other characteristic. Likewise, when the sound ends, it may take a moment to die away completely, or it may stop suddenly. This final drop in amplitude and brightness is called its release. The attack and release, along with variations in amplitude and timbre that occur between the attack and release, make up the sound's envelope.



The Sub Phatty shapes electronic sounds using two envelope generators (abbreviated EG). One envelope affects the Sub Phatty's filter, which controls timbre, and the other affects its amplifier, which controls amplitude. When you press a key on the keyboard, it sends a signal that tells the envelope generator to begin the attack. In voltage-controlled synthesizers like the Sub Phatty, this signal is called a gate. The gate ends when you release the key, telling the envelope generator to begin the release.

Each of the Sub Phatty's envelope generators has four stages: attack, decay, sustain, and release (abbreviated ADSR). Just as attack is the time it takes a level to peak, the decay is the time it takes to fall to a steady level, called the sustain. The sustain level is held until the note ends. At that point, the signal returns to zero at a rate determined by the release setting. Whereas the attack, decay, and release stages are specified as lengths of time, sustain is a control-signal level.

ADSR



When you play the Sub Phatty, your keyboard technique determines how the envelope generators respond, which impacts your musical expression and articulation. If you release the key before the envelope reaches either its maximum or sustain level, the release stage immediately takes effect. When you play staccato (very short notes), the envelope may never reach its decay stage, depending on its attack setting. Playing legato—holding down each key for the note's full duration without lifting your fingers between notes—prevents the envelope from retriggering its attack stage on subsequent notes. In that case, the envelope maintains its sustain level until you trigger the release stage by lifting your finger.

ENVELOPE CONTROLS

FILTER ATTACK: Use this knob to specify the time it takes the filter frequency to ascend from the **CUTOFF** knob's manual setting to its maximum level, which is determined by the filter's **EG AMOUNT** setting. Its value ranges from 1 millisecond to 10 seconds.

When you use the filter envelope to modulate pitch or wave amount, the **ATTACK** knob specifies the time it takes the control level to ascend to its maximum value.

FILTER DECAY: Use this knob to specify the time it takes the filter frequency to descend from its maximum level to its sustain level. Its value ranges from 1 millisecond to 10 seconds.

When you use the filter envelope to modulate pitch or wave amount, the **DECAY** knob specifies the time it takes the control level to descend from its maximum value to its sustain level.

FILTER SUSTAIN: Use this knob to specify the filter cutoff frequency once the decay stage is complete. The sustain stage is held until the envelope receives a Note Off command or the gate ends. Its value ranges from zero to 100 percent, calibrated 1 to 10. Note that the filter's **EG AMOUNT** determines the depth of its effect.

When you use the filter envelope to modulate pitch or wave amount, the **SUSTAIN** knob specifies the control value that is held once the decay stage is complete.

ENVELOPE CONTROLS CONT.

FILTER RELEASE: Use this knob to specify the time it takes the filter cutoff to descend from its sustain value to the **CUTOFF** knob's manual setting. Its value ranges from 1 millisecond to 10 seconds.

When you use the filter envelope to modulate pitch or wave amount, the **RELEASE** knob specifies the time it takes the control level to descend from the sustain value to zero.

AMPLIFIER ATTACK: Use this knob to specify the time it takes the mixer output's amplitude to ascend from zero to its maximum value. Its value ranges from 1 millisecond to 10 seconds.

AMPLIFIER DECAY: Use this knob to specify the time it takes the mixer output's amplitude to descend from its maximum level to its sustain level. Its value ranges from 1 millisecond to 10 seconds.

AMPLIFIER SUSTAIN: Use this knob to specify the mixer output's amplitude once the decay stage is complete. The sustain stage is held until the envelope receives a Note Off command or the gate ends. Its value ranges from zero to 100 percent, calibrated 1 to 10.

AMPLIFIER RELEASE: Use this knob to specify the time it takes the mixer output's amplitude to descend from its sustain value to zero. Its value ranges from 1 millisecond to 10 seconds.

TRY THIS

NOTE ARTICULATION

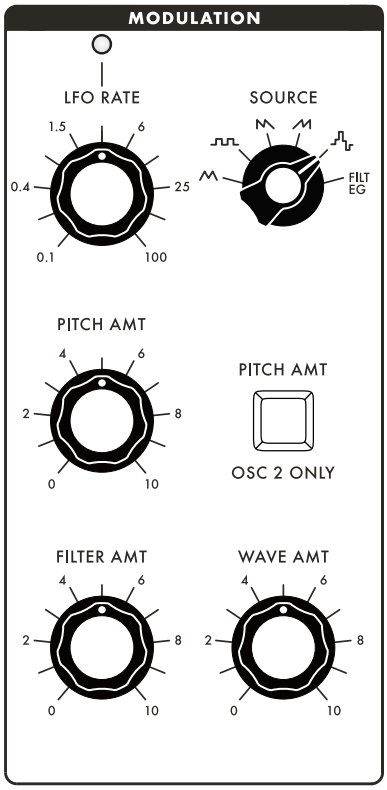
Load your favorite melodic preset. For both envelopes, turn the attack to just under one second and the release to just over one second. Play the keys staccato, making sure to lift your fingers between each note. Notice that you can hear the release stage after every note, especially when you pause long enough for the envelope to return to zero. Now play legato, making sure you don't lift you fingers between notes. Hear the difference? After the first note, the envelopes bypass their attack, decay, and release stages when you play legato and maintain their sustain levels until you lift your fingers. Playing with a combination of staccato and legato articulations adds to the expressivity of your performance.

CLASSIC ELECTRONIC KICK DRUM

One of the simplest sounds you can synthesize is a kick drum, also called a bass drum. Perhaps the best example of an electronic kick drum comes from a classic analog drum machine, the 808. It uses a sine wave and a 2-stage envelope generator to create the sound. The Sub Phatty lets you re-create this vintage sound with just a bit more thump.

Although synthesizing most percussion begins with the noise generator, the kick drum is an exception. After initializing the patch, turn up the mixer level on oscillator 1. Turn oscillator 1's **OCTAVE** knob to 16' and the **WAVE** knob to triangle. On the amplifier envelope, turn the **ATTACK** and **SUSTAIN** knobs all the way down. Now adjust the **DECAY** and **RELEASE** knobs to exactly 1 second. Because triangle waves have a few weak overtones, you'll need to filter those out to approximate a sine wave. Turn the filter **CUTOFF** knob to 320Hz and the **MULTIDRIVE** knob to 9 O'clock. On the front panel's left side, press the left **OCTAVE** button to lower the pitch an octave, and strike the low C key. If necessary, slightly adjust the **CUTOFF** and **DECAY** to taste. And there you have it: a sound that's propelled millions of people out on the dance floor.

MODULATION



OVERVIEW

Controlling modulation (abbreviated as mod) is an important aspect of programming and playing synthesizers. When you modulate a synth's audio signal, you're changing something about the way it sounds. When you modulate a control signal, you're changing something about its effect on whatever it's controlling. Synthesizers route their control signals from modulation sources to modulation destinations. On the Sub Phatty, a changing control signal can modulate pitch, filter cutoff, and waveform shape. You control the modulation signal's depth using the **MOD** wheel immediately to the left of the keyboard.

All LFOs generate repeating waveforms in the sub-audio range. The Sub Phatty's LFO has an extended range capable of generating audio frequencies as well. At sub-audio rates, the LFO is useful for generating repeating effects. At audio rates, the LFO adds harmonic complexity to its destination.

When an LFO modulates oscillator frequency, the oscillator's pitch follows the shape of the modulating waveform. If the LFO's output is a triangle wave, the pitch rises and falls at a regular rate. At the proper rate and depth, this type of modulation is called vibrato. Many performers rely on vibrato to add expression to their performances. A violinist or guitarist employs vibrato with a shaking motion of the hand as it applies pressure to the string. A singer subtly fluctuates vocal pitch. A synthesist uses an LFO to modulate oscillator frequency. The **LFO RATE** knob controls the rate of modulation, and the mod wheel controls its depth.

MODULATION CONTROLS

LFO RATE: By default, this knob varies the low-frequency oscillator's modulation rate from 0.1Hz (one cycle every 10 seconds) to 100Hz (100 cycles per second). You can change this range in Shift mode (see Hidden Parameters on pg. 28).

SOURCE: Use this knob to specify whether the mod source is the LFO or the filter envelope, as well as the LFO waveform. At its counterclockwise position, the LFO generates a triangle wave, which is particularly useful for vibrato. Turning the knob clockwise, the next position generates a square wave, which is useful for performing trills and tremolo effects. The next two positions generate sawtooth and ramp (reverse sawtooth) waves. Applied to pitch, sawtooth-wave modulation is useful for simulating alarms, ray guns, and other ascending and descending effects.

The fifth position uses sample-and-hold as a mod source. Without going into a lot of technical explanation, think of sample-and-hold as a source of random control signals.

The **SOURCE** knob's most clockwise position, labeled **FILTER EG**, bypasses the LFO and routes the filter's envelope to the modulation destinations, which are determined by the settings of the **PITCH AMT, FILTER AMT**, and **WAVE AMT** knobs below.

PITCH AMT: Use this knob to specify the depth of pitch variation applied to the oscillators when the **MOD** wheel is engaged. If the mod source is the filter envelope, you can control changes in pitch using the envelope's attack, decay, sustain, and release settings.

MODULATION CONTROLS CONT.

PITCH AMT OSC 2 ONLY: Pressing this button applies pitch modulation to oscillator 2 only, with no effect on oscillator 1. The button illuminates when it's engaged.

If you engage the **HARD SYNC OSC 2** button (which phase-locks the oscillators), then modulating oscillator 2's frequency with an LFO or envelope will change the oscillator's harmonic content but not its pitch.

FILTER AMT: Use this knob to specify the depth of variation applied to the filter's cutoff frequency when the **MOD** wheel is engaged. Applying LFO modulation to the filter is useful for generating slow filter sweeps, wobbles, and repeating effects.

WAVE AMT: Use this knob to specify the depth of variation applied to the waveform of both audio oscillators when the **MOD** wheel is engaged. As the waveform is modulated, the amplitudes, frequencies, and phase of the harmonics change dynamically. Waveform modulation has no effect on the sub oscillator, which always generates a square wave.

NOTE: *Using Shift mode or the plug-in editor, you can also assign Wave Amount to affect oscillator 1 or 2 independently (see Hidden Parameters on pg. 28).*

TRY THIS

LFO WAVEFORMS

It's likely that much of the time when you're playing melodic sounds, you'll use the **MOD** wheel to control note vibrato to make your playing more expressive. To try this, begin by selecting your favorite lead or solo preset. In the **MODULATION** section, turn the **SOURCE** knob counterclockwise to its triangle-wave position. Turn **PITCH AMT** up to 2 and turn **LFO RATE** to 6. Play a note and nudge the **MOD** wheel up slightly to produce vibrato. Play a few more notes, adding vibrato during sustained notes when it feels appropriate. Adjust the **LFO RATE** to taste.

Learn your way around the LFO by trying the other waveforms and destinations, and by varying the **LFO RATE** and depth. Begin by turning up the **PITCH AMT** knob slightly, raising the **MOD** wheel, and then switching the **SOURCE** knob to the square wave setting. Square wave LFO modulation produces a trill that alternates between two pitches. Varying the **LFO RATE** changes the speed of the trill, and varying the **PITCH AMT** or the **MOD** wheel depth changes its interval.

Now vary the **LFO RATE, PITCH AMT**, and **MOD** wheel depth using the **SOURCE** knob's sawtooth, ramp, and sample-and-hold settings. Notice that sawtooth and ramp-wave modulation work best at slow rates, and sample-and-hold modulation works really well when it's applied to modulate the filter with **RESONANCE** turned up at least halfway. When you're exploring filter modulation, try turning down the oscillator signal and turning up the noise.

PULSE WAVE MODULATION

By routing LFO or envelope modulation to an oscillator's wave amount, you give the waveform motion by changing its harmonic content dynamically. As the control signal changes, so does the waveform. Although the Sub Phatty's continuously variable oscillators let you apply modulation to any waveform, it's most traditional to modulate a pulse wave.

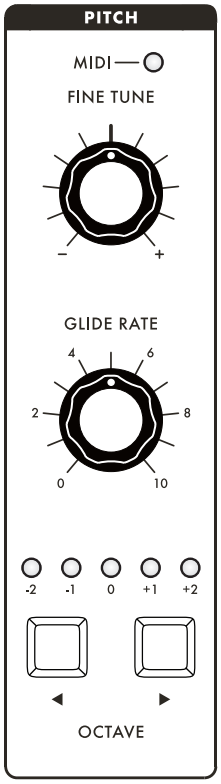
Beginning with an initialized patch, turn up oscillator 1 in the **MIXER** section and turn the **WAVE** knob halfway between square and pulse. Set the **LFO RATE** at approximately 3Hz and the LFO waveform to triangle.

PULSE WAVE MODULATION CONT.

When you press a key and push up the **MOD** wheel, you'll hear the LFO's effect on pulse width. Push it up only slightly, and you'll hear a dramatic sweeping of the harmonics that sounds a bit like a chorusing effect. Turn it up more, and you'll hear the entire waveform being canceled in rhythm with the LFO. That's because you're pushing the pulse wave beyond its maximum width, so that the waveform doesn't have a chance to cycle back to its starting point. Applying LFO modulation to pulse width is most useful at rates normally used for vibrato—usually between 6 and 9Hz.

In the **MODULATION** section, turn the **SOURCE** knob to the **FILTER EG** position and push the **MOD** wheel up all the way. If you play the keyboard and the filter envelope is at its initialized setting, you won't hear anything until you release the keys. Again, that's because the pulse width is pushed beyond its maximum. Lower the **MOD** wheel to about halfway and play around with the filter envelope settings to get a feel for the envelope's effect on pulse width.

GLOBAL PITCH CONTROLS



MIDI INDICATOR: This LED illuminates whenever the Sub Phatty receives MIDI data through either its **MIDI IN** or **USB PORT.**

FINE TUNE: Use this knob to adjust the frequency of both oscillators as much as one semitone up or down from its center position. Fine-tuning is useful for putting the Sub Phatty in tune with any other instruments that deviate slightly from standard pitch.

GLIDE RATE: Glide, also called portamento or glissando, causes smooth pitch changes between notes. Use this knob to specify how much time it takes to transition from one pitch to the next when you play the keyboard. Although glide is normally applied to every note you play when it's engaged, you can turn on legato glide using Shift mode (see Hidden Parameters on pg.26).

OCTAVE BUTTONS: Use these buttons to extend the Sub Phatty's keyboard beyond its normal two-octave range. Pressing the left button once transposes the Sub Phatty's pitch down an octave, and pressing it again transposes it down another octave. Likewise, pressing the right button transposes the pitch up an octave, and pressing it again transposes it up another octave. The illuminated LED indicates the current transposition. The buttons also transpose the MIDI Note Numbers that the Sub Phatty transmits by corresponding amounts.

Over time, you'll discover that you can overcome the limitations of a 25-note keyboard once you become proficient at pressing the **OCTAVE** buttons at the right moment. In fact, using the **OCTAVE** buttons gives the Sub Phatty's keyboard a seven-octave range.

KEYBOARD: The Sub Phatty's 25-note keyboard is velocity-sensitive, so that it transmits MIDI Velocity data in response to how fast you press the keys.

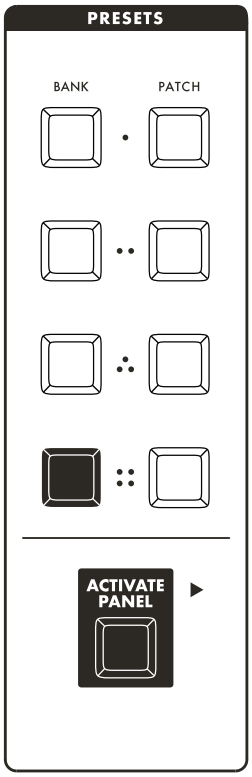
WHEELS: The **PITCH** and **MOD** wheels located to the left of the keyboard can contribute greatly to the expressivity of your playing. Use the **PITCH** wheel to smoothly bend pitch during performance. By default, it transposes pitch up two semitones and down two semitones. However, you can change either interval in Shift mode (see Hidden Parameters on pg. 26). The **PITCH** wheel is spring-loaded to automatically return to the center position.

The **MOD** wheel controls the depth of modulation. At its minimum setting, modulation is turned off. At its maximum setting, modulation is at full throttle. The depth of the **MOD** wheel's effect depends on the settings of the **PITCH AMT, FILTER AMT**, and **WAVE AMT** knobs.

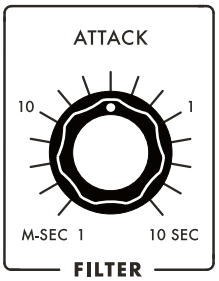
SHIFT MODE

Although you can control all of the Sub Phatty's functions directly from the front panel, you'll need to dig a little deeper to reach some of them. Shift mode reassigns several front-panel controls so you can use them to edit hidden parameters. Like all parameters, changes you make in Shift mode are memorized when you save your preset.

Engage Shift mode by holding down the **BANK 4** button and then pressing the **ACTIVATE PANEL** button. When you do, all the **BANK** and **PATCH** buttons will go dark and the **ACTIVATE PANEL** button will blink. Pressing **ACTIVATE PANEL** again will cancel Shift mode and return all the controls to their normal functions.



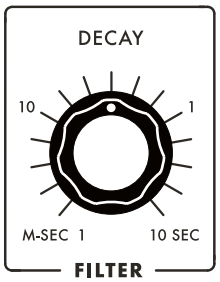
KNOB & BUTTON REASSIGNMENTS IN SHIFT MODE



***PARAMETER:* FILTER ENVELOPE DELAY**

***KNOB:* FILTER ENVELOPE ATTACK**

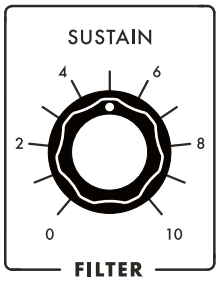
Adding a delay stage to the filter envelope lets you specify a timed pause before the onset of the attack, effectively turning an ADSR envelope into a DADSR envelope. By engaging Shift mode and turning the amplifier envelope's **ATTACK** knob, you can vary the envelope's delay time from a minimum of 0 to a maximum of 10 seconds.



***PARAMETER:* FILTER ENVELOPE HOLD**

***KNOB:* FILTER ENVELOPE DECAY**

Adding a hold stage to the filter envelope lets you specify a fixed delay between the attack and sustain stages, effectively turning an ADSR envelope into an AHDSR envelope. During this stage, the filter's cutoff frequency is held at its maximum level, which is determined by the filter's **EG AMOUNT** setting. By engaging Shift mode and turning the filter envelope's **DECAY** knob, you can vary the envelope's hold time from a minimum of 0 to a maximum of 10 seconds.

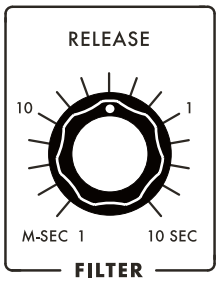


***PARAMETER:* VELOCITY TO FILTER ENVELOPE AMOUNT**

***KNOB:* FILTER ENVELOPE SUSTAIN**

To make your sounds get brighter as you press the keys faster on the keyboard, engage Shift mode and turn up the filter envelope's **SUSTAIN** knob. The knob's range varies from 0 to 100%.

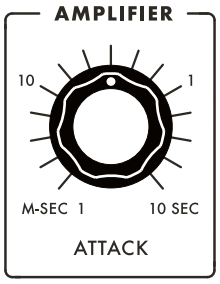
KNOB & BUTTON REASSIGNMENTS CONT.



PARAMETER: VELOCITY TO FILTER ENVELOPE DECAY/RELEASE

KNOB: FILTER ENVELOPE RELEASE

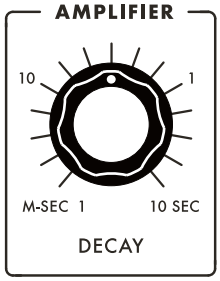
Changing this setting lets you specify how much velocity affects the filter envelope's decay and release times. To lengthen the decay and release in response to how hard you play on the keyboard, engage Shift mode and turn up the filter envelope's **RELEASE** knob. The knob's range is from 0 to 100%.



PARAMETER: AMPLIFIER ENVELOPE DELAY

KNOB: AMPLIFIER ENVELOPE ATTACK

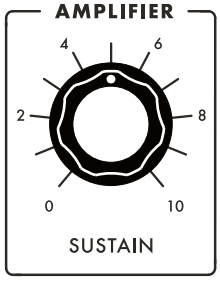
Adding a delay stage to the amplifier envelope lets you specify a timed pause before the onset of the attack, effectively turning an ADSR envelope into a DADSR envelope. By engaging Shift mode and turning the amplifier envelope's **ATTACK** knob, you can vary the envelope's delay time from a minimum of 0 to a maximum of 10 seconds. The Amplifier Envelope Delay stage only occurs when the envelope generator is in Looping mode (see Hidden Functions on pg.26).



PARAMETER: AMPLIFIER ENVELOPE HOLD

KNOB: AMPLIFIER ENVELOPE DECAY

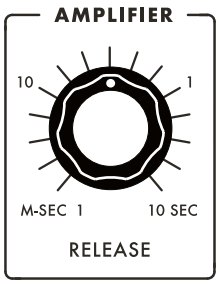
Adding a hold stage to the amplifier envelope lets you specify a fixed delay between the attack and sustain stages, effectively turning an ADSR envelope into an AHDSR envelope. During this stage, the mixer output's amplitude is held at its maximum value. By engaging Shift mode and turning the amplifier envelope's **DECAY** knob, you can vary the envelope's hold time from a minimum of 0 to a maximum of 10 seconds.



PARAMETER: VELOCITY TO AMPLIFIER ENVELOPE AMOUNT

KNOB: AMPLIFIER ENVELOPE SUSTAIN

Your patches will be much more dynamic if you make a habit of programming their velocity sensitivity. To make your sounds get louder as you press the keys faster on the keyboard, engage Shift mode and turn up the amplifier envelope's **SUSTAIN** knob. The knob's range varies from 0 to 100%.

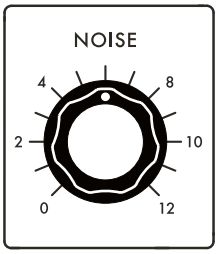


PARAMETER: VELOCITY TO AMPLIFIER ENVELOPE DECAY/RELEASE

KNOB: AMPLIFIER ENVELOPE RELEASE

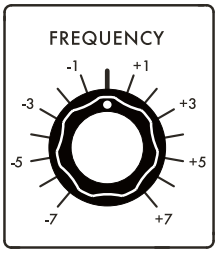
Changing this setting lets you specify how much velocity affects the amplifier envelope's decay and release times. To lengthen the decay and release in response to how fast you press the keys on the keyboard, engage Shift mode and turn up the amplifier envelope's **RELEASE** knob. The knob's range is from 0 to 100%.

KNOB & BUTTON REASSIGNMENTS CONT.



PARAMETER: **EXTERNAL INPUT LEVEL**

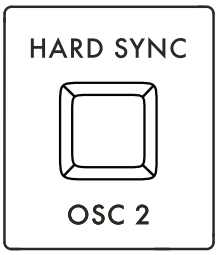
KNOB: **NOISE**
To manually control the level of signals coming from the Sub Phatty's **EXT IN** jack, engage Shift mode and turn the **NOISE** knob.



PARAMETER: **OSCILLATOR 2 BEAT FREQUENCY**

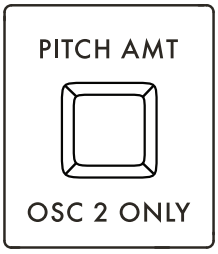
KNOB: **OSCILLATOR 2 FREQUENCY**
Engage Shift mode and turn oscillator 2's **FREQUENCY** knob to set the "beat frequency" of oscillator 2 against oscillator 1. The range is plus or minus 3.5 Hz, with no detuning (0Hz) in the middle. This parameter creates a linear constant detuning of oscillator 2 relative to oscillator 1, so that oscillator 2 is always detuned by the same number of cycles per second (Hz) regardless of the musical pitch. The result is a musical detuning effect which phases or "beats" at a consistent rate on every note.

By contrast, the **OSCILLATOR 2 FREQUENCY** knob detunes oscillator 2 by musical cents, where the rate of beating between oscillators is halved or doubled as you play an octave lower or higher in pitch. NOTE: for this reason, if you want a constant beat frequency at all pitches, make sure that the regular **OSCILLATOR 2 FREQUENCY** control is centered. If you want absolute unison between oscillator 2 and oscillator 1, make sure this **BEAT FREQUENCY** control is centered.



PARAMETER: **OSCILLATOR GATE RESET**

BUTTON: **HARD SYNC OSC 2**
Engage Shift mode and press the **HARD SYNC OSC 2** button to turn on oscillator reset. This function forces the audio oscillators to simultaneously begin their cycles whenever you play a new note. When turned on, the result is a more well defined leading edge to sounds with a hard attack.



PARAMETER: **LFO GATE RESET**

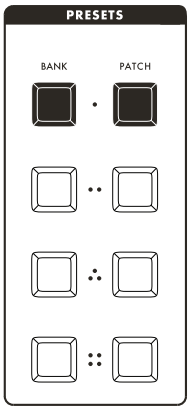
BUTTON: **PITCH AMT OSC 2 ONLY**
Engage Shift mode and press the **PITCH AMT OSC 2 ONLY** button to turn on the LFO gate reset. This function forces the LFO to begin a new cycle each time you play a new note.

When LFO reset is turned off, the LFO runs freely, without regard to the notes you're playing. When it's turned on, however, its instantaneous amplitude always ascends from its zero-crossing point whenever an envelope is triggered. This can be especially important for creating realistic vibrato when you're emulating acoustic instruments, or for programming filter sweeps.

ADDITIONAL HIDDEN PARAMETERS IN SHIFT MODE

You can access the Sub Phatty's additional hidden parameters using a combination of buttons and the keyboard. First engage Shift mode by holding down the **BANK 4** button and pressing the **ACTIVATE PANEL** button. Then enter a code from the hidden parameter chart using the **BANK** and **PATCH** buttons to select the parameter. Finally, press a key on the keyboard to select the parameter's value.

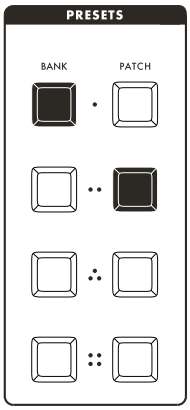
All parameters have at least two possible values (ON and OFF), and some parameters have 24 possible values. Lower keys specify lower values, and higher keys specify higher values. Because most parameters have a limited range of values, they respond to only the leftmost keys. The low C key always selects the lowest value. For parameters with two values, the low C always selects OFF and the low C# always selects ON. For parameters that use less than the entire keyboard to select values, unused keys play normally, allowing you to audition sounds while you make parameter changes.



KEYBOARD TRANSPOSE

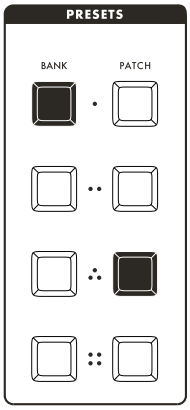
To transpose the entire keyboard to any pitch you choose, engage Shift mode, press the **BANK 1** and **PATCH 1** buttons, and then press any key. Pressing a key above middle C transposes up by the interval you select. Likewise, pressing a key below middle C transposes down by the interval you select. For example, if you press A below middle C, you will transpose the keyboard down 3 semitones, and if you press C above middle C, you will transpose the keyboard up a full octave. The maximum range is up or down 12 semitones.

NOTE: *Middle C refers to the C key at the center of the Sub Phatty's keyboard, not to the pitch usually referred to as middle C, which is actually one octave higher.*



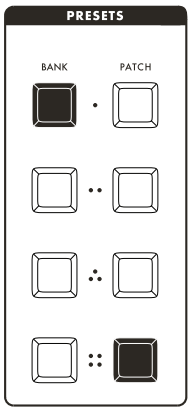
PITCH BEND RANGE UP

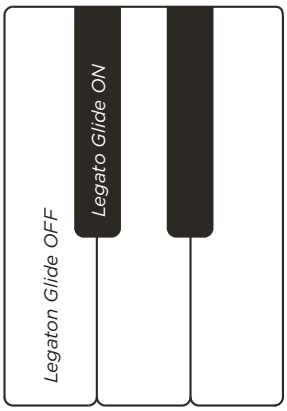
The Sub Phatty's pitch bend defaults to two semitones up or down, but you can change either direction to any interval you want. To specify the **PITCH** wheel's range when you push it up, engage Shift mode and press the **BANK 1** and **PATCH 2** buttons. Pressing any key selects the bend interval, with each key increasing the interval by a semitone as you go from left to right. If you want to bend up an octave, for example, press the middle C key. The maximum range is 24 semitones up.



PITCH BEND RANGE DOWN

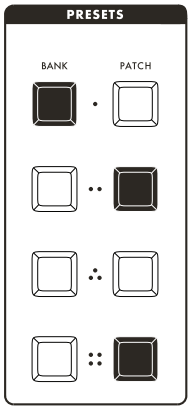
To specify the **PITCH** wheel's range when you push it down, engage Shift mode and press the **BANK 1** and **PATCH 3** buttons. Pressing any key selects the bend interval, with each key increasing the interval by a semitone as you go from left to right. If you want to bend down a perfect 5th, for example, press the low G key. The maximum range is 24 semitones down.

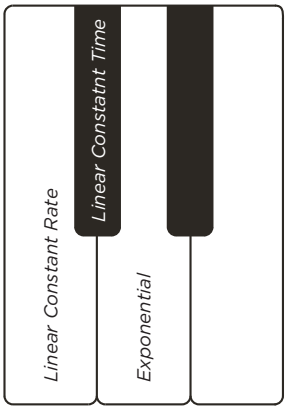




LEGATO GLIDE

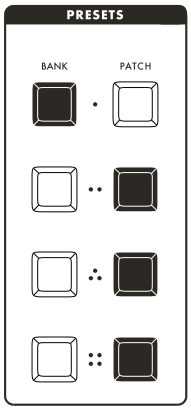
You can change the default setting so that glide is engaged only when you press a key before you release the previous key. This is called legato glide. You can toggle legato on and off by engaging Shift mode and pressing the **BANK 1** and **PATCH 4** buttons. Pressing the low C# key turns legato glide on, and pressing the C key turns legato glide off. When glide is turned on and legato glide is turned off, glide affects all notes you play.

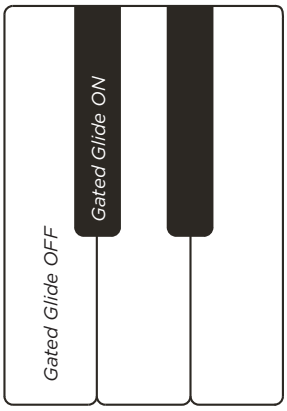




GLIDE TYPE

Engaging Shift mode and pressing the **BANK 1, PATCH 2,** and **PATCH 4** buttons lets you choose from three different types of glide: linear constant rate (LCR), linear constant time (LCT), and exponential (EXP). When you select LCR (the default) by pressing the low C key, the glide rate will depend on the size of the interval; the larger the interval between pitches, then the longer the glide time will be. When you select LCT by pressing the low C# key, the glide time will stay the same regardless of the interval. And when you select EXP by pressing the low D key, the glide rate will follow an exponential curve that begins with a fast rate and slows as it approaches the target note.

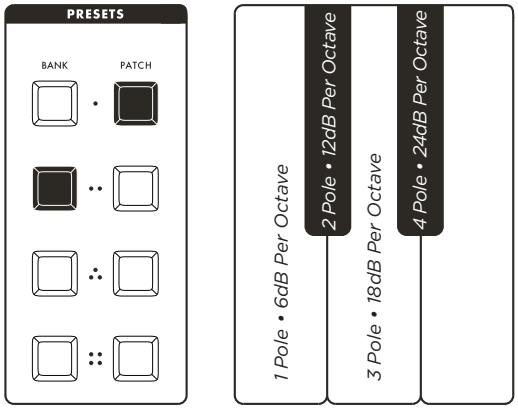




GATED GLIDE

The Glide function creates a gradual, gliding change in the oscillators' pitch voltage. Gated Glide causes this gradual change to be started and stopped by the keyboard gate. When Gated Glide is off, the pitch CV will continue gliding to the target pitch at the current Glide Rate, regardless of whether or not the Sub Phatty is playing a note. When Gated Glide is on, the pitch CV only glides while a note is playing, and is held constant in between notes. The different behaviors are more distinct with longer Glide times.

To toggle gated glide on and off, engage Shift mode and press the **BANK 1, PATCH 2, PATCH 3,** and **PATCH 4** buttons. Press the low C# to turn gated glide on, and press the low C to turn gated glide off.



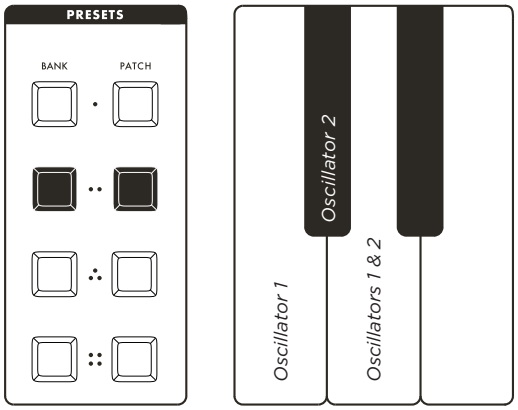
FILTER SLOPE

By default, the Sub Phatty's filter rolloff is set to the classic Moog 24dB-per-octave slope. You can change this setting in real time as you play, making the change in slope part of your performance.

To change the filter slope, engage Shift mode and press the **BANK 2** and **PATCH 1** buttons. Use the four lowest notes on the keyboard to select the slope. Pressing the C key selects a 1-pole, 6dB-per-octave slope. C# selects a 2-pole, 12dB-per-octave slope. The D key selects a 3-pole, 18dB-per-octave slope, and D# selects the default 4-pole, 24dB-per-octave slope. After you've made your selection, press **ACTIVATE PANEL** to disengage Shift mode.

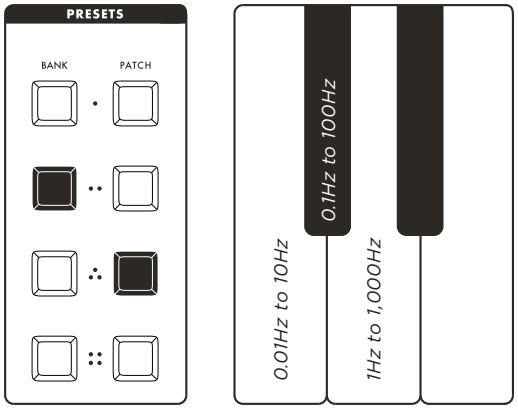
MODULATION PARAMETERS

Shift mode also lets you determine several modulation parameters, including the waveform modulation destination, LFO Range, LFO pitch tracking, and whether the LFO syncs to tempo.



WAVEFORM MODULATION DESTINATION

To change how waveform modulation is routed, enter Shift mode and press the **BANK 2** and **PATCH 2** buttons. Then use the three lowest keys to specify whether waveform modulation will be applied to oscillator 1 (press the C key), oscillator 2 (press the C# key), or both oscillators (press the D key). Note that the **WAVE AMT** knob must be turned up for waveform modulation to have an effect.

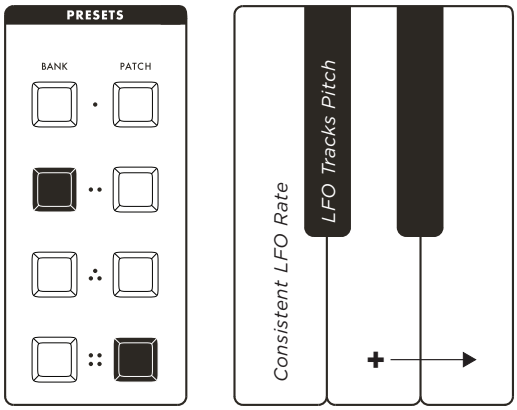


LFO RANGE SELECTION

The Sub Phatty's LFO has three selectable ranges: 0.01 to 10Hz, 0.1 to 100Hz, and 1 to 1000 Hz. Although the mixer has no audio input for the LFO, an audio-frequency oscillator can be very useful as a modulation source, allowing the Sub Phatty to produce classic, clangerous FM (frequency modulation) tones.

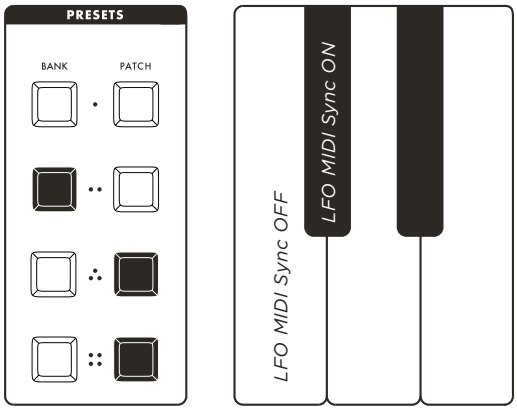
In Shift mode, press the **BANK 2** and **PATCH 3** buttons to change the LFO's range. Press the low C key to assign the LFO to its lowest frequency range, from 0.01 to 10Hz. Press C# to assign the LFO to its middle range, from 0.1 to 100Hz. Press the D key to assign the LFO to its upper range, from 1 to 1,000Hz.

NOTE: *No matter which range you choose, modulation at normal vibrato rates (between 5 and 10 Hz) is possible.*



LFO KEYBOARD TRACKING AMOUNT

To specify how much the LFO rate tracks the keyboard pitch, enter Shift mode and press the **BANK 2** and **PATCH 4** buttons. Pressing the low C key sets keyboard tracking to zero, meaning key pitch will have no effect on LFO rate. Pressing higher keys sets a proportionally greater amount of keyboard tracking; the middle C on the keyboard sets 1:1 LFO pitch tracking, meaning the LFO rate will double when the key pitch doubles. The high C key sets 2:1 LFO pitch tracking, meaning that the LFO rate will change by four times for every octave of pitch change.

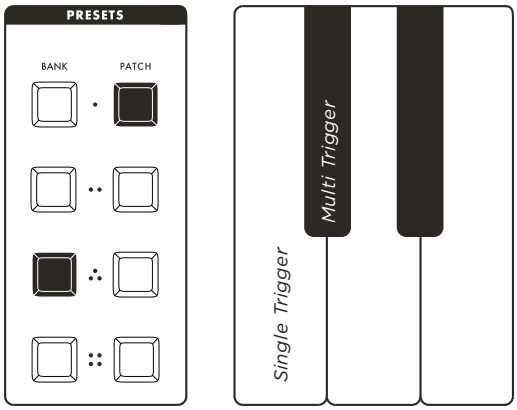


LFO MIDI SYNC

This function lets you synchronize the Sub Phatty's LFO with an external MIDI clock signal, typically from another synth, a sequencer, or a digital audio workstation. When synced, the LFO rate locks to tempo, oscillating in rhythm with its clock source. The **LFO RATE** knob lets you select the note division—whether the LFO cycles once every eighth note, half note, or whatever. LFO MIDI sync is turned on by default.

Engage Shift mode and press the **BANK 2, PATCH 3,** and **PATCH 4** buttons. Press the low C# key to turn on LFO MIDI sync, and press the C key to turn it off. At the **LFO RATE** knob's fully counterclockwise position, a single LFO cycle is 4 whole notes long (384 MIDI clocks). At its fully clockwise position, one cycle equals a 1/64th-note triplet (1 MIDI clock). Please refer to the chart on page 38 for a list of clock divisions available for LFO sync.

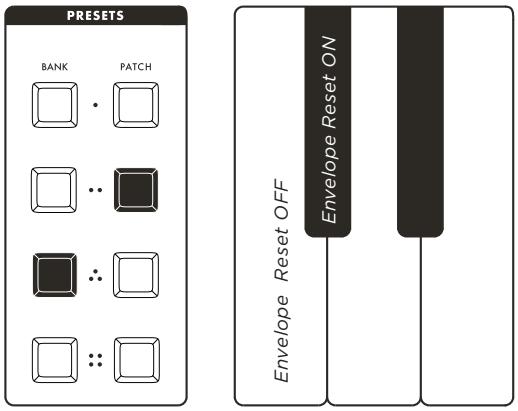
NOTE: *When no clock is present, the LFO will run freely at a rate determined by its RATE setting.*



FILTER ENVELOPE TRIGGER MODE

As mentioned in the Envelopes Overview, by default, playing legato on the Sub Phatty prevents envelopes from retriggering on subsequent notes; this is called single triggering. You can change this behavior by turning off single triggering in Shift mode. With single triggering turned off, a new gate occurs each time you play a note on the keyboard, regardless of whether you've released the previous key; this is called multiple triggering. You can select single or multiple triggering separately for the amplifier and filter envelopes..

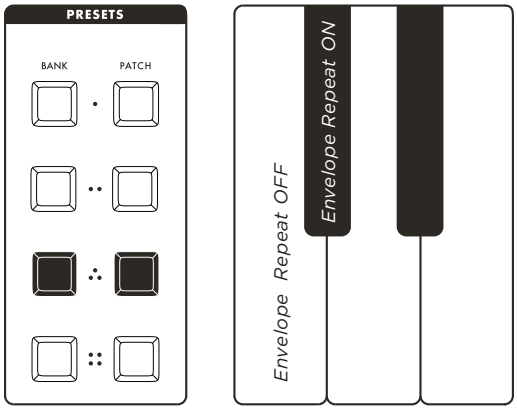
To specify single or multiple triggering for the filter envelope, engage Shift mode and press the **BANK 3** and **PATCH 1** buttons. Press the low C key to turn select single triggering, and press the low C# key to select multiple triggering.



FILTER ENVELOPE RESET

When Filter Envelope Reset is turned on, each new note triggers the filter envelope to reset from zero, so its output sweeps fully from zero to maximum with each attack. By default, with envelope reset turned off, an envelope Attack sweeps the envelope output only from its current level to maximum. The effect of Envelope Reset is more prominent with longer attack and release times.

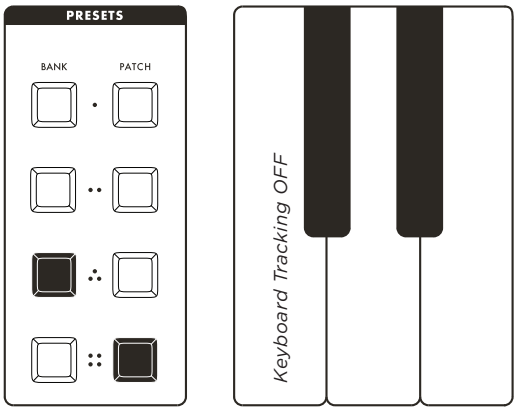
To change this function, engage Shift mode and press the **BANK 3** and **PATCH 2** buttons. Pressing the low C key turns Filter Envelope Reset off, and pressing C# turns it on.



FILTER ENVELOPE REPEAT

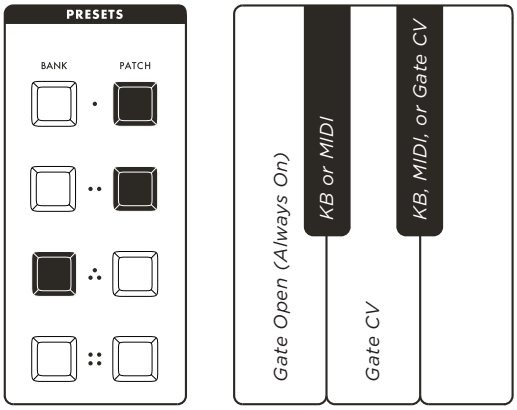
Normally, an envelope occurs just once when you play a note. It's possible, however, to use the filter's envelope generator as a multistage LFO for controlling cutoff, pitch, or waveform. When filter envelope repeat is enabled, then the delay, attack, hold, decay, and release stages will loop continuously for as long as the note is held. The shorter the envelope times, the faster the loop will repeat.

To turn on filter envelope repeat, enable Shift mode, press the **BANK 3** and **PATCH 3** buttons, and press the C# key. Pressing the C key turns off filter envelope repeat.



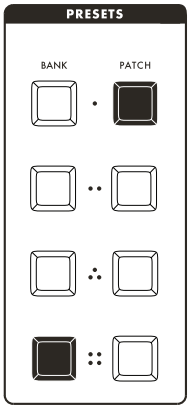
FILTER ENVELOPE KEYBOARD AMOUNT

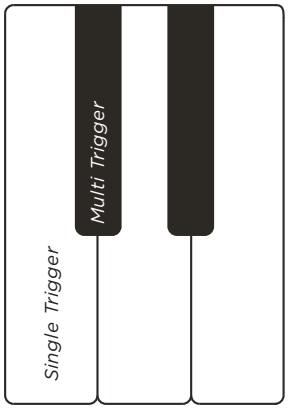
When filter envelope keyboard tracking is enabled, the filter's envelope times will respond to how high or how low you play on the keyboard. Engage Shift mode, press the **BANK 3** and **PATCH 4** buttons, and press any key besides low C to make the filter envelope track the keyboard. The higher the key you press, then the more keyboard tracking will affect envelope times. Engage Shift mode, press the **BANK 3** and **PATCH 4** buttons, and press low C to turn off keyboard tracking.



FILTER ENVELOPE GATE

You can control whether the filter envelope is triggered by the keyboard, by an external control-voltage source, by both, or whether the envelope is always on. Engage Shift mode and press the **BANK 3, PATCH 1,** and **PATCH 2** buttons. Pressing the low C key leaves the gate open and bypasses the envelope generator. When you press C#, only the keyboard or a MIDI signal will trigger the envelope. When you press D, only a gate signal routed from an external source to the **GATE CV** jack will trigger the envelope. When you press D#, the keyboard, a MIDI signal, or an external gate signal will trigger the envelope (default).

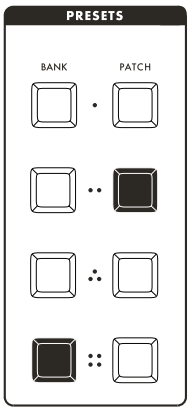


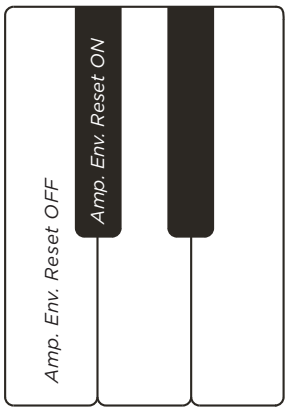


AMPLIFIER ENVELOPE TRIGGER MODE

As mentioned in the Envelopes Overview, by default, playing legato on the Sub Phatty prevents envelopes from retriggering on subsequent notes. With single triggering, the Sub Phatty prevents envelopes from retriggering on subsequent notes unless you've released the previous key. With multiple triggering, a new gate occurs each time you play a note on the keyboard, regardless of whether you've released the previous key. You can select single or multiple triggering separately for the amplifier and filter envelopes.

To specify single or multiple triggering for the amplifier envelope, engage Shift mode and press the **BANK 4** and **PATCH 1** buttons. Press the low C key to turn select single triggering (default), or press the low C# key to select multiple triggering.

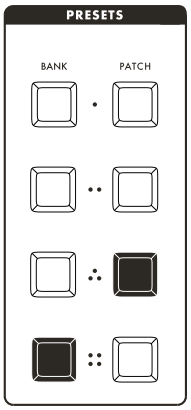


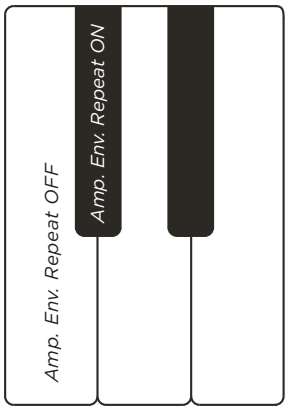


AMPLIFIER ENVELOPE RESET

When Amplifier Envelope Reset is turned on, each new note triggers the amplifier envelope to reset from zero, so its output sweeps fully from zero to maximum with each attack. By default, with envelope reset turned off, an envelope Attack sweeps the envelope output only from its current level to maximum. The effect of Envelope Reset is more prominent with longer attack and release times.

To change this function, engage Shift mode and press the **BANK 4** and **PATCH 2** buttons. Pressing the low C key turns Amplifier Envelope Reset off, and pressing C# turns it on.

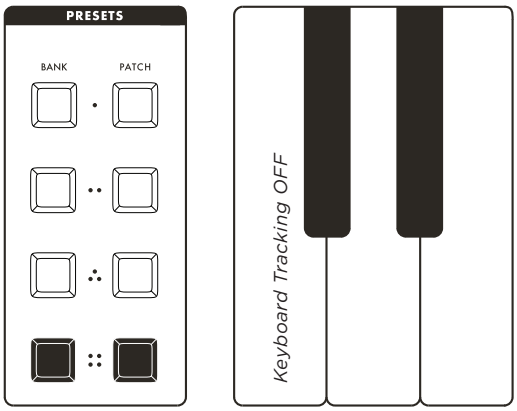




AMPLIFIER ENVELOPE REPEAT

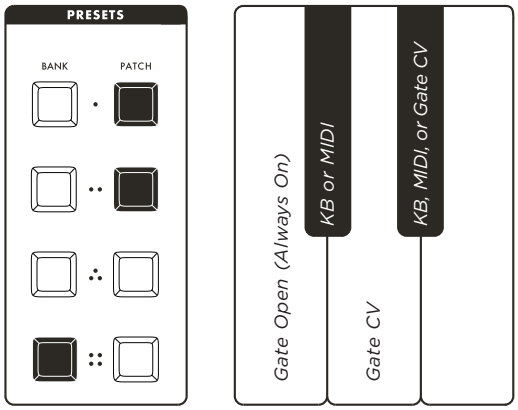
Just as with filter envelope repeat, it's possible to use the amplifier's envelope generator as a multistage LFO for controlling amplitude. When amplifier envelope repeat is enabled, then the delay, attack, hold, decay, and release stages will loop continuously for as long as the note is held. The shorter the envelope times, the faster the loop will repeat.

To turn on amplifier envelope repeat, enable Shift mode, press the **BANK 4** and **PATCH 3** buttons, and press the C# key. Pressing the C key turns off amplifier envelope repeat.



AMPLIFIER ENVELOPE KEYBOARD AMOUNT

When amplifier envelope keyboard tracking is enabled, the amplifier's envelope times will respond to how high or how low you play on the keyboard. Engage Shift mode, press the **BANK 4** and **PATCH 4** buttons, and press any key besides low C to make the amplifier envelope track the keyboard. The higher the key you press, then the more keyboard tracking will affect envelope times. Engage Shift mode, press the **BANK 4** and **PATCH 4** buttons, and press low C to turn off keyboard tracking.

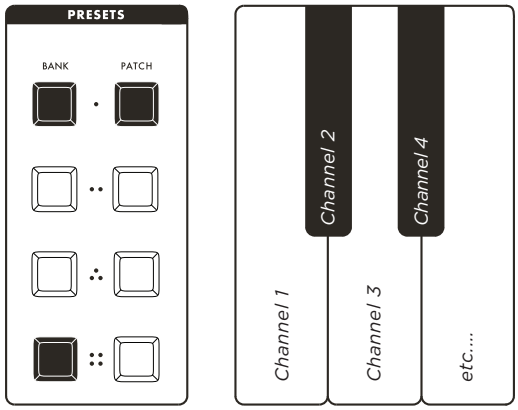


AMPLIFIER ENVELOPE GATE

You can control whether the amplifier envelope is triggered by the keyboard, by an external control-voltage source, by both, or whether the envelope is always on. Engage Shift mode and press the **BANK 4, PATCH 1,** and **PATCH 2** buttons. Pressing the low C key leaves the gate open and bypasses the envelope generator. When you press C#, only the keyboard or a MIDI signal will trigger the envelope. When you press D, only a gate (CV) signal routed from an external source to the **GATE CV** jack will trigger the envelope. When you press D#, the keyboard, a MIDI signal, or an external gate signal will trigger the envelope (default).

MIDI PARAMETERS

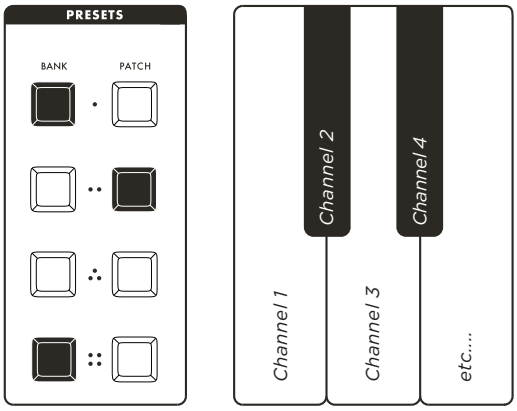
Shift mode lets you modify the Sub Phatty's default MIDI settings. You can change the MIDI transmit and receive channels, turn local control on and off, filter MIDI data, enable and disable fine-resolution data recognition, and enable and disable the DIN or USB ports to send, receive, and merge MIDI data. Changing some MIDI settings requires that you press two **BANK** buttons and one **PATCH** button in Shift mode.



MIDI IN CHANNEL

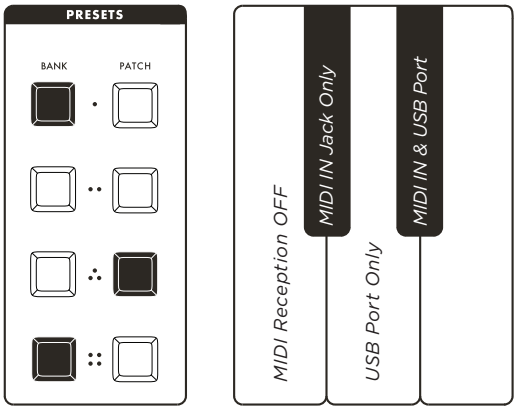
By default, the Sub Phatty sends and receives data on MIDI Channel 1, but you can set it to send or receive on any MIDI Channel from 1 to 16.

To change the input channel, engage Shift mode and press the **BANK 1, BANK 4,** and **PATCH 1** buttons. The next key you press will determine the input channel. Pressing the low C selects Channel 1, C# selects Channel 2, and so on, all the way up to D# above middle C, which selects Channel 16.



MIDI OUT CHANNEL

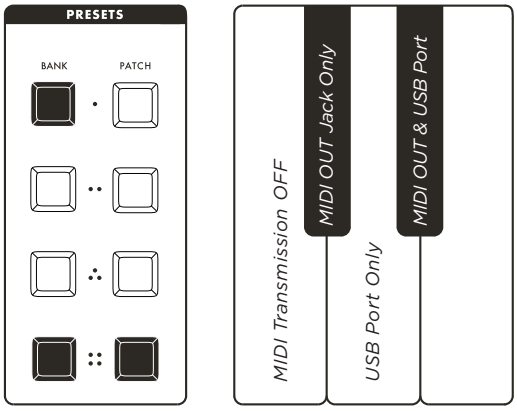
To change the output channel, engage Shift mode and press the **BANK 1, BANK 4,** and **PATCH 2** buttons. The next key you press will determine the output channel. Pressing the low C selects Channel 1, C# selects Channel 2, and so on, all the way up to D# above middle C, which selects Channel 16.



MIDI INPUT SELECT

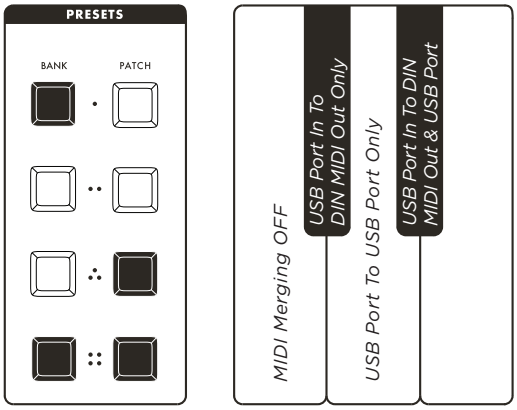
The Sub Phatty can send and receive MIDI data through the DIN jacks labeled **MIDI IN** and **MIDI OUT** or through its USB port, depending on your preferences.

To specify the MIDI In path, engage Shift mode and press the **BANK 1, BANK 4,** and **PATCH 3** buttons. Pressing the low C key will turn MIDI reception off. Pressing C# will cause the Sub Phatty to receive data through the **MIDI IN** jack only. Pressing D will cause it to receive data through the USB port only. Pressing D# will cause it to receive data through both the **MIDI IN** jack and the USB port (default).



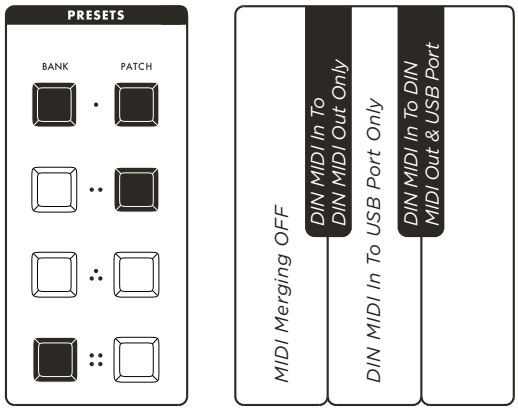
MIDI OUTPUT SELECT

To specify the MIDI Out path, engage Shift mode and press the **BANK 1, BANK 4,** and **PATCH 4** buttons. Pressing the low C key will turn MIDI transmission off. Pressing C# will cause the Sub Phatty to send data through the **MIDI OUT** jack only. Pressing D will cause it to send data through the USB port only. Pressing D# will cause it to send data through both the **MIDI OUT** jack and the USB port, which is the default setting.



MIDI MERGE USB

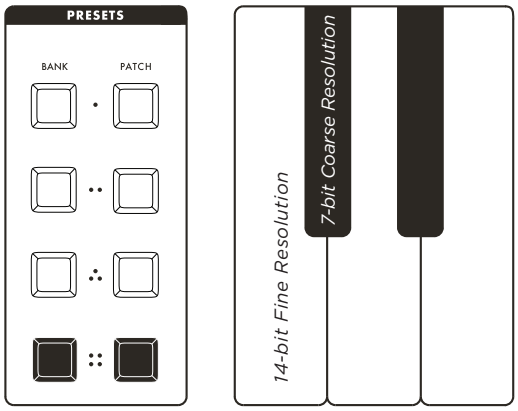
To set the MIDI Merge parameters for the USB port, engage Shift mode and press **BANK 1, BANK 4, PATCH 3,** and **PATCH 4**. Pressing the low C key will turn off MIDI merging. Pressing C# will cause data received by the USB port to pass through to the **MIDI OUT** jack only. Pressing D will cause data received by the USB port jack to pass through to the USB port only. Pressing D# will cause data received by the USB port jack to pass through to both the **MIDI OUT** jack and the USB port.



MIDI MERGE DIN

The Sub Phatty can merge MIDI data it receives with the MIDI data it transmits. You can specify the path of the merged data so that data received at either the **MIDI IN** jack or the **USB** port is passed through to the **MIDI OUT** jack or the **USB** port.

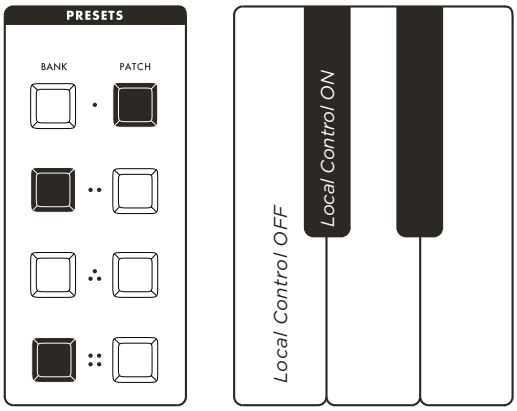
To set the MIDI Merge parameters for the **MIDI IN** jack, engage Shift mode and press **BANK 1, BANK 4, PATCH 1**, and **PATCH 2.** Pressing the low C key will turn off MIDI merging. Pressing C# will cause data received by the **MIDI IN** jack to pass through to the **MIDI OUT** jack only. Pressing D will cause data received by the **MIDI IN** jack to pass through to the **USB** port only. Pressing D# will cause data received by the **MIDI IN** jack to pass through to both the **MIDI OUT** jack and the **USB** port.



MIDI CC RESOLUTION

Most MIDI commands allow a range of values from 0 to 127, a number limited by the 7-bit words that make up standard MIDI messages. For Control Change (CC) commands that require greater resolution, it's possible to use 14-bit words that allow a much finer-resolution range of values, from 0 to 16,384.

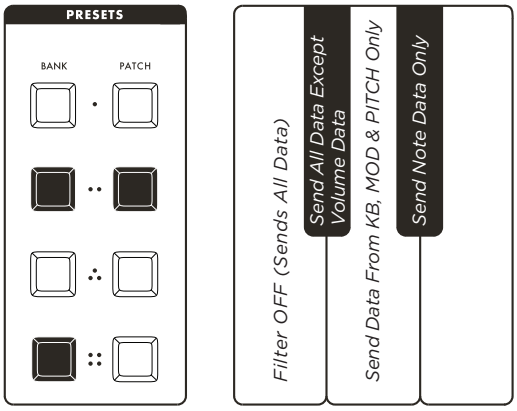
To enable the Sub Phatty to send MIDI CCs with 14-bit fine resolution, engage Shift mode, press **BANK 4** and **PATCH 4,** and press the low C key. To return to standard 7-bit coarse resolution, engage Shift mode, press **BANK 4** and **PATCH 4,** and press the low C# key.



LOCAL CONTROL

Sometimes it's useful to disable the keyboard when you're using it as a MIDI controller for other instruments or when you're recording tracks into a DAW. With Local Control turned on, you can use the keyboard and the front-panel controls to play and program the Sub Phatty. With Local Control turned off, any keys you press or control settings you change send data directly to the instrument's MIDI Out or USB, without affecting the Sub Phatty.

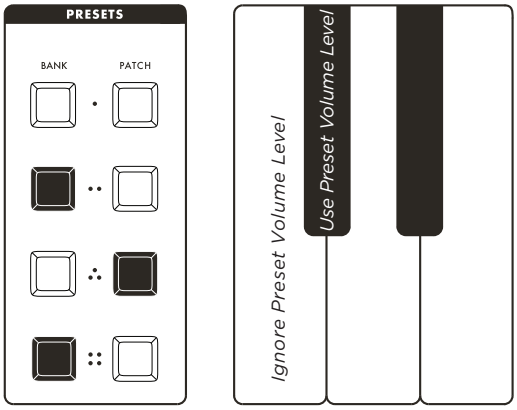
To turn Local Control off, engage Shift mode, press **BANK 2, BANK 4,** and **PATCH 1,** and then press the low C key. To turn Local Control back on, engage Shift mode, press **BANK 2, BANK 4,** and **PATCH 1,** and then press the low C# key.



MIDI OUTPUT FILTER

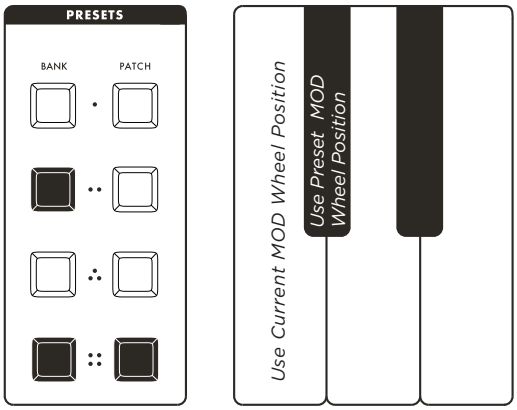
It is possible to filter the MIDI data that the Sub Phatty sends so that certain data isn't received by external MIDI devices. To turn on the MIDI output filter, engage Shift mode and press the **BANK 2, BANK 4,** and **PATCH 2** buttons. Press the C# key to send everything except volume data. Press the D key to send data from the keyboard, **MOD** wheel, and **PITCH** wheel only, filtering out everything else. Press the D# key to send only note data when you play the keyboard. Pressing the C key turns off the filter, ensuring that the Sub Phatty sends all MIDI data (default).

GLOBAL PARAMETERS



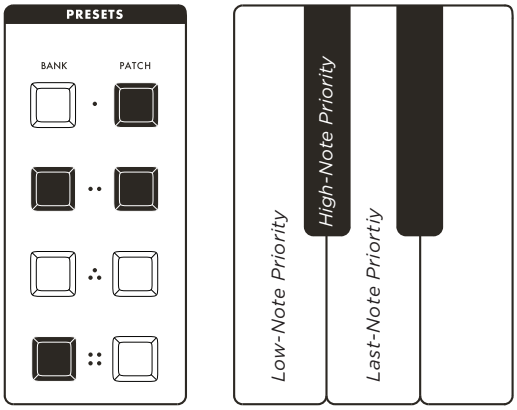
USE PRESET VOLUME

When you load a preset, you can specify whether its loudness is controlled by the **MASTER VOLUME's** current setting or by the volume level that was saved as part of the preset. Engage Shift mode and press the **BANK 2, BANK 4,** and **PATCH 3** buttons. Then, press C if you want the current patch to ignore its preset volume level, or press C# if you want it to use its preset volume level (default).



USE PRESET MOD WHEEL

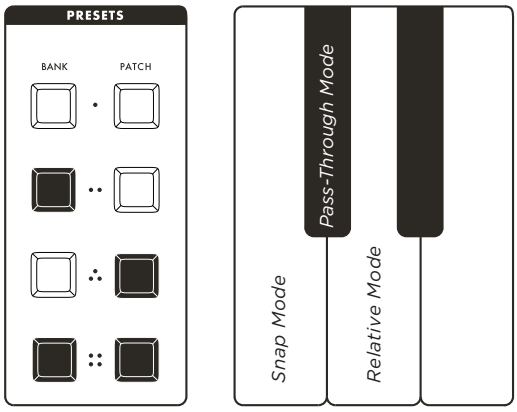
When you load a preset, you can specify whether its modulation depth is controlled by the MOD wheel setting that was current when you saved the patch. Engage Shift mode and press the **BANK 2, BANK 4,** and **PATCH 4** buttons. Press C# to use the preset MOD wheel setting (default), and press C to use the current MOD wheel position.



GLOBAL NOTE PRIORITY

Because the Sub Phatty is monophonic, it will play only one note at a time. What happens when you press two keys at the same time? By default, it plays a note in response to the most recent key you pressed, regardless of its position. This is called last-note priority. You can change that behavior, however, so that it will play either the lowest or the highest note when you press more than one key.

Engage Shift mode and press the **BANK 2, BANK 4, PATCH 1,** and **PATCH 2** buttons. Pressing the low C key engages low-note priority, so that only the lowest note plays when you hold down more than one key. Pressing C# engages high-note priority, so that only the highest note plays when you hold down more than one key. Pressing D engages the default, last-note priority.



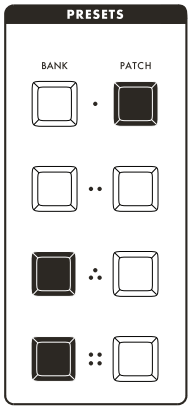
KNOB MODE

When you change presets, it's unlikely that the positions of the knobs will match the values of the preset's parameters. When you turn a knob to make changes, how it responds will depend on its mode.

To enter Knob mode, engage Shift mode and press **BANK 2, BANK 4, PATCH 3, and PATCH 4.** Press the low C to engage Snap mode, in which the value jumps to the knob's current position as soon as you begin turning it. Press C# to engage Pass-Through mode, in which turning the knob has no effect until it reaches its preset value and then takes effect. Press D to engage Relative mode (the default), in which turning the knob up or down slightly causes a minor change in value, and turning it further causes a increasingly greater change in value. This allows the value to "catch up" with the knob's position and prevents any sudden jumps.

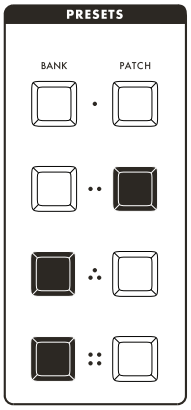
SYSTEM COMMANDS

Whenever you invoke a system command, you cause some kind of irreversible change. For this reason, each command requires that you press a key twice to confirm your choice. Once you've selected a command, press the C# key twice to invoke it, or press the C key to cancel it.



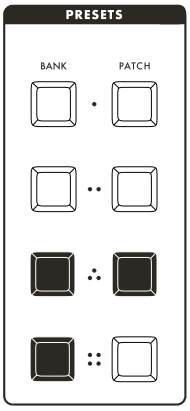
INITIALIZE PRESET

Engage Shift mode and press **BANK 3, BANK 4,** and **PATCH 1.** Press C# twice to reset all the Shift-mode parameters to their default settings.



INITIALIZE GLOBAL PARAMETERS

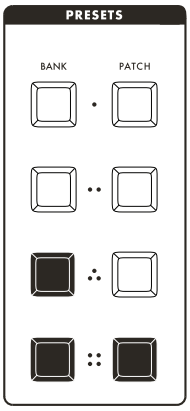
Engage Shift mode and press **BANK 3, BANK 4,** and **PATCH 2.** Press C# twice to reset the global parameters (Local Control, MIDI Output Filter, Use Preset Volume, Use Preset MOD Wheel, Note Priority, Knob Wheel) to their default setting.



RESTORE FACTORY PRESETS

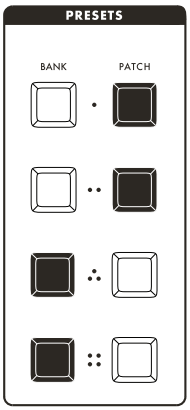
Engage Shift mode and press **BANK 3, BANK 4,** and **PATCH 3**. Press C# twice to reload the Sub Phatty's 16 factory presets.

***NOTE*:** *Invoking this command will delete any user presets.*



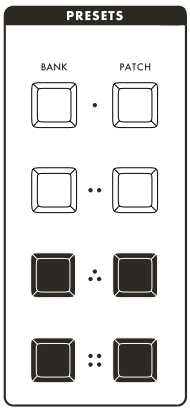
NOTE CALIBRATION

Engage Shift mode and press **BANK 3, BANK 4,** and **PATCH 4**. Press C# twice to run a full-range note calibration routine for the two oscillators. This will ensure that the oscillators remain in tune in every octave throughout their entire pitch range.



SEND CURRENT PRESET

Engage Shift mode and press the **BANK 3, BANK 4, PATCH 1,** and **PATCH 2** buttons. Press C# twice to send all the settings for the current preset to your computer as MIDI system exclusive data. If you record this data on your computer and then send it back to the Sub Phatty, it will replace the patch that's currently loaded into the panel buffer. Once it's in the buffer, you must manually save the data to a preset location if you don't want to lose it.



SEND ALL PRESETS

Engage Shift mode and press the **BANK 3, BANK 4, PATCH 3,** and **PATCH 4** buttons. Press C# twice to send all 16 presets to your computer as a single Preset Bank file. If you record this MIDI system exclusive data on your computer and then send it back to the Sub Phatty, it will replace all 16 presets stored in the Sub Phatty's memory.

For additional hidden parameters and updates visit ***www.moogmusic.com/subphatty.***

MIDI OPERATIONS

MIDI CHANNEL

By default, the Sub Phatty is set to receive and send MIDI on Channel 1, but it can be configured to send and receive to MIDI Channel (1-16).

MIDI CONTROL CHANGE (CC) MESSAGES

The tables on the following pages list all MIDI CC messages for the Sub Phatty.

MIDI CC VALUES FOR THE LFO CLOCK DIVIDER (CC #3)

TIME VALUE	DIVISION	VALUE
1/64 Note Triplet	1/64 T	122-127
1/32 Note Triplet	1/32 T	116-121
1/32 Note	1/32	110-115
1/16 Note Triplet	1/16 T	104-109
1/16 Note	1/16	98-103
1/8 Note Triplet	1/8 T	92-97
Dotted 1/16 Note	1/16 DOT	86-91
1/8 Note	1/8	80-85
1/4 Note Triplet	1/4 T	74-79
Dotted 1/8 Note	1/8 DOT	68-73
1/4 Note	1/4	61-67
1/2 Note Triplet	1/2 T	55-60
Dotted 1/4 Note Triplet	1/4 DOT	49-54
1/2 Note	1/2	43-48
Whole Note Triplet	WH T	37-42
Dotted 1/2 Note	1/2 DOT	31-36
Whole Note	WH	25-30
Whole Note + Half Note	WH + 1/2	19-24
2 Whole Notes	2 Whole	13-18
3 Whole Notes	3 Whole	7-12
4 Whole Notes	4 Whole	0-6

CONTROL/ PARAMETER	CC	CC VALUE RANGE	14 BIT MSB / LSB
AMPLIFIER EG ATTACK	28	0-16383	14 BIT: CC 28 / CC 60
AMPLIFIER EG DECAY	29	0-16383	14 BIT: CC 29 / CC 61
AMPLIFIER EG SUSTAIN	30	0-16383	14 BIT: CC 30 / CC 62
AMPLIFIER EG RELEASE	31	0-16383	14 BIT: CC 31 / CC 63
FILTER EG ATTACK	23	0-16383	14 BIT: CC 23 / CC 55
FILTER EG DECAY	24	0-16383	14 BIT: CC 24 / CC 56
FILTER EG SUSTAIN	25	0-16383	14 BIT: CC 25 / CC 57
FILTER EG RELEASE	26	0-16383	14 BIT: CC 26 / CC 58
VCO 1 LEVEL	15	0-16383	14 BIT: CC 15 / CC 47
VCO 2 LEVEL	16	0-16383	14 BIT: CC 16 / CC 48
NOISE LEVEL	8	0-16383	14 BIT: CC 8 / CC 40
VCO 1 SUB LEVEL	17	0-16383	14 BIT: CC 17 / CC 49
VCO 1 WAVE	9	0-16383	14 BIT: CC 9 / CC 41
VCO 2 WAVE	14	0-16383	14 BIT: CC 14 / CC 46
VCO 2 FREQUENCY	12	0-16383	14 BIT: CC 12 / CC 44
VCO 2 BEAT FREQUENCY	13	0-16383	14 BIT: CC 13 / CC 45
VCO 2 HARD SYNC	77	0 = OFF, 64 = 0N	
VCO GATE RESET	81	0 = OFF, 64 = ON	
FILTER CUTOFF FREQUENCY	19	0-16383	14 BIT: CC 19 / CC 51
FILTER RESONANCE	21	0-16383	14 BIT: CC 21 / CC 53
FILTER KB TRACKING AMOUNT	27	0-16383	14 BIT: CC 27 / CC 59
FILTER EG AMOUNT	22	0-16383	14 BIT: CC 22 / CC 54
MULTIDRIVE AMOUNT	18	0-16383	14 BIT: CC 18 / CC 50
FILTER EG VELOCITY TO AMPLITUDE	110	0-127	
AMPLIFIER EG VELOCITY TO AMPLITUDE	92	0-127	

CONTROL/ PARAMETER	CC	CC VALUE RANGE	14 BIT MSB / LSB
NOTE PRIORITY	111	0 = Global, 32 = Low Note, 64 = High Note, 96 = Last Note	
RELEASE ON / OFF	88	0 = OFF, 64 = ON	
MODULATION SOURCE	71	0 = Triangle LFO, 16 = Square LFO, 32 = Saw LFO, 48 = Ramp LFO, 64 = S&H, 80 = Filter Envelope	
LFO RATE	3	0 - 16383	14 BIT: CC 3 / CC 35
LFO MIDI SYNC	102	0 = OFF, 64 = ON	
LFO GATE RESET	93	0 = OFF, 64 = ON	
FILTER MOD AMOUNT	2	0 - 16383	14 BIT: CC 2 / CC 34
PITCH MOD AMOUNT	4	0 - 16383	14 BIT: CC 4 / CC 36
WAVE MOD AMOUNT	20	0 - 16383	14 BIT: CC 20 / CC 52
PITCH BEND UP	107	0 - 25	
PITCH BEND DOWN	108	0 - 25	
GLIDE ON / OFF	65	0 = OFF, 64 = ON	
GLIDE LEGATO	94	0 = OFF, 64 = ON	
GLIDE RATE	5	0 - 16383	14 BIT: CC 5 / CC 37
GLIDE TYPE	85	0 = Linear Constant Rate, 43 = Linear Constant Time, 86 = Exponential	
LFO KB TRACKING AMT.	78	0 - 127	
AMPLIFIER EG RESET	83	0 = OFF, 64 = 0N	
FILTER EG RESET	82	0 = OFF, 64 = ON	
OUTPUT LEVEL	7	0 - 16383	14 BIT: CC 7 / CC 39
KEYBOARD OCTAVE	89	0 = -2 Oct, 16 = -1 Oct, 32 = +0 Oct 48 = +1 Oct, 64 = +2 Oct	
EXTERNAL INPUT LVL.	116	0 - 127	
AMPLIFIER EG DELAY	104	0 - 127	
AMPLIFIER EG HOLD	106	0 - 127	
FILTER EG DELAY	103	0 - 127	
FILTER EG HOLD	105	0 - 127	

CONTROL/ PARAMETER	CC	CC VALUE RANGE	14 BIT MSB / LSB
PITCH MOD. OSC 2 ONLY	70	0 = OFF, 64 = ON	
MODULATION WHEEL	1	0 - 16383	
WAVE MOD DESTINATION	72	0 = OSC 1 Only, 43 = OSC 2 Only, 86 = Both OSC 1 & 2	
VCO 1 OCTAVE	74	16 = 16', 32 = 8', 48 = 4', 64 = 2'	
VCO 2 OCTAVE	75	16 = 16', 32 = 8', 48 = 4', 64 = 2'	
FILTER POLES	109	0 = 1 POLE, 32 = 2 POLES, 64 = 3 POLES, 96 = 4 POLES	
LFO RANGE	76	0 = Low (.01 Hz - 10Hz) 43 = Mid (.1Hz - 100Hz) 86 = High (1Hz - 1kHz)	
LEGATO	68	0 = OFF, 64 = ON	
KEYBOARD TRANSPOSE	119	0 = 12 Semitones, 1 = -11 Semitones... 12 = +0 Semitones... 24 = +12 Semitones	
GATED GLIDE	73	0 = OFF, 64 = ON	
FILTER EG REPEAT	112	0 = OFF, 64 = ON	
FILTER EG VELOCITY TO TIME	86	0 - 127	
FILTER EG KB AMOUNT	79	0 - 127	
FILTER EG GATE SOURCE	90	0 = Gate On, 32 = Keys Only, 64 = Gate Only, 96 = Keys Or Gate Input	
AMPLIFIER EG REPEAT	113	0 = OFF, 64 = ON	
AMPLIFIER EG VELOCITY TO TIME	87	0 - 127	
AMPLIFIER EG KB AMOUNT	80	0 - 127	
VOLUME EG GATE SOURCE	91	0 = Gate On, 32 = Keys Only, 64 = Gate Only, 96 = Keys Or Gate Input	
FILTER EG TRIGGER MODE	114	0 = OFF, 64 = ON	
AMPLIFIER EG TRIGGER MODE	115	0 = OFF, 64 = ON	

SERVICE AND SUPPORT INFORMATION

MOOG LIMITED WARRANTY

Moog Music warrants its products to be free of defects in materials and workmanship for a period of one year from the date of purchase. During the warranty period, any defective products will be repaired or replaced, at Moog Music's option, on a return-to-factory basis. This warranty covers defects that Moog Music determines are no fault of the user. In countries outside of the USA, contact a Moog authorized distributor listed on our web site (www.moogmusic.com) for service.

RETURNING YOUR PRODUCT TO MOOG MUSIC

You must obtain prior approval in the form of an RMA (Return Material Authorization) number from Moog Music before returning any product. To request an RMA number call us at (828) 251-0090 or email techsupport@moogmusic.com. The Sub Phatty must be returned in its original packing. The warranty will not be honored if the product is not properly packed. Send the product to Moog Music Inc. with transportation and insurance charges paid.

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 has been abused, damaged in transit, or is out of warranty, we will contact you with an estimate of the repair cost.

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 instrument. Registering your instrument initiates your warranty, ensures you receive the latest software updates, gets you the free editor/librarian, and gets you a nifty sticker!

CARING FOR THE SUB PHATTY

Clean the Sub Phatty with a soft, slightly moist cloth only – do not use solvents or abrasive detergents. Heed the safety warnings at the beginning of the manual. Don't drop the unit. If you are shipping your Sub Phatty to the factory for servicing, we recommend using the original shipping carton, or an ATA approved Road Case.

AN IMPORTANT NOTE ABOUT SAFETY: *Do not open the chassis. There are no user serviceable parts in the Sub Phatty. Maintenance of the Sub Phatty synthesizer should be referred to qualified service personnel only.*

SPECIFICATIONS

TYPE: Programmable Monophonic Analog Synthesizer

SOUND ENGINE: Analog

NUMBER OF KEYS: 25

TYPE OF KEYS: Semi-Weighted

OTHER CONTROLLERS: Pitch Bend, Mod Wheel

POLYPHONY: Monophonic

SOUND SOURCES: 2 Variable Waveshape Oscillators, 1 Square Wave Sub Oscillator, 1 Noise Generator

OSCILLATOR CALIBRATION RANGE: 22Hz-6.8kHz. Guaranteed note range at 8' of Note 18 to 116

MOD SOURCES: Triangle, Square, Saw, Ramp, SH, Filter Envelope

MOD DESTINATIONS: Pitch, Osc 2 Pitch Only, Filter, Waveshape

FILTER: Moog Ladder Filter 20Hz-20kHz

AUDIO INPUT: 1xTS

AUDIO OUTPUT: 1xTS, 1xTRS Headphone

PRESETS: 4 Banks, 4 Patches per Bank

MIDI I/O: DIN In, Out, and MIDI over USB

CV/GATE INPUTS: Filter CV, Pitch CV, Volume CV, KB Gate

TRANSPOSITION: +/- 2 Octaves

LFO: 0.01Hz - 1000Hz

Specifications Subject To Change Without Notice