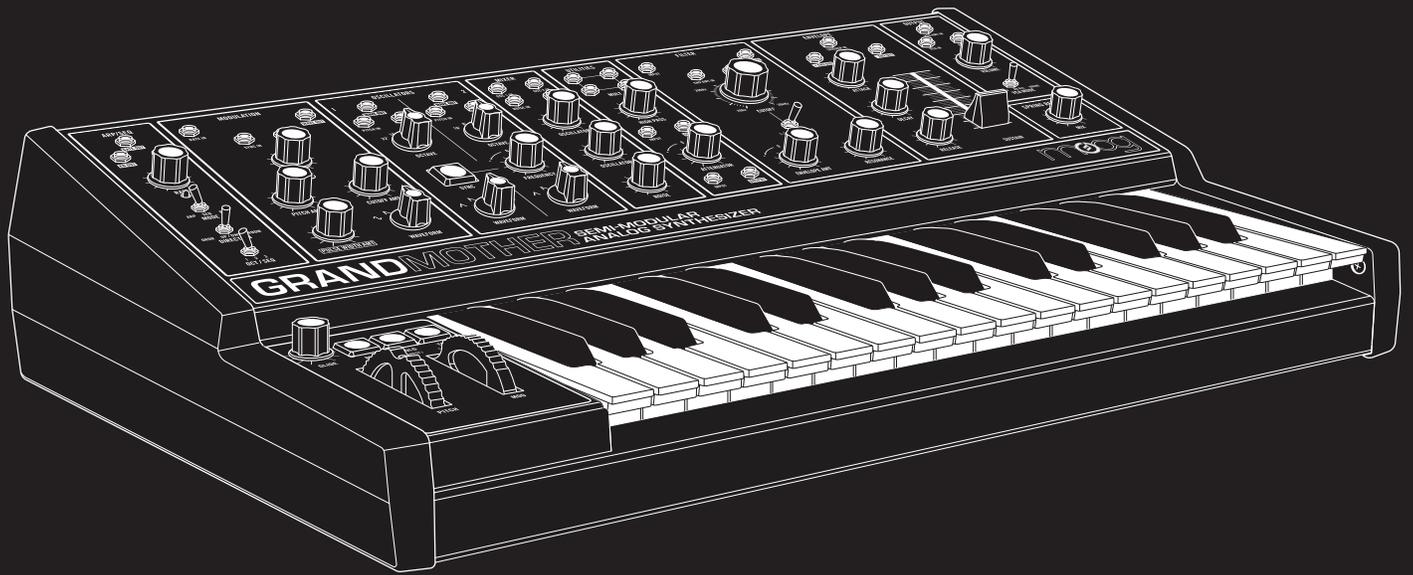




GRANDMOTHER DARK

USER'S MANUAL



“Everything has some consciousness,
and we tap into that. It is about
energy at its most basic level.”

- **Dr. Robert Moog** -

IMPORTANT SAFETY INSTRUCTIONS

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

1. Read all the instructions before using the product.
2. Do not use 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. No naked flame sources (such as candles, lighters, etc.) should be placed near this product. Do not operate in direct sunlight.
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 or during lightning storms.
8. Care should be taken so that objects do not fall, and liquids are not spilled, into the enclosure through openings.

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

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

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

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

OPERATING CONDITIONS AND STORAGE:

For optimal performance you should use your Grandmother between 50 - 95 degrees Fahrenheit or 10 - 35 degrees Celsius. Safe operating conditions are within the range of 50 - 110 degrees Fahrenheit or 10 - 43 degrees Celsius.

Your Grandmother should be stored in temperatures above 32 F (0 C) but never greater than 135 F (57 C). Do not leave your Grandmother in a vehicle on a hot day with the windows closed. Temperatures in a vehicle can exceed 175 F (80 C).

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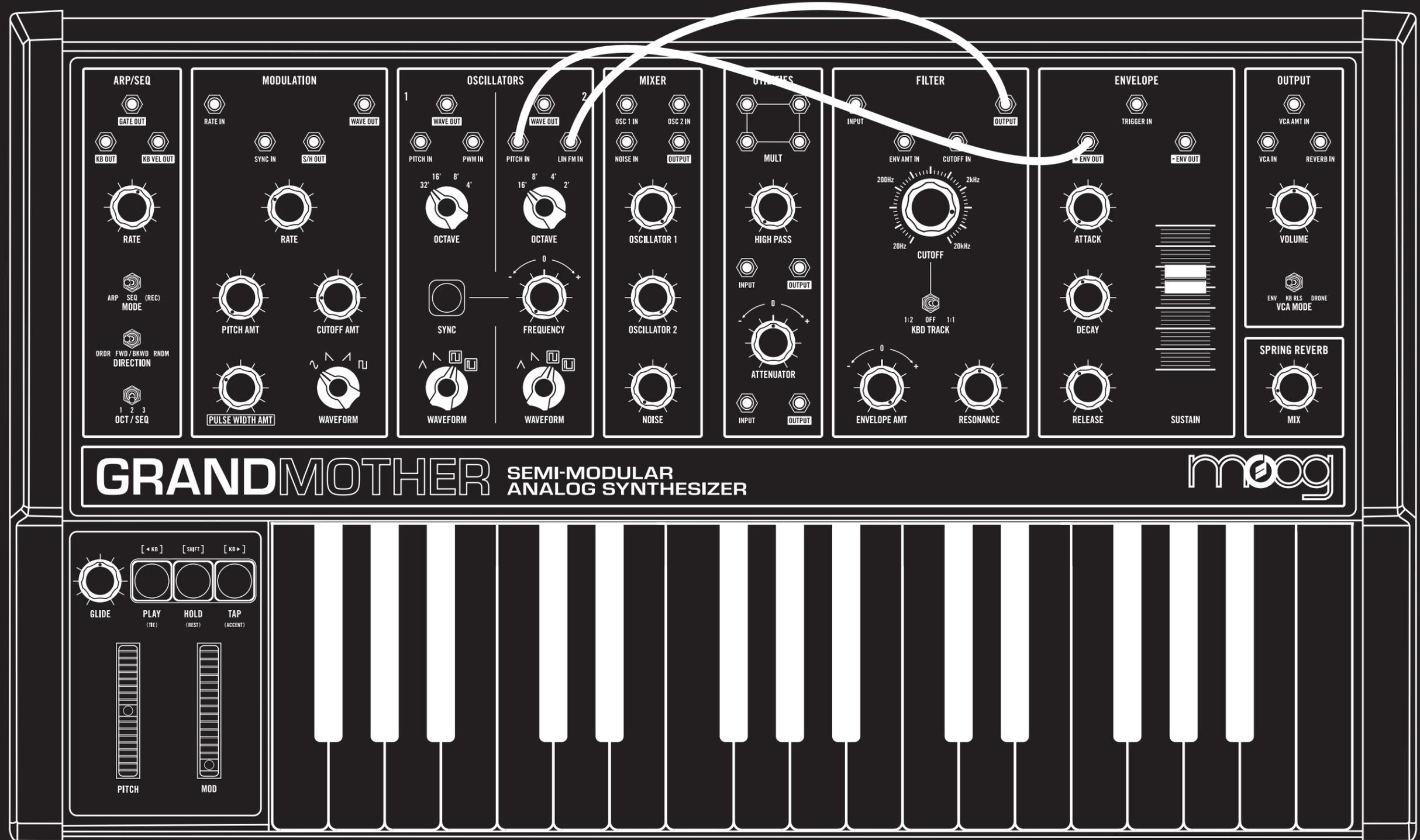
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GRANDMOTHER SEMI-MODULAR ANALOG SYNTHESIZER



GRANDMOTHER

Grandmother is a sonic playground that harkens back to Moog's modular roots, where synthesis is not only about the end result, but the journey of discovery and experimentation.

UNPACKING AND INSPECTION

Check the contents of the shipping carton.

Be careful when unpacking your new Moog Grandmother® 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 Grandmother ships with the following items:

1. Grandmother Semi-Modular Analog Synthesizer
2. Power Supply
3. Owner's Manual
4. Patch Cables
5. Registration Card

What you will need:

1. A table or surface where you can set your Grandmother.
2. A 1/4" instrument cable and amplified speaker or headphones with a 1/4" plug.
3. A properly wired AC outlet.

SETUP AND CONNECTIONS



POWER

Plug the included power adapter into the 12VDC power jack on the back of your Grandmother.

NOTE: The Grandmother's universal power supply will operate with a power source from 100 to 240 Volts AC, 50/60Hz.

Plug the other end of the included power adapter into an AC outlet.

NOTE: Your Grandmother is an analog instrument and should be allowed 10-15 minutes to warm up before use. In cases where it has been left in a cold car overnight, for example, it may take as long as 25 minutes before oscillator tuning has stabilized. Do not operate Grandmother in direct sunlight.

AUDIO OUT / HEADPHONES

With the Master **VOLUME** control turned all the way down, plug one end of a 1/4" (TS) instrument cable into Grandmother's **AUDIO OUT** jack on the rear panel.

Plug the other end into an amplified speaker or mixing console input. This jack can also be used with a set of mono or stereo headphones.

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

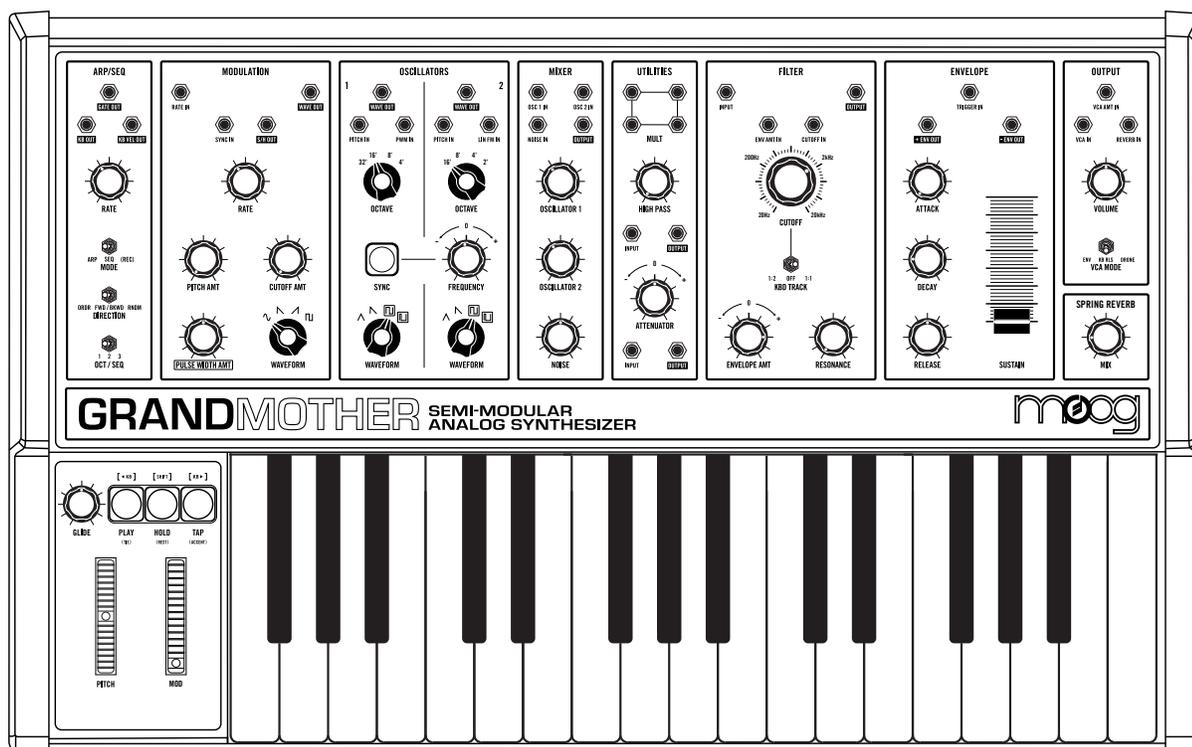
ABOUT GRANDMOTHER

Grandmother is a sonic playground that harkens back to Moog's modular roots, where synthesis is not only about the end result, but also the journey of discovery and experimentation. While capable of highly complex sounds and modulation, Grandmother's semi-modular design requires absolutely no patching, ensuring that human beings of any skill level can easily explore and experience the joys and magic of analog synthesis.

Inspired by the classic Moog modular synthesizers that came before it, Grandmother's sound engine, modulation engine, and onboard spring reverb tank are completely analog, resulting in an unrestricted sonic vocabulary of immeasurable beauty and power. In addition, Grandmother also features an easy-to-use Arpeggiator and Sequencer for added enjoyment and programmable syncopation.

Though not required, creative patching and exploration are the keys to discovering exciting new relationships between modules and to truly unlocking Grandmother's infinite expanse of auditory inspiration. Patching can also be used to override internal connections, allowing each section to function just as an independent module would.

In addition to its standalone function, Grandmother is also an ideal analog audio processor for external sound sources, and a powerful keyboard front end for expanding a Mother-32, DFAM, or any Eurorack modular system.



PERFORMANCE

32-note keyboard with arpeggiator and a 256-note sequencer with three sequence locations

SOUND SOURCES

Two voltage-controlled oscillators with hard sync and a white noise generator

ANALOG EFFECTS

6" spring reverb tank

SOUND BLENDING

3-channel mixer with an additional 1/4" external audio input

SOUND SHAPING

Classic 4-pole 10Hz to 20kHz Ladder filter and a patchable 1-pole high pass filter

UTILITIES

Patchable 4-point mult and a bipolar attenuator

DYNAMICS

Analog ADSR envelope

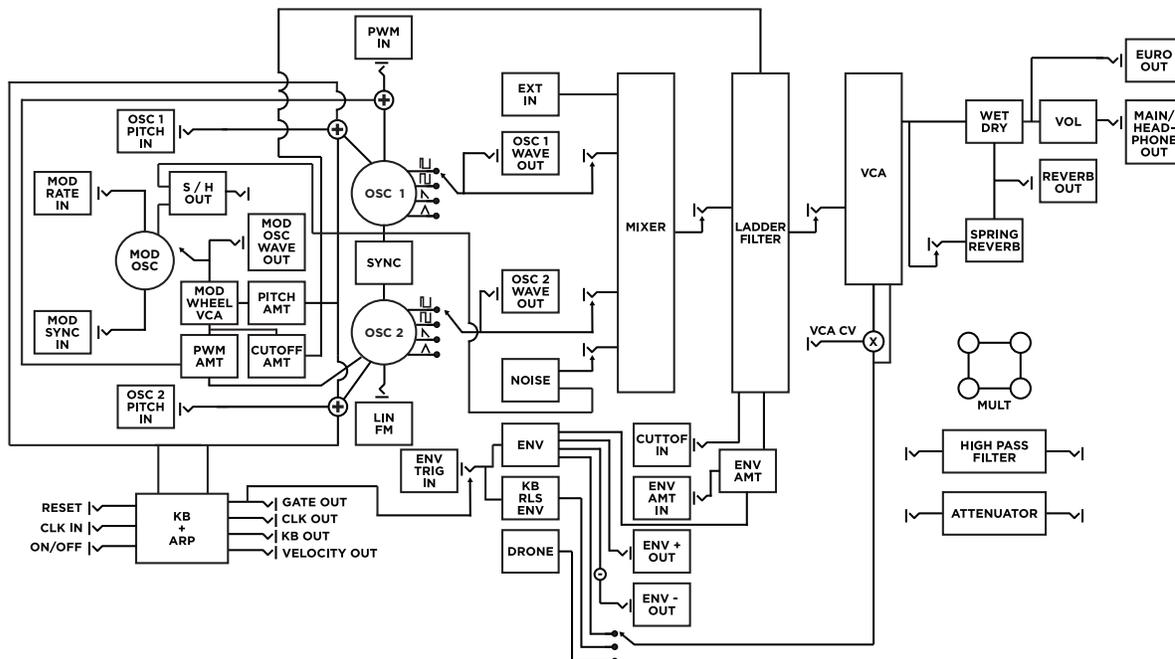
MODULATION

Wide-range analog LFO with Sync input and a Sample/Hold output

PATCH POINTS

41 patch points with 21 inputs and 20 outputs

SIGNAL FLOW



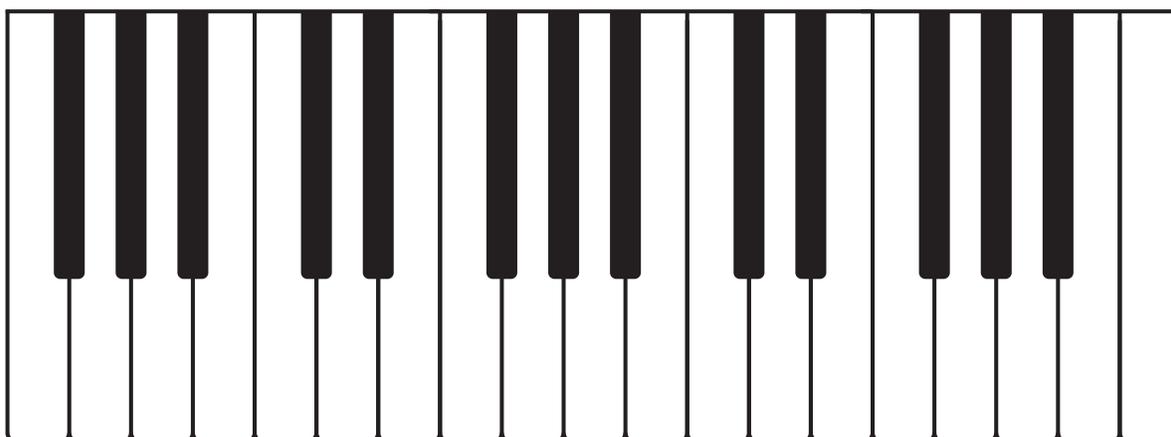
FEATURES AND CONTROLS

Grandmother groups panel controls together by module. Each module is also equipped with a set of modular patch points which greatly extend the capabilities of this expansive analog instrument.

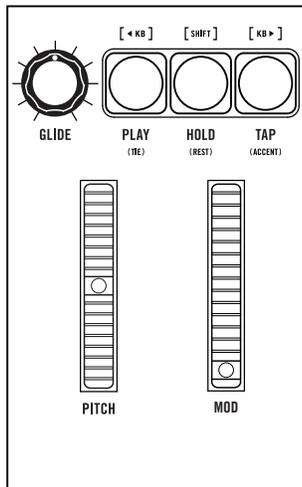
■ KEYBOARD

Grandmother is equipped with a 32-note velocity-sensitive keyboard.

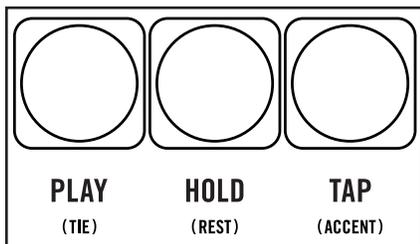
NOTE: There is no internal routing for keyboard velocity, but a connection can easily be made from the **KB VEL OUT** to the **CUTOFF IN** patch point in the Filter section.



■ LEFT-HAND CONTROLLER

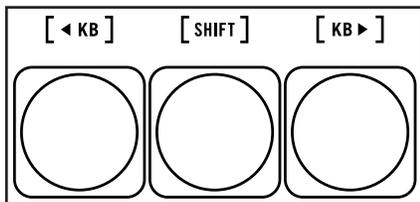


Grandmother's Left-Hand Controller is home to numerous performance and programming controls including **PITCH** and **MOD** wheels, a **GLIDE** control, and transport controls for the Arpeggiator and Sequencer.



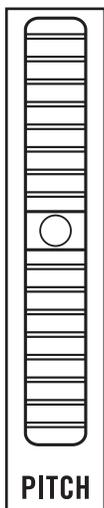
ARP / SEQUENCER CONTROLS

The **PLAY**, **HOLD**, and **TAP** buttons provide access to, and control over, the **ARP / SEQ** module. When recording a sequence, their function changes and they become the **(TIE)**, **(REST)**, and **(ACCENT)** buttons. To learn more about the Arpeggiator and Sequencer, go to page 29 and page 32.



OCTAVE TRANSPOSE

Grandmother is designed to behave and function like a traditional analog instrument, but changing keyboard octaves is a useful function for live performance and interfacing with other MIDI equipped devices. To transpose the keyboard by octave units, simply press and hold the **[SHIFT]** button, and then press the **[<KB]** button (down one octave) or **[KB >]** button (up one octave).

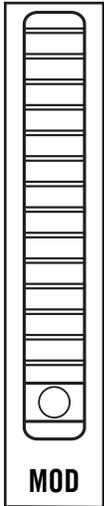


PITCH

The **PITCH** wheel provides an intuitive method for quickly bending the pitch of the Oscillators up or down during live performance.

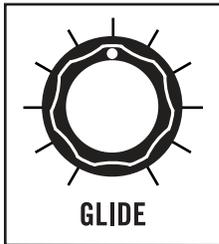
NOTE: The **PITCH** wheel is spring-loaded and will return to center position as soon as it is released.

LEFT-HAND CONTROLLER (Continued)



MOD

The **MOD** wheel determines how much modulation is applied to the Filter Cutoff frequency, the pitch of the Oscillators, and to the width of the Pulse waveforms. It scales the overall amount of modulation from Off to the maximum settings specified by the **PITCH AMT**, **CUTOFF AMT**, and **PULSE WIDTH AMT** knobs in the **MODULATION** section.

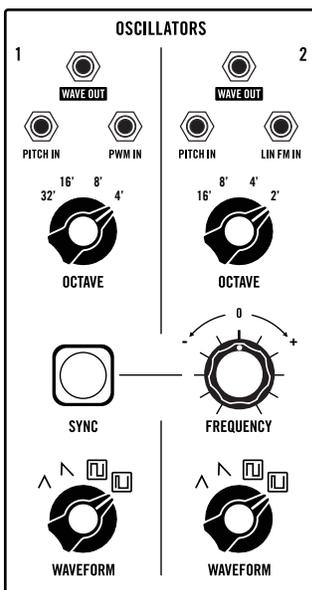


GLIDE

Glide produces a smooth, continuous change in pitch between notes when transitioning from one note to the next. The **GLIDE** knob sets the amount of time needed to complete this transition. When the **GLIDE** knob is set to minimum, there is no Glide effect. Raising the value of the **GLIDE** knob will increase the Glide time between notes.

***TIP:** Legato glide is useful when creating acid-style sequences. To turn Legato Glide On, continue to press the **HOLD** button while turning the **GLIDE** knob to the right. To turn Legato Glide Off, continue to press the **HOLD** button while turning the **GLIDE** knob to the left. The Default is Off.*

■ OSCILLATORS

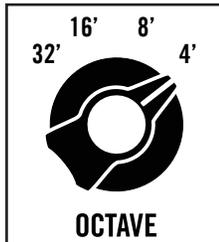


This is where the sound of the synthesizer is born. Grandmother provides two oscillators of almost identical design, each with its own Octave and Waveform settings. Oscillator 2 is equipped with a **FREQUENCY** knob to detune it from Oscillator 1.

***NOTE:** There is a **FINE TUNE** knob located on the rear panel for adjusting the overall tuning of the instrument.*

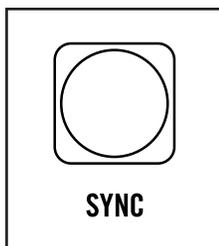
OSCILLATORS *(Continued)*

OSCILLATOR 1



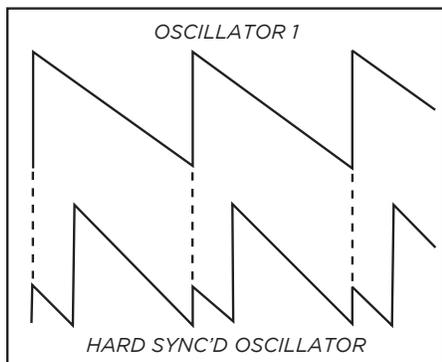
OCTAVE

This four-position switch is used to select the fundamental Octave setting for Oscillator 1. The choices are 32', 16', 8', and 4'.



SYNC

When this button is lit, the phase of Oscillator 2 is hard Sync'd to the phase of Oscillator 1. This will cause Oscillator 2 to reset at each zero-crossing of Oscillator 1. This forced synchronization causes the waveform of Oscillator 2 to take on a more complex wave shape as it works to stay aligned with Oscillator 1. Sync is useful for creating sharp, metallic, and flange-like sounds, while also ensuring that the pitch of Oscillator 2 stays locked to Oscillator 1.



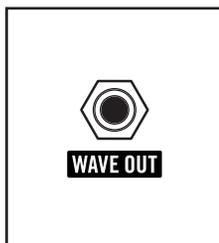
TIP: Applying modulation to the Frequency of Oscillator 2 is a great way to enhance the Sync effect.

NOTE: When Sync is on and the Frequency of Oscillator 2 is set lower than that of Oscillator 1, Oscillator 2 will not be able to complete a full cycle before it is forced to reset, resulting in little or no output.



WAVEFORM

This four-position knob is used to select the Waveform setting for Oscillator 1. The choices are Triangle, Saw, Square, and Narrow Pulse.

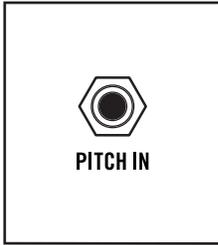


WAVE OUT

The audio signal coming from this output is determined by the settings of the Oscillator 1 OCTAVE and WAVEFORM knobs.

CV / AUDIO OUTPUT: 10V peak-to-peak

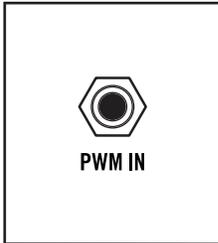
OSCILLATOR 1 (Continued)



PITCH IN

The control signal received here is summed with the internal Pitch CV to modulate the pitch of the Oscillator 1.

CV INPUT: -5V to +5V Control Voltage (1V/Oct)

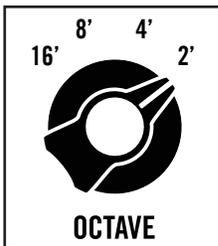


PWM IN

A control signal connected to this input will modulate the pulse width of the Square or Narrow Pulse waveform selected by a patched oscillator. Pulse Width Modulation (PWM) varies the duty cycle, or pulse width of a wave, and thereby changes its harmonic content. Among other things, PWM is often used to mimic the sound of ensemble strings and to thicken bass sounds.

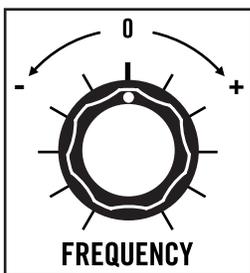
CV INPUT: -5V to +5V

OSCILLATOR 2



OCTAVE

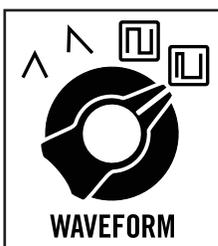
This four-position switch is used to select the fundamental Octave setting for Oscillator 2. The choices are 16', 8', 4', and 2'.



FREQUENCY

This knob detunes Oscillator 2 from Oscillator 1 over a range of +/- 7 semi-tones. The center position (12 O'clock) puts Oscillator 2 in unison with Oscillator 1. Increasing the value raises the pitch, decreasing the value lowers the pitch. When the **SYNC** button is lit, the pitch of Oscillator 2 is locked to Oscillator 1; in this case, changing the Frequency value will vary the degree of the Sync effect and effect harmonics. The range of the **FREQUENCY** knob is also greatly increased.

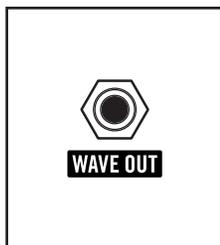
NOTE: The range of the **FREQUENCY** knob can be specified in the Global Settings.



WAVEFORM

This four-position knob is used to select the Waveform setting for Oscillator 2. The choices are Triangle, Saw, Square, and Narrow Pulse.

OSCILLATOR 2 (Continued)



WAVE OUT

The audio signal coming from this output is determined by the settings of the Oscillator 2 **OCTAVE**, **FREQUENCY**, and **WAVEFORM** knobs, as well as the state of the **SYNC** button.

CV / AUDIO OUTPUT: 10V peak-to-peak



PITCH IN

The control signal received here is summed with the internal Pitch CV to modulate the pitch of the Oscillator 2.

CV INPUT: -5V to +5V Control Voltage (1V/Oct)



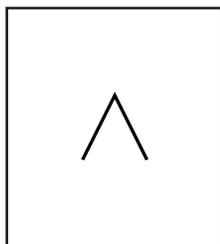
LIN FM IN

Connecting an audio signal or high-frequency control signal to this input introduces Linear Frequency Modulation (FM) to a patched oscillator, which can be useful in creating brash, metallic, or bell-like tones. The control signal received here is summed with the internal Pitch CV to modulate the pitch of Oscillator 2.

CV INPUT: -5V to +5V Control Voltage (AC coupled)

WAVEFORMS

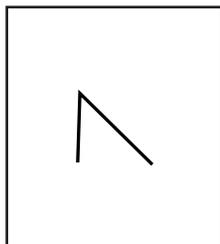
Each waveform has unique harmonic content that is based on the number and strength of the harmonic overtones that it contains. These overtones are what impart a particular timbre, or character, to the sound of an Oscillator.



TRIANGLE

The Triangle wave has an extremely strong fundamental, yet contains only odd-numbered harmonics at very low levels. This makes the Triangle wave an ideal choice for creating soft, flute-like sounds that have a pure tone with little overtone activity.

TIP: Try mixing a triangle wave from one oscillator with a more complex wave from another to emphasize one particular harmonic without adding unwanted overtones.



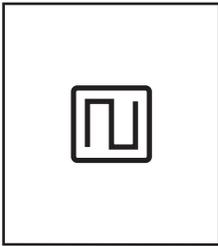
SAWTOOTH

The Sawtooth wave is the most harmonically dense of the four waveform options, containing all of the natural harmonics in relatively strong levels. In addition to creating thick, brassy sounds, the Sawtooth wave lends itself to powerful lead, brass, and bass sounds as well.

WAVEFORMS (Continued)

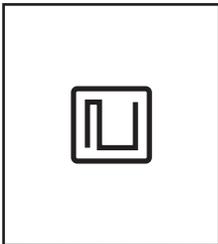
PULSE WAVES (SQUARE & NARROW PULSE)

Think of a pulse wave as a switch you can turn off and on hundreds of times per second. Pulse width, or duty cycle, is the percentage of time that the wave is “on”. Every pulse width has its own unique harmonic structure, making a variety of basic timbres possible.



SQUARE

A Square wave is simply a pulse wave with 50% duty cycle, 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. Square waves sound hollow and provide a rich starting point for oboe and bass sounds.

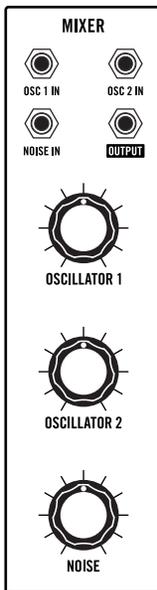


NARROW PULSE

As a pulse wave continues to get narrower, lower numbered harmonics—both odd and even—are emphasized. The resulting timbre takes on a more reedy, or nasal tone.

***TIP:** Varying the duty cycle of the Pulse wave can result in a wide variety of lush or chorus-like sounds. With at least one Pulse wave selected, try experimenting with the **PULSE WIDTH AMT** knob in the Modulation section and listen to how modulating this waveform affects the sound.*

MIXER



The Mixer is where all of the sound sources within Grandmother are blended together before being passed on to the Filter. Patch points in the Mixer allow each hardwired source (Oscillator 1, Oscillator 2, Noise) to be replaced with an external audio signal.

***NOTE:** The **MIXER** is DC coupled, which means it can be used to sum multiple control voltages. Combining audio signals and control signals will yield results that may or may not be desirable.*



OSCILLATOR 1

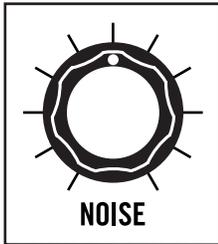
The **OSCILLATOR 1** knob sets the level of Oscillator 1 as it enters the mixer. Settings above 12 o'clock will begin to impart gentle distortion, while higher settings will result in more overdriven tones.

MIXER (Continued)



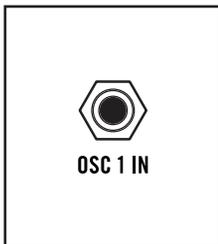
OSCILLATOR 2

The **OSCILLATOR 2** knob sets the level of Oscillator 2 as it enters the mixer. Settings above 1 O'clock will begin to impart gentle distortion, while higher settings will result in more overdriven tones.



NOISE

The **NOISE** knob sets the level of Grandmother's white noise generator as it enters the mixer. Settings above 1 O'clock will begin to impart gentle distortion, while higher settings will result in more overdriven tones. Noise is an un-pitched sound source that can be a useful tool for creating explosive percussion sounds, or for adding a gentle breath to the synthesized wind instruments like flutes.



OSC 1 IN

When an external audio source is patched to this input, Oscillator 1 will be removed from the signal path, and the **OSCILLATOR 1** knob will control the level of the new source.

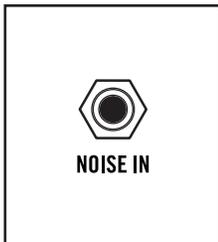
AUDIO INPUT: 10V peak-to-peak



OSC 2 IN

When an external audio source is patched to this input, Oscillator 2 will be removed from the signal path, and the **OSCILLATOR 2** knob will control the level of the new source.

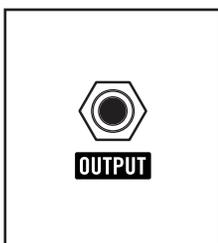
AUDIO INPUT: 10V peak-to-peak



NOISE IN

When an external audio source is patched to this input, the Noise generator will be removed from the signal path, and the **NOISE** knob will control the level of the new source.

AUDIO INPUT: 10V peak-to-peak



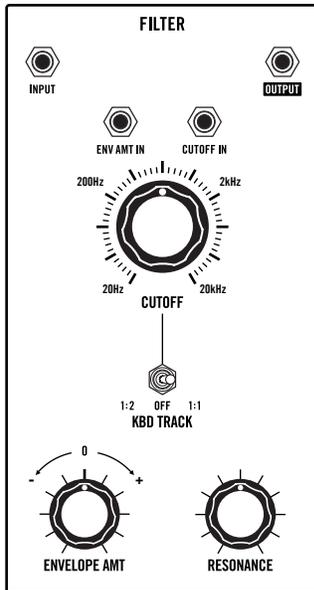
OUTPUT

The combined signal of all audio sources connected to the Mixer is available at this output.

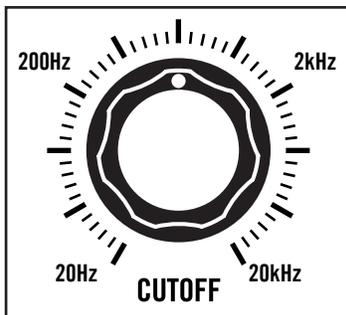
AUDIO OUTPUT: 10V peak-to-peak

TIP: Try patching from the **MIXER OUTPUT** to the **INPUT** of the High Pass Filter in the Utilities section. Then patch from the **OUTPUT** of the High Pass to the **INPUT** of the Low Pass Filter. Now you have two filters for sculpting sounds.

FILTER



Grandmother relies on a classic -24dB/octave Moog Low Pass Ladder Filter. The term “Ladder” stems from the hardware design of the original filter, which has transistors wired in a type of ladder configuration. Low Pass indicates that the Filter is selectively removing harmonic content in the upper part of the audio spectrum, while allowing the lower frequencies to pass unaffected - this is the essence of a low pass filter, and the foundation of subtractive analog synthesis. Finally, the -24dB specification indicates how frequencies are attenuated above the Cutoff frequency. In this case, harmonic content is rolled off at a rate of -24dB per octave.



CUTOFF

The **CUTOFF** knob specifies the frequency at which the Filter begins to attenuate (or reduce) harmonic content, from 10Hz to 20kHz. Harmonic content occurring above the Cutoff frequency is attenuated, while sounds occurring below the Cutoff frequency will pass through unaffected. As the Cutoff frequency is lowered, less harmonic content is able to pass, resulting in a progressively darker sound. Raising the Cutoff frequency opens the Filter, and more harmonic content is able to pass, creating a progressively brighter sound.

NOTE: Filter Cutoff is one of the most effective parameters to apply modulation to. Doing so allows the sound to have motion and character, without interfering with the ability to play “tonal” music in the way that applying modulation to the Oscillators’ frequency might.



KBD TRACK

Keyboard Tracking allows the value of the note played on the keyboard to also affect the Cutoff frequency of the Filter. Higher notes on the keyboard will be perceived as being brighter than notes played lower on the keyboard. This is how many acoustic instruments sound in nature; higher pitched notes have more upper harmonic energy and appear to be brighter.

1:2

In the **1:2** position, the value of the note played on the keyboard will affect the Cutoff frequency at half of its full value. This means that playing a note two octaves above another will only raise the Cutoff frequency by one octave.

OFF

In the **OFF** position, the keyboard Tracking is off, and the value of the note played on the keyboard will have no effect on the Cutoff frequency.

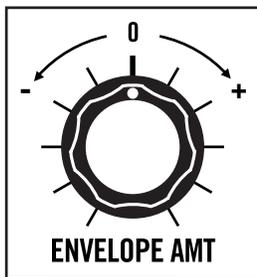
KBD TRACKING (Continued)

1:1

In the **1:1** position, the value of the note played on the keyboard will affect the Cutoff frequency at full value. This means that playing a note two octaves above another will raise the Cutoff frequency by a full two octaves.

TECH NOTE: The Keyboard Tracking value in the **1:1** selection is 1 Volt-per-Octave.

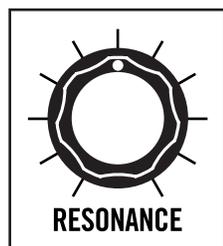
TIP: Turn the **OSCILLATOR 1** and **2** knobs in the mixer all the way down, and turn the **NOISE** knob half way up. Now, set the **RESONANCE** knob to its middle position and set the **KBD TRACK** switch to **1:1**. This will allow the Filter to be played from the keyboard while also creating an eerie sound.



ENVELOPE AMT

The **ENVELOPE AMT** knob determines how much of the control signal created by the Envelope will be applied to the Filter's Cutoff frequency over time. This knob is bipolar, so turning the **ENVELOPE AMT** knob clockwise from center will raise the Filter's Cutoff frequency from the **CUTOFF** knob's current setting. Turning it counterclockwise from center will lower the Filter's Cutoff frequency from the **CUTOFF** knob's current setting.

NOTE: Negative, or inverse, modulation simply flips the shape of the Envelope generator. Instead of the Attack parameter raising the Cutoff frequency over time, the Attack parameter will lower the Cutoff frequency by the same amount, in the same period of time.

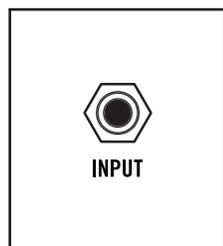


RESONANCE

Resonance takes a portion of the Filter's output and sends it back to the input of the Filter, creating emphasis at the Filter's Cutoff frequency. This is useful for adding focus, articulation, or "frickin' laser beams" to a sound.

NOTE: Adding Resonance may reduce the overall volume or bottom-end of a sound. This is normal.

TIP: Turn the **RESONANCE** knob all the way up and lower the **CUTOFF** knob to about 10 O'clock to cause the Filter to self-oscillate. Then set the **KBD TRACK** switch to **1:1** to play the Filter from the keyboard as a Sine wave oscillator.

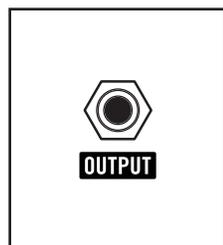


INPUT

The audio source connected to this input will be processed by the Low Pass Filter (VCF). With no connection made here, the Mixer **OUTPUT** signal is normalised to the input of the Low Pass Filter.

AUDIO INPUT: 10V peak-to-peak

NOTE: Do not use this input to introduce an instrument or line-level signal. The high-impedance 1/4" **INSTRUMENT IN** jack on the rear panel is available for these purposes.



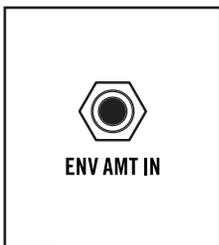
OUTPUT

The output of the Low Pass Filter is available via this jack.

AUDIO OUTPUT: 10V peak-to-peak

TIP: Patching from the Output of the Filter to the Input of the High Pass Filter, and then from the Output of the High Pass Filter to the **VCA IN** in the Output section allows you to vary the low-end "weight" of a sound without affecting the relationship between the Mixer and the Low Pass Filter.

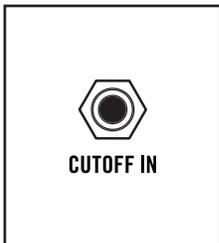
FILTER (Continued)



ENV AMT IN

A control signal connected here will modulate the value of the **ENVELOPE AMT** knob, thereby changing how much influence the Filter Envelope has over the Filter Cutoff frequency.

CV INPUT: -8V to +8V

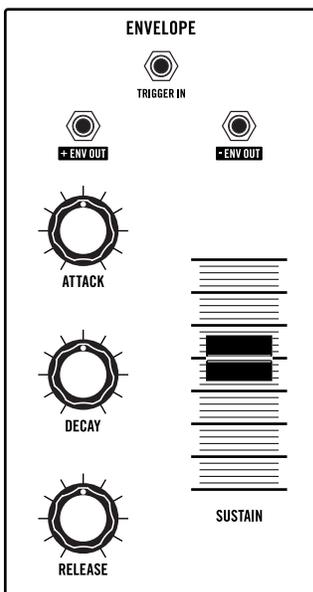


CUTOFF IN

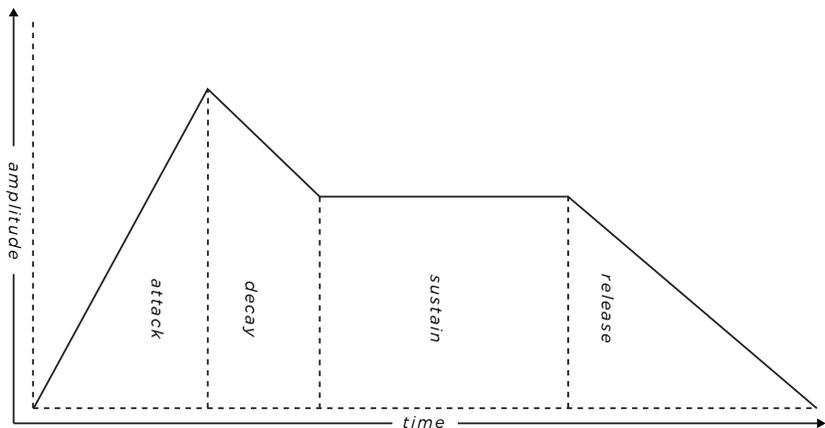
The control signal received here is summed with the **KBD TRACK** setting, the **ENVELOPE AMT** value, the **CUTOFF** knob, etc. and is used to modulate the value of the Cutoff frequency of the Low Pass Filter.

CV INPUT: -5V to +5V

■ ENVELOPE (ADSR)



Sounds change over time. How they change over time is part of what makes each one unique. Some sounds begin abruptly, like the strike of a drum. Some sounds end just as quickly, and some linger like a held chord on a piano. We call this the envelope of a sound. Grandmother uses an Envelope generator to create a control voltage that will change over time. This control voltage is then applied to the volume of the sound. This same control voltage can be used to affect the Cutoff frequency of the Filter over time, creating changes in timbre, or tone. Regardless of how the Envelope is applied, there are four main stages: **ATTACK** time, **DECAY** time, **SUSTAIN** level, and **RELEASE** time.



ENVELOPE (ADSR) *(Continued)*



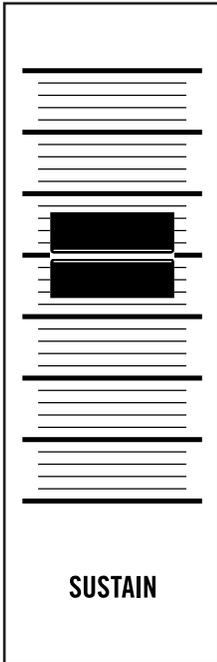
ATTACK

The **ATTACK** knob determines the amount of time required for the control signal to rise from zero to its maximum level once a key is pressed. Fast attacks are useful for creating plucked sounds, while slow attacks are more useful for creating bowed string sounds and swells.



DECAY

The **DECAY** knob determines the amount of time required for the control signal to fall from the maximum level achieved by the Attack stage to the Sustain level when a key is held. Fast decay times are useful for creating articulated lead notes, while longer decay times allow a note to fade slowly into the Sustain level.



SUSTAIN

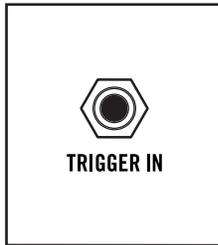
While the Attack, Decay, and Release parameters deal with time, the Sustain parameter controls level. Once the Attack and Decay stages are complete, the control signal will remain at the level set by the **SUSTAIN** slider for as long as a key is held.



RELEASE

The **RELEASE** knob determines the amount of time required for the control signal to fall from its Sustain level to zero once a key is released. Shorter settings are good for classic funk basses that end abruptly, while longer settings are good for creating smooth musical tails that ring out over time.

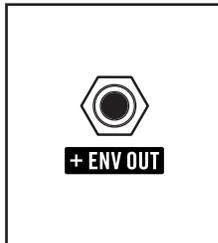
ENVELOPE (ADSR) *(Continued)*



TRIGGER IN

Any control signal > +2.3 Volts will act as a Trigger to start the Envelope cycle. With no connection made here, the Gate signal from the Keyboard, Arpeggiator, Sequencer, etc. is normalled to this input.

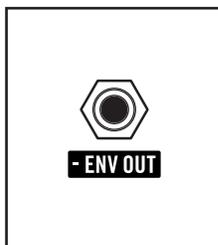
CV / GATE INPUT: 0V to +8V



+ ENV OUT

The control signal created by the ADSR setting of the Envelope is available via this jack.

CV OUTPUT: 0V to +8V

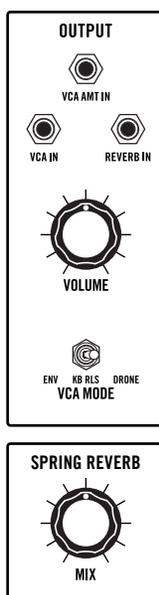


- ENV OUT

An inverted copy of the control signal created by the ADSR settings of the Envelope is available via this jack. For example, Instead of the Attack parameter raising a particular value over time, inverse modulation values cause the Attack parameter to lower a particular value by the same amount, in the same period of time.

CV OUTPUT: -8V to 0V

■ OUTPUT



The Output module is home to parameters that determine how the final sound is heard. These include the output **VOLUME** knob, **VCA** (Voltage Controlled Amplifier) **MODE** switch, and the **SPRING REVERB MIX** knob.

OUTPUT (Continued)



VOLUME

The **VOLUME** knob sets the level for the combined **MAIN OUT / HEADPHONE OUT** 1/4" jack located on the rear panel.

NOTE: The **VOLUME** knob is placed after the **SPRING REVERB MIX** knob in the signal path.

NOTE: The level of the **EURORACK** output jack on the rear panel is unaffected by the **VOLUME** knob setting



VCA MODE

The Voltage Controlled Amplifier, or VCA, is an amplifier that can be modulated from different sources to control Grandmother's output level. Most often the control source is the Envelope generator – but not always.

ENV (ENVELOPE)

In the **ENV** position, the output Volume will be controlled by the Envelope generator.

KB RLS (KEYBOARD RELEASE)

In the **KB RLS** position, the attack of each note will be instantaneous, and will sound at the maximum sustain level for as long as a note is held. Once the note is released, the VCA will follow the Envelope Release setting to determine how long it takes for the sound to fade from its maximum level to zero. This is particularly useful when paired with exaggerated filter modulation.

NOTE: **KB RLS** was inspired by the classic Moog **KB GATE** function, but has been modified for greater musical flexibility.

DRONE

In the **DRONE** position, Grandmother will continue to output sound at the current volume level whether a key is held or not. This can be valuable when creating synthetic textures and droning sounds, and when processing external audio signals via the **INSTRUMENT IN** jack.



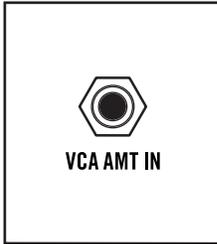
MIX (SPRING REVERB)

The **MIX** knob sets the balance between the dry (unaffected) signal, and the wet (fully affected) sound of the built-in spring reverb tank. At minimum position, no Reverb is present. At maximum position, the dry signal is absent, and only the Reverb signal is present.

NOTE: The **MIX** knob has no effect on the rear panel **REVERB OUTPUT** jack as it is always 100% wet.

CRITICAL NOTE: Grandmother's Spring Reverb may be susceptible to physical vibrations and electro-magnetic interference from other sources - radio signals, cell phones, etc. This is due to the nature and construction of an analog spring reverb tank, and is normal.

OUTPUT *(Continued)*



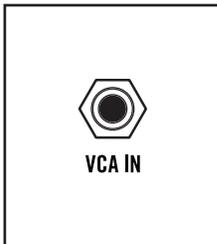
VCA AMT IN

The control signal received here will affect Grandmother's output Volume. When the **VCA TYPE** switch is set to **DRONE**, connecting a control signal here will instantly set the VCA CV to zero. The value of the control signal alone will be used to control the output volume. With the **VCA TYPE** switch set to **ENV** or **KB RLS**, the value of the control signal received via this input is multiplied with the current settings to set the output level.

CV INPUT (DRONE): 0V to +8V **CV INPUT (ENV OR KB RLS):** -8V to +8V

***TIP:** Patching the modulation **WAVE OUT** jack to the **VCA AMT IN** jack can create some interesting AM (Amplitude Modulation) effects.*

***NOTE:** With the **VCA MODE** switch set to **DRONE** and an external CV patched into the **VCA AMT IN** jack, Grandmother's output VCA will behave as a standard VCA whose level is set entirely by an external control voltage. A voltage of 0V, or a negative voltage, will result in silence. As the voltage to this input is increased, the output volume will also increase (+8 maximum).*



VCA IN

This jack provides an audio input to the VCA. With no connection made here, the signal from the Filter output is normalised to this input.

AUDIO INPUT: 10V peak-to-peak

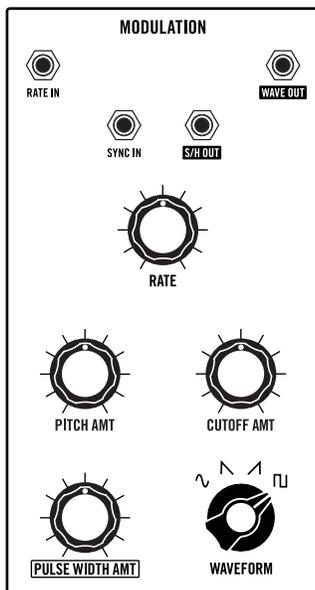


REVERB IN

This jack provides an audio input to the Spring Reverb unit. With no connection made here, the signal from the VCA output is normalised to this input.

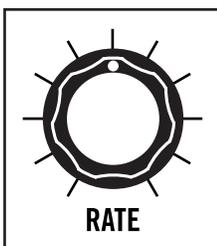
AUDIO INPUT: 10V peak-to-peak

■ MODULATION



Modulation is an important aspect of programming and playing synthesizers. In short, whenever one signal is used to change the value of another – it is known as modulation. Grandmother has a dedicated Modulation section that can apply modulation to multiple destinations at once, and in varying amounts. This Modulation section is based around an analog oscillator that operates in the low-frequency range, and is commonly known as an LFO (Low Frequency Oscillator).

NOTE: The **PITCH AMT**, **CUTOFF AMT**, and **PULSE WIDTH AMT** knobs are used to specify the maximum amount of modulation to be applied to specific parameters. In order to actually apply the modulation and hear the effect, the **MOD** wheel must be set to a greater than minimum position.



RATE

The **RATE** knob sets the frequency of the LFO from .07 Hz to 1.3 kHz. The accompanying LED will flash at the current Rate setting.

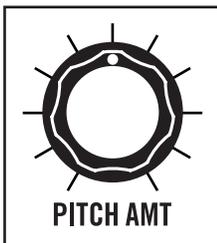
TIP: Patching from the **KB OUT** in the **ARP / SEQ** section, into the **RATE IN** jack will cause the LFO to track the pitch of the keyboard just as Oscillator 1 and 2. This will also allow the LFO to exceed the range of the panel **RATE** control.

TIP: Holding the **SHIFT** button while adjusting the Modulation **RATE** knob allows fine-tuning of the LFO rate, which is useful when utilizing the Modulation LFO as an audio oscillator.



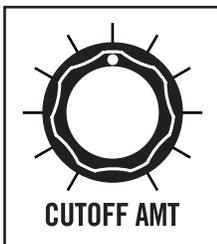
WAVEFORM

This four-position knob is used to select the Waveform for the Modulation LFO. The choices are Sine, Sawtooth, Ramp, and Square.



PITCH AMT (AMOUNT)

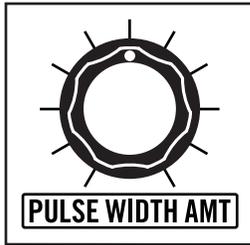
The **PITCH AMT** knob determines the maximum depth of modulation that will be applied to the Pitch of Oscillators 1 and 2 when the **MOD** wheel is at its maximum position.



CUTOFF AMT (AMOUNT)

The **CUTOFF AMT** knob determines the maximum depth of modulation that will be applied to the Cutoff frequency of the Low Pass Filter when the **MOD** wheel is at its maximum position.

MODULATION (Continued)



PULSE WIDTH AMT (AMOUNT)

The **PULSE WIDTH AMT** knob determines the maximum depth of modulation that will be applied to the Pulse Width of the Square and Narrow Pulse waves of Oscillators 1 and 2 when the **MOD** wheel is at its maximum position.

NOTE: Pulse Width Modulation (PWM) can only be applied to an oscillator when a square or narrow pulse wave is selected as the current waveform. Pulse Width Modulation continuously varies the duty cycle, or pulse width, of these waves, causing the harmonic content to continuously vary as well.

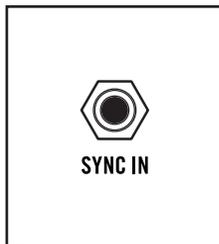


RATE IN

A control signal received here is added to the value of the **RATE** knob to determine the frequency of the LFO.

CV INPUT: -5V to +5V (1V/Oct)

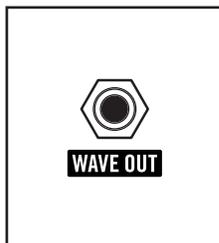
TIP: Patch from the **KB OUT** jack to the **RATE IN** jack and adjust the **RATE** knob accordingly to allow the LFO to be "played" like an oscillator.



SYNC IN

A gate or trigger pulse received here will reset the LFO wave to its starting point.

CV INPUT: Rising signal > 3 Volts will create a reset trigger. (0V to +10V)



WAVE OUT

This jack outputs the selected Waveform as a control signal, at the current Rate setting.

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



S/H OUT

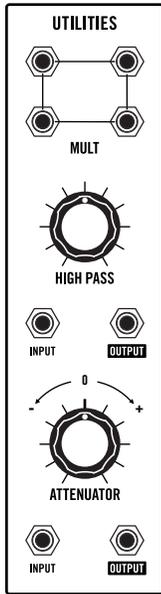
Sample/Hold (S/H) is a stepped modulation effect, often used to "pulse" the Cutoff frequency of a Low Pass filter with near random values. At the beginning of every modulation wave cycle, the Noise generator is sampled to acquire a control value that can be used to modulate another parameter. That stream of Sample/Hold values is available via this output.

CV OUTPUT: -5V to +5V

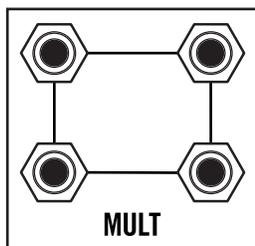
TIP: A control or gate signal received at the **SYNC IN** jack will reset the Modulation generator to the beginning of its wave cycle, meaning the Sample & Hold feature can be stepped by an external trigger or gate. Try patching from the **GATE OUT** in the **ARP / SEQ** section to the **SYNC IN**, and set the **RATE** control to its minimum value. This will allow you to use the keyboard to step through Sample & Hold values with each key press.

NOTE: There is no internal routing to use the Sample/Hold generator, so it must be patched from this jack to a specific destination in order for it to modulate another parameter.

UTILITIES



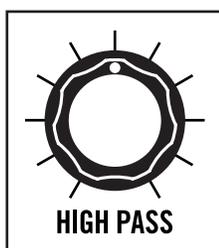
The Utilities section imbues Grandmother with a series of tools that are key to the exploration of modular analog synthesis. A four-point mult, high pass filter, and bipolar attenuator are included as non-wired, patchable resources.



MULT

The **MULT** consists of four jacks wired together in parallel as a way of sharing and distributing control signals. For example, the **S/H OUT** of the **MODULATION** generator could be connected to the **MULT**, where it could then be sent to three different locations. The **MULT** jacks can also be used to safely mix two audio signals together so that the combined audio signal can then be sent to a single audio input.

NOTE: Only audio signals may be merged using the **MULT** jacks, and only audio signals that are AC coupled. These signals include **OSCILLATOR 1 WAVE OUT**, **OSCILLATOR 2 WAVE OUT**, **FILTER OUT**, **HIGH PASS FILTER OUT**, **REVERB OUT**, and **EURORACK OUT**.



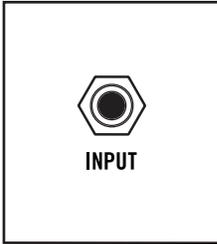
HIGH PASS FILTER

Grandmother contains two independent filters: a Voltage Controlled Low Pass Filter, and this static -6dB/Octave High Pass Filter. Unlike the Low Pass Filter, the High Pass Filter must be patched to become part of the audio path - but there are many possibilities. The **HIGH PASS** knob sets the Cutoff frequency of the High Pass Filter. Frequencies and harmonic content above the **HIGH PASS** knob setting are free to pass, while frequencies below the **HIGH PASS** knob setting will be diminished at a rate of 6dB per octave.

TIP: Try patching the **WAVE OUT** of Oscillator 2, into the **INPUT** of the High Pass Filter. Then patch the **OUTPUT** of the High Pass Filter into the **OSC 2 IN** jack of the Mixer. Now the tone of Oscillator 2 can be shaped independently of Oscillator 1.

ADVANCED TIP: Patch the output of Oscillator 2 into the High Pass Filter, and then patch the output of the High Pass Filter into one of the **MULT** jacks. Next, patch the output of the Low Pass Filter into another one of the **MULT** jacks. The two audio signals are now merged using the Mult. From here, patch out of a third **MULT** jack into the **VCA IN** jack in the Output section. You are now independently processing each oscillator through its own filter.

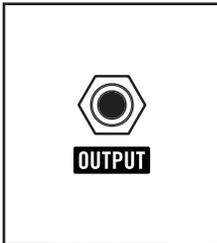
UTILITIES (Continued)



INPUT

An audio signal connected here will be processed by the High Pass Filter.

AUDIO INPUT: 10V peak-to-peak



OUTPUT

The output of the High Pass Filter is available via this jack.

AUDIO OUTPUT: 10V peak-to-peak

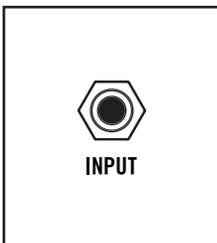


ATTENUATOR (BIPOLAR)

An Attenuator is used to reduce the strength of a control signal to provide more accuracy when modulating a specific parameter value. This Attenuator can also deliver both normal and inverted values. In the center position, the **ATTENUATOR** knob provides its full effect, and any input signal is fully attenuated. Raising the value clockwise from center will provide less and less attenuation, until the full scale of the input signal is restored and passed through unaffected. Lowering the value counterclockwise from center will provide less and less attenuation of the inverted signal, until the full value of the inverted signal is restored at the full counterclockwise position.

NOTE: Negative (or inverse) modulation simply flips the control signal, so that any control signal previously raising the value of a parameter would now be lowering it.

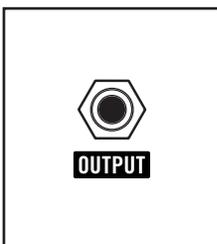
TIP: The input to the attenuator is normalled to a positive voltage. With nothing patched to its input, the output is a DC source of $\pm 8V$. Try patching from the Attenuator **OUTPUT** jack to the **RATE IN** jack of the Modulation section. You can now use the **ATTENUATOR** knob to add to, or subtract from, the minimum or maximum panel values of the Modulation **RATE** knob.



INPUT

Any signal connected here will be processed by the Attenuator.

CV/AUDIO INPUT: -8V to +8V

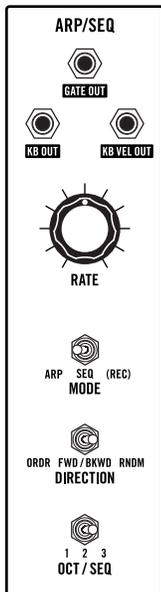


OUTPUT

The signal available here is the output of the Attenuator.

CV OUTPUT: -8V to +8V

■ ARP / SEQ



This module contains two very important features: the Arpeggiator and the Sequencer. In addition to the controls found here, the **PLAY**, **HOLD**, and **TAP** buttons located on the Left-Hand Controller are active in operating the Arpeggiator and the Sequencer. This module also contains patch points for **KB OUT** (Keyboard Pitch Control Voltage), **GATE OUT**, and **KB VEL OUT** (Keyboard Velocity Control Voltage).

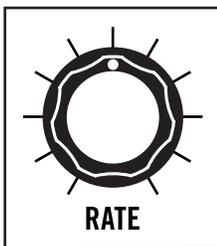
ARPEGGIATOR

The Arpeggiator takes the notes being held on the keyboard, and plays them one at a time in a repeating, rhythmic pattern. This is useful for creating swooping cascades of notes, building a rhythmic base, or for generating new and fun musical ideas. Grandmother allows you to select the order in which the notes are played, and also provides the option of repeating the pattern in different octaves.

SEQUENCER

The Sequencer is a step sequencer that can store up to 256 steps per sequence. Each step can be entered as a Note or a Rest, and individual steps can also be entered with a Tie and/or an Accent. Three separate sequences can be stored and called up during performance.

NOTE: Sequence memory is retained even with the power off, so sequences can be programmed in advance and used later in performance.

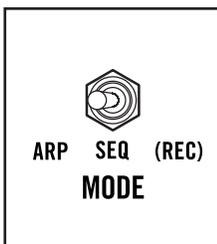


RATE

The **RATE** knob sets the playback speed of the Arpeggiator and the Sequencer, with a tempo range of 20 - 280 BPM (Beats Per Minute). The accompanying LED flashes at the current Rate setting. If Grandmother is synced to MIDI, External Clock, or Tap Tempo, then the **RATE** knob selects timing values that are musical subdivisions of this external tempo.

TIP: The Rate can also be set by pressing the **TAP** button, at the desired tempo, at least three times in a row. To exit Tap Tempo, press and hold the **TAP** button for about one second, until its light turns off.

NOTE: When synced, turning the **RATE** knob selects even and dotted note values; pressing the **SHIFT** button while turning the **RATE** knob selects triplet note values.



MODE

The **MODE** switch allows you to select between the Arpeggiator and the Sequencer. A third position places the Sequencer into Record mode.

ARP

With the **MODE** switch in the **ARP** position, pressing the **PLAY** button will activate the Arpeggiator.

SEQ

With the **MODE** switch in the **SEQ** position, pressing the **PLAY** button will activate the Sequencer.

(REC)

With the **MODE** switch in the **(REC)** position, the Sequencer is armed for recording. From here, entering a new note will overwrite any existing sequencer data for the currently selected sequence (**1**, **2**, or **3**). If the **MODE** switch is set to **(REC)** while the sequencer is currently playing back an active sequence, individual notes in that sequence can be updated in real time.

ARP / SEQ (Continued)



DIRECTION

The function of this switch applies to both the Arpeggiator and the Sequencer. It selects the order in which the notes are played.

ORDR (ORDER) ARPEGGIATOR (ORDR)

The arpeggiated notes will play in the same order as they were originally played on the keyboard.

SEQUENCER (ORDR)

The Sequencer will play notes from the beginning of the pattern to the end.

FWD / BKWD (FORWARD/BACKWARD) ARPEGGIATOR (FWD / BKWD)

The arpeggiated notes will first play in the same order as they were originally played, and then in the inverse of that order.

SEQUENCER (FWD / BKWD)

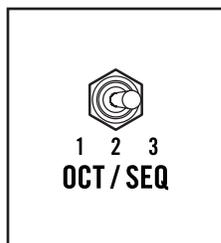
The Sequencer will play the notes from the beginning of the pattern to the end, and then from the end of the pattern back to the beginning.

RNDM (RANDOM) ARPEGGIATOR (RANDOM)

The arpeggiated notes will play back in a completely random order.

SEQUENCER (RANDOM)

Notes contained in the Sequencer pattern will be played in a random order.



OCT / SEQ

With the **MODE** switch set to the **ARP** position, the **OCT / SEQ** switch specifies the number of octaves that will be used to play the arpeggiated pattern. If the **MODE** switch is set to the **SEQ** or **REC** position, this switch specifies which of the three Sequencer files is being played or recorded.

1

ARPEGGIATOR (1)

Only the notes played are arpeggiated.

SEQUENCER (1)

Sequence 1 is active.

2

ARPEGGIATOR (2)

The arpeggiated pattern is played and then repeated one octave higher than the original.

SEQUENCER (2)

Sequence 2 is active.

3

ARPEGGIATOR (3)

The arpeggiated pattern is played and then repeated one, and then two octaves higher than the original.

SEQUENCER (3)

Sequence 3 is active.

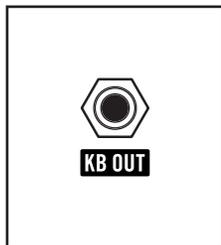
ARP / SEQ (Continued)



GATE OUT

Pressing a note on the keyboard initiates a gate signal that is sent via this jack for as long as the note is held. During arpeggiator or sequencer playback, the **GATE OUT** signal is instead based on the notes being output by the arpeggiator or sequencer.

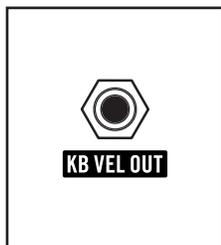
GATE OUTPUT: +8V



KB OUT

Pressing a note on the keyboard initiates a keyboard control voltage (CV) signal that is based on the note being played, using the 1 Volt-per-Octave standard. During arpeggiator or sequencer playback, the **KB OUT** signal is instead based on the notes being output by the arpeggiator or sequencer.

CV OUTPUT: -5V to +5V (1V/Oct)

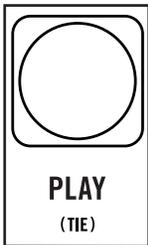


KB VEL OUT

The velocity with which a note is played on the keyboard initiates a keyboard velocity control voltage (CV) signal. This applies to the Keyboard and Arpeggiator only. When the Sequencer is in use, the **KB VEL OUT** jack outputs an accent envelope with a fast attack and release time that can be patched anywhere on the instrument.

CV OUTPUT: 0V to +5V

■ LEFT-HAND CONTROLLER



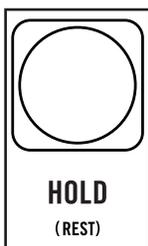
PLAY

The **PLAY** button activates the Arpeggiator or Sequencer.

(TIE)

When the **MODE** switch is set to **REC**, the **PLAY** button is used to enter a **TIE** step when recording to the Sequencer. A tie is used to string two individual notes together musically.

NOTE: *If the same note is tied together multiple times in a row, it will be heard during playback as if that one note is being held continuously. If different notes are tied together, the transition between notes will be heard as legato-style playing. This is especially useful when using Glide.*

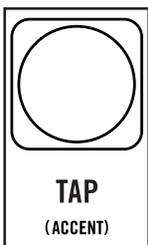


HOLD

The **HOLD** button activates the **HOLD** function, allowing the Arpeggiator or sequencer to continue to play even after your hand is lifted from the keyboard. Notes played while other notes are being held on the keyboard will be added to an arpeggiated pattern. Notes played after all fingers have been lifted from the keyboard will begin a new pattern.

(REST)

When the **MODE** switch set to **REC**, the **HOLD** button is used to enter a **REST** step when recording to the Sequencer. A rest is used to create a timed musical pause.



TAP

The **TAP** button can be used to set the Arpeggiator or Sequencer playback rate by feel. Press the **TAP** button at least three times in a row, at the desired tempo, to set the rate of the Arpeggiator or Sequencer. The **TAP** button will light up when Tap Tempo is active. To exit Tap Tempo, press and hold the **TAP** button for about one second, until its light turns off.

NOTE: *If an external clock is detected and in use, the tap-tempo operation will have no effect.*

(ACCENT)

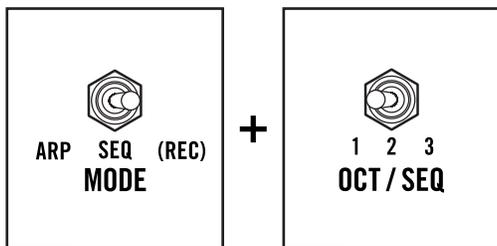
When the **MODE** switch set to **REC**, the **TAP** button is used to add an **ACCENT** to a step when recording to the Sequencer. The Accent function utilizes a dedicated envelope with a fast attack and release time to add musical emphasis or impact to an individual note. This Accent envelope appears at the **KB VEL OUT** jack (**ARP/SEQ** module) when the Sequencer is playing only.

NOTE: *In order for Grandmother to reflect this dynamic change, you will need to connect a patch cable from the **KB VEL OUT** jack (**ARP / SEQ** module) to the **CUTOFF IN** jack on the Filter module. You can also patch this to other modules for more creative use.*

■ SEQUENCER - GETTING STARTED

Grandmother's sequencer can store and play back three independent sequences, each containing up to 256 notes.

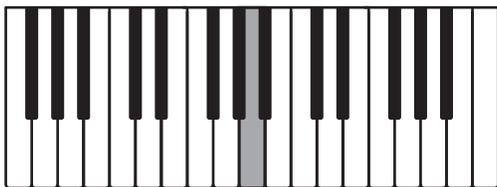
CREATE A SEQUENCE



ARM THE SEQUENCER

To arm the Sequencer for recording, set the **MODE** switch to the **(REC)** position, and set the **OCT / SEQ** switch to **1**.

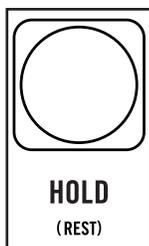
NOTE: This will arm Sequence 1.



PLAY A NOTE

Play any note on the keyboard. This is the first note of your sequence.

CAUTION: The first note entered in **(REC)** mode will erase all existing data in a currently selected sequence.



ADD A REST

Press the **REST** button.

NOTE: During playback, this step will be silent.

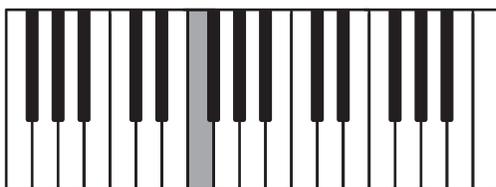


ADD A NOTE

Play another note on the keyboard.



+



ADD A TIE

Now, press the **TIE** button and then play the same note again.

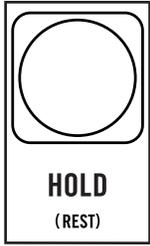


ADD LEGATO

Press and hold a new note. While holding that note, press another note.

NOTE: During playback, the transition between these two notes will have a legato feel.

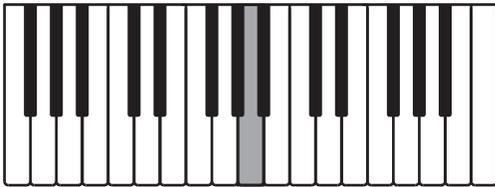
CREATE A SEQUENCE (Continued)



ADD A REST

Press the **REST** button.

NOTE: During playback, this step will be silent.



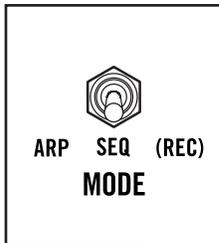
+



ADD AN ACCENT

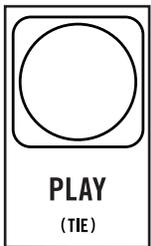
Finally, play one last note and then press the **ACCENT** button.

NOTE: During playback, this step will output an Accent voltage from the **KB VEL OUT** jack that can be patched into other modules. A good place to try would be into the **CUTOFF IN** jack in the Filter section.

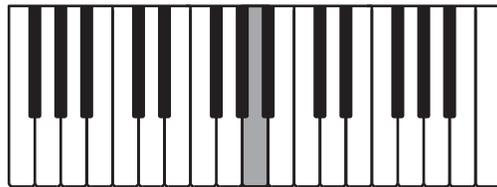


END RECORDING

To end recording, set the **MODE** switch to the **SEQ** position.



+



PLAY YOUR SEQUENCE

Now press the **PLAY** button and then press a note to listen to your sequence.

NOTE: You may transpose your sequence by playing a new note.

TIP: Use the **RATE** knob to adjust the playback speed.

DO YOU LIKE YOUR SEQUENCE?

NO!

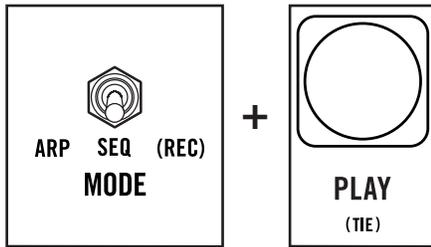
To delete your sequence, simply start over at the beginning of this tutorial.

YES!

To keep your sequence and create another one, follow the above directions, but be sure to set the **OCT / SEQ** switch to **2** or **3**. (There are three available sequence locations.)

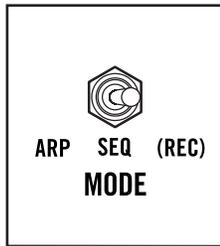
EDITING A SEQUENCE

Sequences can only be edited in real time during live playback. To edit a sequence:



ENTER SEQUENCE EDIT MODE

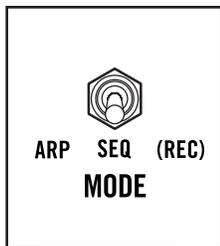
Set the **MODE** switch to the **SEQ** position and push **PLAY**.



EDIT YOUR SEQUENCE

While your sequence is playing back, set the **MODE** switch to the **(REC)** position.

NOTE: Now any rest, tie, accent, or note that is played will overwrite the current data for that step as it is played, without deleting the other notes of the sequence.



EXIT EDIT MODE

To exit recording, set the **MODE** switch to the **SEQ** position. (The sequence will continue to play, but you are no longer able to edit individual note data.)

WARNING: The sequencer must be playing in order to edit note data in real time. If the **MODE** switch is set to **(REC)** and a note is pressed while the sequencer is stopped, all data for that sequence will be erased.

SEQUENCING TIP: Legato glide is useful when creating acid-style sequences.

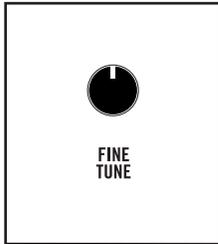
To turn Legato Glide ON, hold the **SHIFT** button and turn the **GLIDE** knob to the right.

To turn Legato Glide OFF, hold the **SHIFT** button and turn the **GLIDE** knob to the left.

The Default is OFF.

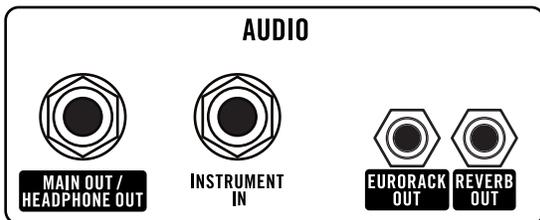
REAR PANEL

Grandmother's rear panel is populated by jacks and connectors that relate to the instrument as a whole. Here is where you will find audio and MIDI connections, additional CV I/O, a **FINE TUNE** knob, the connection for the AC adapter with stress relief hook, and a Kensington security slot.



FINE TUNE

This knob controls the fine tuning of Oscillators 1 & 2, and is the default tuning knob for Oscillator 1.



AUDIO

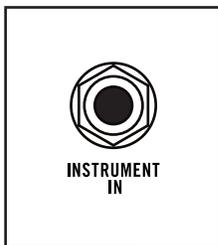
This group of jacks is dedicated to inputting and outputting audio signals.



MAIN OUT / HEADPHONE OUT

This 1/4" TRS output is suitable for both headphone monitoring and connection to an amplifier, PA system, recording equipment, etc.

WARNING: Do not use a TRS (balanced) cable for line output applications as this will cause phase cancellation and a very weak signal. Since the audio output is in mono, it's best to just use a standard 1/4" TS (instrument/guitar) cable.



INSTRUMENT IN

This 1/4" input allows an external sound source to be processed by Grandmother's analog circuits. There is no gain control for this input, so its preamp has been designed to bring low level signals (like that of a guitar) up to 10 Volts (peak-to-peak) in the Mixer. When connected to sources like a cell phone, drum machine, or other synthesizers, this input can easily be pushed into hard, musical clipping.

TIP: Even a high-output guitar signal can clip the mixer in some cases, which may or may not be desirable. Be sure to use the volume knob on your external sound source to dial in the sound you are looking for.



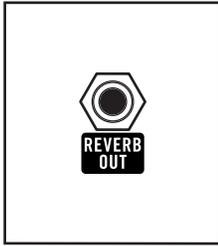
EURORACK OUT

This 3.5mm output duplicates the **MAIN OUT** signal, but at typical Eurorack audio levels (-5 to +5 Volts).

AUDIO OUTPUT: 10V peak-to-peak

NOTE: The output level of the **EURORACK OUT** jack is not controlled by the **VOLUME** knob in the Output module.

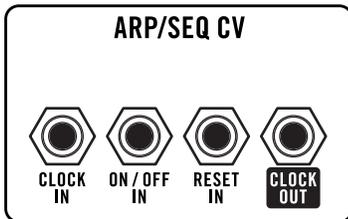
REAR PANEL *(Continued)*



REVERB OUT

This 3.5mm output provides a separate output directly from the Spring Reverb tank at typical Eurorack audio levels. When combined with the **REVERB IN** patch point on the front panel, this jack allows the Spring Reverb to be used as a standalone processor.

AUDIO OUTPUT: 10V peak-to-peak



ARP / SEQ CV

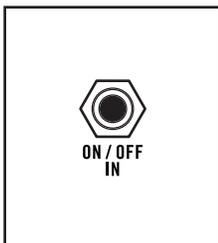
This group of jacks is dedicated to synchronizing the Arpeggiator or Sequencer with other analog instruments.



CLOCK IN

This input allows Grandmother to be synchronized to an external clock source such as a DFAM, Mother-32, or any other instrument that outputs clock sync. There are two modes for this jack, Clock or Step-Advance. In Clock Mode, the timing of clock pulses received at the **CLOCK IN** sets the tempo of the Arpeggiator and Sequencer, according to the Clock Input PPQN (Pulses Per Quarter Note), which is set in the Global Settings (see page 39). In Step-Advance mode, the Sequencer or Arpeggiator pattern is advanced by one step each time the rising edge of a gate or pulse signal is detected at the Clock Input.

CV INPUT: 0V to +5V (Rising signal > 3V will create a Sync pulse).

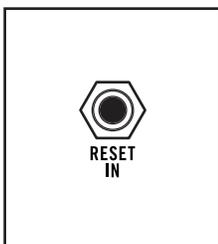


ON / OFF IN

A control signal connected to this jack can turn the Grandmother Arpeggiator and/or Sequencer on and off.

CV INPUT: 0V to 5V

NOTE: Signals with a voltage greater than 2.5 Volts will activate the ARP / SEQ; signals with a voltage less than 2.5 Volts will deactivate the ARP / SEQ.



RESET IN

A +5V signal received here will cause the Arpeggiator or Sequencer to reset to the beginning of the pattern or sequence without stopping.

CV INPUT: 0V to 5V

NOTE: The **RESET IN** jack responds to voltages greater than 3 Volts.

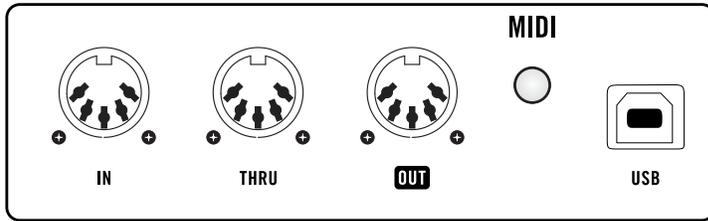


CLOCK OUT

This output allows Grandmother to transmit clock sync to other instruments based on the **ARP/SEQ RATE** knob setting and the Global **CLOCK OUTPUT** PPQN setting (page 39). Grandmother can also send Clock information via MIDI.

CV OUTPUT: 0V to +5V

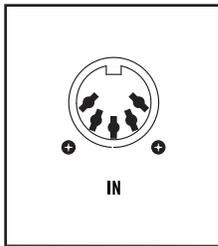
REAR PANEL (Continued)



MIDI

These 5-pin DIN style jacks provide a way of sharing MIDI signals with other MIDI-equipped synthesizers, keyboards, processors, and more. MIDI information can also be shared via USB.

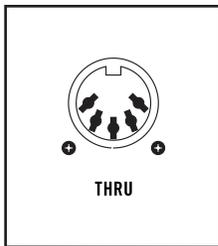
TIP: If you get any stuck MIDI notes, hold all three LHC buttons down together for about 1 second. Grandmother will clear its note stack and also send a MIDI "All Notes Off" message.



MIDI IN

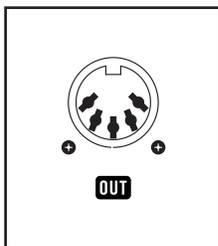
The **MIDI IN** port can receive MIDI messages sent from another synthesizer or module.

NOTE: The MIDI LED will blink when a MIDI signal is present at this input.



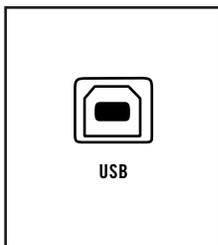
MIDI THRU

The MIDI signal received at the **MIDI IN** port is passed along unchanged via this port.



MIDI OUT

MIDI signals created and originating with Grandmother can be shared with other MIDI compatible equipment via this port.



MIDI USB

MIDI signals may be sent and received via USB, allowing Grandmother to integrate with computer-based DAW systems, etc.

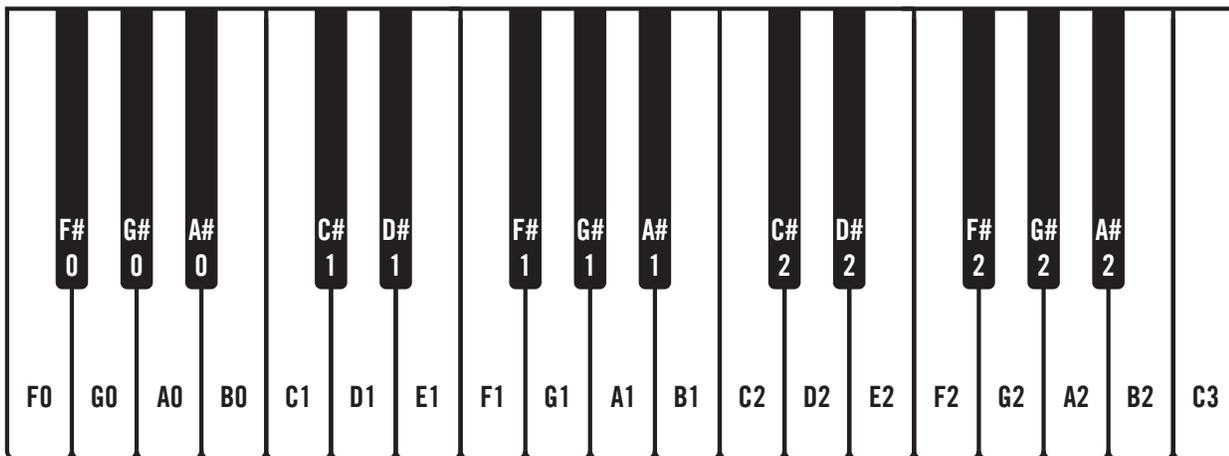
■ GLOBAL SETTINGS

To access Grandmother's Global Settings, simultaneously press and hold the **HOLD** button (on the Left-Hand Controller) and **SYNC** button (in Oscillator 1) until the **SYNC** button begins to blink. Now you can use the keyboard commands listed below to make any needed changes to the Global Settings. The **SYNC** button will continue to blink a number of times to indicate which Global Setting is currently selected. When you have finished making any changes, simply press the **SYNC** button to exit the Global Settings edit mode.

TIP: You can also double-tap your Global Settings selection on a white key to update a setting and exit the edit mode.

NOTE: Global Settings are retained even when the power has been turned off.

For information on advanced Global Settings visit www.moogmusic.com/grandmother.



HERE'S HOW IT WORKS

Global Settings are organized in groups of ten. An individual parameter in the chosen group is selected using one of the lower 10 black keys, starting with **F#0**. The white keys, starting with **FO**, are used to set the value of the chosen parameter. The first 10 parameters are in the default group, and no group selection is required. Additional groups are selected using one of the upper black keys, starting with **F#2**. To access these additional parameters, hold down a Group Select key while pressing the individual Parameter Select key.

Global Parameters Default Group (Group 0)	Group Select Key	Parameter Select Key
0.1 Changing the MIDI Channel	(none)	F#0
Grandmother can send and receive data on any MIDI channel. To select the MIDI channel, press the (F#0) key, and then press one of the first 16 white keys (F0 to G2) to select the corresponding MIDI channel (1-16). The Default is MIDI Channel 1.		
0.2 MIDI Clock Input	(none)	G#0
Grandmother's Sequencer and Arpeggiator can be set to follow MIDI Clock, and can respond to Start and Stop commands received via MIDI. Depending on your setup, you may wish for Grandmother to ignore these commands. To change this setting, press the (G#0) key, and then use the first three white keys to select FOLLOW MIDI CLOCK + MIDI START/STOP COMMANDS (F0), FOLLOW MIDI CLOCK ONLY (Ignore MIDI Start/Stop commands) (G0), or IGNORE ALL MIDI CLOCK + MIDI START/STOP COMMANDS (A0).		
0.3 MIDI Clock Output	(none)	A#0
Grandmother's Sequencer and Arpeggiator can be set to output MIDI Clock and Start and Stop commands. Depending on your setup, you may wish for Grandmother not to send these commands. To change this setting, press the (A#0) key, and then use the first three white keys to select SEND MIDI CLOCK + MIDI START/STOP COMMANDS (F0), SEND MIDI CLOCK ONLY (Don't send MIDI Start/Stop commands) (G0), or DON'T SEND MIDI CLOCK OR MIDI START/STOP COMMANDS (A0).		
0.4 Note Priority	(none)	C#1
You can select which note will have priority on Grandmother's monophonic keyboard - the highest note played, the lowest note played, or the most recent note played. To change the note priority, press the (C#1) key, and then use the first three white keys to select LOW (F0), HIGH (G0), or LAST (A0). The Default is LAST.		
0.5 Pitch Bend Range	(none)	D#1
The pitch bend range of Grandmother's PITCH wheel can be set anywhere from 0 to 12 semitones. To adjust the Pitch Bend Range setting, press the (D#1) key, and then use the lowest 13 white keys (F0 to D2) to select the corresponding number of semitones (0-12). The Default is 2 semitones.		
0.6 External Clock Mode	(none)	F#1
Via the real panel CLOCK IN jack, Grandmother can either sync to an external clock signal, or advance each time a gate or trigger signal is received. To specify the external clock mode, first press the (F#1) key, and then use the first two white keys to select CLOCK (F0), or STEP-ADVANCE (G0). The Default is CLOCK.		

Global Parameters Default Group (Group 0)	Group Select Key	Parameter Select Key
0.7 External Clock Input PPQN	(none)	G#1
<p>To be sure that Grandmother's Sequencer and Arpeggiator sync correctly to an External Clock, you can determine how many pulses are received per quarter note (PPQN). To edit the PPQN value, first press the (G#1) key, and then use the first eight white keys to choose the number of clock pulses received per quarter note. (F0) = 1 PPQN; (G0) = 2 PPQN; (A0) = 3 PPQN; (B0) = 4 PPQN; (C1) = 5 PPQN; (D1) = 6 PPQN; (E1) = 7 PPQN; (F1) = 8 PPQN; (G1) = 9 PPQN; (A1) = 10 PPQN; (B1) = 11 PPQN; (C2) = 12 PPQN; (D2) = 24 PPQN; (E2) = 48 PPQN. The Default is 2PPQN.</p>		
0.8 Clock Output PPQN	(none)	A#1
<p>To be sure that external devices sync correctly to Grandmother's Sequencer and Arpeggiator, you can set how many pulses are sent per quarter note (PPQN). To edit the PPQN value, first press the (A#1) key, and then use the first eight white keys to choose the number of clock pulses sent per quarter note. (F0) = 1 PPQN; (G0) = 2 PPQN; (A0) = 3 PPQN; (B0) = 4 PPQN; (C1) = 5 PPQN; (D1) = 6 PPQN; (E1) = 7 PPQN; (F1) = 8 PPQN; (G1) = 9 PPQN; (A1) = 10 PPQN; (B1) = 11 PPQN; (C2) = 12 PPQN; (D2) = 24 PPQN; (E2) = 48 PPQN. The Default is 2PPQN.</p>		
0.9 KB Out Range	(none)	C#2
<p>The voltage range of Grandmother's KB OUT (pitch CV) jack can be either -5 to +5 Volts, or 0 to 10 Volts. To adjust the KB OUT Range setting, press the (C#2) key, and then use the first two white keys to select -5V to +5V (F0), or 0V to 10V (G0). The Default is -5V to +5V.</p>		
0.10 Local On/Off	(none)	D#2
<p>Grandmother can be used to drive external MIDI devices, as well as its own internal sound engine and modules. In some cases, you may wish to have Grandmother only controlling an external setup. By setting the Local parameter to OFF, Grandmother's Keyboard, PITCH wheel, and Arpeggiator are only transmitted through MIDI, and do not use any hard-wired connections to play the internal sound engine. Additionally, when Local is set to OFF, Grandmother's KB OUT, GATE OUT, and KB VELOCITY OUT jacks are disengaged (because these output jacks are also hard-wired to the internal sound engine). To access the Local setting, first press the (D#2) key, and then use the lowest two white keys to select LOCAL OFF (F0), or LOCAL ON (G0). The Default is Local ON.</p>		

Global Parameters Group 1	Group Select Key	Parameter Select Key
1.1 Glide Type	F#2	F#0
<p>Grandmother's Glide type can be changed to best suit playing style or preference. There are three options - Linear Constant Rate, Linear Constant Time, and Exponential. To change Grandmother's Glide Type, press the (F#2 + F#0) keys, and then use the first three white keys to select LCR (FO), LCT (GO), or EXP (AO). The Default is LCR.</p>		
1.2 Gated Glide	F#2	G#0
<p>While Glide is in use, Gated Glide allows Grandmother to transition between the pitch of two notes only when a note is pressed. The Glide transition halts in between notes and continues when a new note is pressed. If Gated Glide is off, the transition between the pitch of two notes completes in the amount of time set by the GLIDE knob, regardless of whether or not a note is held. To specify the state of Gated Glide, press the (F#2 + G#0) keys, and then use the first two white keys to determine if Gated Glide is OFF (FO), or ON (GO). The Default is ON.</p>		
1.3 Transposition Behavior	F#2	A#0
<p>This setting determines how Grandmother will behave when its Octave settings are changed via the Left-Hand Control. To specify whether Grandmother's pitch is transposed Immediately, or when a New Note is played, press the (F#2 + A#0) keys, and then use the first two white keys to select New Note (FO), or Immediate (GO). The Default is New Note.</p>		
1.4 Tap-Tempo Clock Division Persistence	F#2	C#1
<p>This setting determines whether the clock divisions specified while Tap Tempo is in use will persist when Tap Tempo is disengaged or if the clock divisions will be reset to Eighth Notes when disengaged. Press the (F#2 + C#1) keys, and then use the first two white keys to determine whether Tap-Tempo Clock Division Persistence is OFF (FO), or ON (GO). The Default is OFF.</p>		
1.5 Velocity CV Output Range	F#2	D#1
<p>Grandmother's VELOCITY CV Output can be set to transmit velocity data at two different voltage ranges. To set the VELOCITY CV Output range, press the (F#2 + D#1) keys, and then use the first two white keys to select between -5V to +5V (FO), and 0V to 10V (GO). The Default is -5V to +5V.</p>		
1.6 Oscillator 2 Frequency Knob Range	F#2	F#1
<p>Hold (F#2) and press (F#1) to select. 0 Semitones / Off (FO), 1 Semitone (GO), 2 Semitones (AO) ... 7 Semitones (F1) is the Default... 18 Semitones (C3). Osc 2 Freq Knob Range controls the amount of pitch detuning available from the FREQUENCY knob in the Oscillator 2 section of the front panel. The default is 7 semitones; the range is 0 to 18 semitones, set using any of the white keys on the keyboard (lowest to highest white key sets range to be 0 to 18 semitones).</p>		

(Continued) Global Parameters Group 1	Group Select Key	Parameter Select Key
1.7 Clock Output Mode	F#2	G#1
<p>Hold (F#2) and press (G#1) to select. Output clock only when Arp/Seq is running (F0) - Default, Output clock all the time (G0). Clock Output Mode controls when a clock signal will be present at the CLOCK OUT jack on the Grandmother rear panel. Options are to output clock pulses only when the internal Arpeggiator or Sequencer is running, or to output clock pulses all the time. The timing of clock pulses is determined by the tempo in BPM and the Clock Output PPQN setting.</p>		

Global Parameters	Group Select Key	Parameter Select Key
2.1 Separate MIDI Channels	G#2	F#0
<p>To set only MIDI OUT channel, go into Global Edit mode and then press and hold the highest G# key (G#2); while holding that also press the lowest black key (F#0). Then, the lowest 16 white keys set MIDI OUT channel 1-16. The original MIDI Channel global option (just pressing lowest F#0 key by itself) continues to set both MIDI IN and OUT channels to the selected channel number.</p>		

■ MIDI DOCUMENTATION

MIDI Continuous Controller (CC) Mapping:

Function	CC Number	Values
Pitch Wheel	--	--
Mod Wheel	1	0-127 (or 0-16383 using CC1 & CC 33)
Modulation Rate	3	0-127 (or 0-16383 using CC3 & CC 35)
Glide Time	5	0-127 (or 0-16383 using CC5 & CC 37)
Arp/Seq Rate	8	0-127 (or 0-16383 using CC8 & CC 40)
Oscillator 2 Frequency	12	0-127 (or 0-16383 using CC12 & CC 44)
Glide On/Off	65	0 = Off, 64 = On
Arp/Seq Hold	69	0 = Off, 64 = On
Arp/Seq Play	73	0 = Off, 64 = On
Oscillator 1 Octave	74	0 = 32', 32 = 16', 64 = 8', 96 = 4'
Oscillator 2 Octave	75	0 = 32', 32 = 16', 64 = 8', 96 = 4'
Oscillator 2 Sync	77	0 = Off, 64 = On
Glide Type	85	0 = LCR, 43 = LCT, 85 = Exponential
Keyboard Octave	89	0 = -2, 26 = -1, 51 = 0, 77 = +1, 102 = +2
Arp/Seq Clock Division	90	(See Grandmother Clock Divisions table)
Arp/Seq Mode	91	0 = ARP, 43 = SEQ, 85 = REC
Arp/Seq Pattern	92	0 = ORDR, 43 = FWD/BKWD, 85 = RNDM
Arp Range/Seq Number	93	0 = 1, 43 = 2, 85 = 3
Legato Glide	94	0 = Off, 64 = On
Gated Glide	103	0 = Off, 64 = On
Pitch Bend Up Amt	107	(see table 2)
Pitch Bend Down Amt	108	(see table 2)
KB Transpose (Semitones)	119	(see table 3)

Additional MIDI Functions	
Pitch Bend Amount	RPN 0
Fine Tuning	RPN 1
Coarse Tuning	RPN 2
Sustain Pedal	MIDI CC 64
Local Control On/Off	MIDI CC 122
All Sounds Off / All Notes Off	Receives MIDI CC 120, 123

Grandmother Clock Divisions	CC 90 Value
4 Whole Notes	0
3 Whole Notes	5
2 Whole Notes	11
Dotted Whole Note	16
Whole Note	21
Dotted Half Note	27
Whole Note Triplet	32
Half Note	37
Dotted Quarter Note	43
Half Note Triplet	48
Quarter Note	53
Dotted Eighth Note	59

Clock Divisions (Continued)	CC 90 Value
Quarter Note Triplet	64
Eighth Note	69
Dotted Sixteenth Note	75
Eighth Note Triplet	80
Sixteenth Note	85
Dotted 32nd Note	91
Sixteenth Note Triplet	96
32nd Note	101
Dotted 64th Note	107
32nd Note Triplet	112
64th Note	117
64th Note Triplet	123

TABLE 2 Bend Range (Semitones)	CC 107 / CC 108 Value
0 (Off)	0
1	5
2	10
3	15
4	20
5	26
6	31
7	36
8	41
9	46
10	51
11	56
12 (One Octave)	61
13	67
14	72
15	77
16	82
17	87
18	92
19	97
20	102
21	108
22	113
23	118
24 (Two Octaves)	123

TABLE 3 KB Transpose (Semitones)	CC 119
-12	0
-11	5
-10	10
-9	15
-8	20
-7	26
-6	31
-5	36
-4	41
-3	46
-2	51
-1	56
0 (Off)	61
+1	67
+2	72
+3	77
+4	82
+5	87
+6	92
+7	97
+8	102
+9	108
+10	113
+11	118
+12	123

ARP/SEQ

WAVE/OUT
 SEQ/OUT
 KEYPAD
 RATE
 ARP SEQ (REC) MODE
 DRUM ENV/ADSR/ANIM DIRECTION
 1 2 3 5
 OCT1/SEQ

MODULATION

WAVE/OUT
 RATE IN
 SYNC IN
 ESC/OUT
 RATE
 PITCH AMT
 CUTOFF AMT
 WAVEFORM
 PULSE WIDTH AMT

OSCILLATORS

WAVE/OUT
 PITCH IN
 PW/IN
 OCTAVE
 16 8 4 2
 SYNC
 WAVEFORM
 WAVE/OUT
 LIN/IN
 LIN/IN
 OCTAVE
 16 8 4 2
 FREQUENCY
 WAVEFORM

MIXER

OSC 1 IN
 OSC 2 IN
 NOISE IN
 OUTPUT
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE
 INPUT
 HIGH PASS
 ATTENUATOR
 OUTPUT

FILTER

INPUT
 E/W/AMT IN
 CUTOFF IN
 CUTOFF
 2000Hz
 2kHz
 20kHz
 1:2 OFF 1:1
 KBD TRACK
 ENVELOPE AMT
 RESONANCE

ENVELOPE

TRIGGER IN
 ENVELOPE IN
 ENVELOPE IN
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

OUTPUT

VCA/AMT IN
 VCA IN
 REVERB IN
 VOLUME
 ENV. AD/BS DRONE VCA MODE
 SPRING REVERB
 MIX

DISCO TOM

ARP/SEQ

WAVE/OUT
 SEQ/OUT
 KEYPAD
 RATE
 ARP SEQ (REC) MODE
 DRUM ENV/ADSR/ANIM DIRECTION
 1 2 3 5
 OCT1/SEQ

MODULATION

WAVE/OUT
 RATE IN
 SYNC IN
 ESC/OUT
 RATE
 PITCH AMT
 CUTOFF AMT
 WAVEFORM
 PULSE WIDTH AMT

OSCILLATORS

WAVE/OUT
 PITCH IN
 PW/IN
 OCTAVE
 16 8 4 2
 SYNC
 WAVEFORM
 WAVE/OUT
 LIN/IN
 LIN/IN
 OCTAVE
 16 8 4 2
 FREQUENCY
 WAVEFORM

MIXER

OSC 1 IN
 OSC 2 IN
 NOISE IN
 OUTPUT
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE
 INPUT
 HIGH PASS
 ATTENUATOR
 OUTPUT

FILTER

INPUT
 E/W/AMT IN
 CUTOFF IN
 CUTOFF
 2000Hz
 2kHz
 20kHz
 1:2 OFF 1:1
 KBD TRACK
 ENVELOPE AMT
 RESONANCE

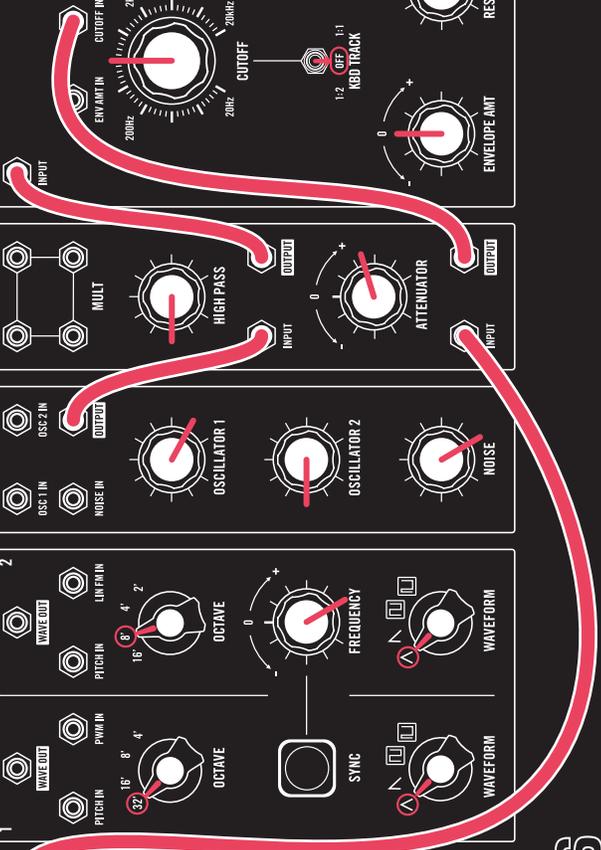
ENVELOPE

TRIGGER IN
 ENVELOPE IN
 ENVELOPE IN
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

OUTPUT

VCA/AMT IN
 VCA IN
 REVERB IN
 VOLUME
 ENV. AD/BS DRONE VCA MODE
 SPRING REVERB
 MIX

DRONE TIDES



ARP/SEQ
 RATE
 KEYPAD
 KEYPAD
 ARP SEQ (REC) MODE
 DRUM ENVELOPE/ANOM DIRECTION
 1 2 3
 OCT1/SEQ

MODULATION
 RATE IN
 SYNC
 RATE
 PITCH AMT
 CUTOFF AMT
 WAVEFORM

OSCILLATORS
 1
 WAVEFORM
 PITCH IN
 PW IN
 OCTAVE
 32 16 8 4
 SYNC
 WAVEFORM
 2
 WAVEFORM
 PITCH IN
 LIN P IN
 OCTAVE
 16 8 4 2
 FREQUENCY
 WAVEFORM

MIXER
 OSC 1 IN
 OSC 2 IN
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE

UTILITIES
 INPUT
 HIGH PASS
 ATTENUATOR
 INPUT

FILTER
 INPUT
 EWAMT IN
 CUTOFF IN
 200Hz
 2kHz
 CUTOFF
 1:2 OFF 1:1
 KBD TRACK
 ENVELOPE AMT
 RESONANCE

ENVELOPE
 TRIGGER IN
 ENVELOPE
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

OUTPUT
 VCA AMT IN
 VCA IN
 REVERB IN
 VOLUME
 ENV 1/2 3/4 DRONE
 VCA MODE
 SPRING REVERB
 MIX

EVOLUTION ARP

ARP/SEQ
 RATE
 KEYPAD
 KEYPAD
 ARP SEQ (REC) MODE
 DRUM ENVELOPE/ANOM DIRECTION
 1 2 3
 OCT1/SEQ

MODULATION
 RATE IN
 SYNC
 RATE
 PITCH AMT
 CUTOFF AMT
 WAVEFORM

OSCILLATORS
 1
 WAVEFORM
 PITCH IN
 PW IN
 OCTAVE
 32 16 8 4
 SYNC
 WAVEFORM
 2
 WAVEFORM
 PITCH IN
 LIN P IN
 OCTAVE
 16 8 4 2
 FREQUENCY
 WAVEFORM

MIXER
 OSC 1 IN
 OSC 2 IN
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE

UTILITIES
 INPUT
 HIGH PASS
 ATTENUATOR
 INPUT

FILTER
 INPUT
 EWAMT IN
 CUTOFF IN
 200Hz
 2kHz
 CUTOFF
 1:2 OFF 1:1
 KBD TRACK
 ENVELOPE AMT
 RESONANCE

ENVELOPE
 TRIGGER IN
 ENVELOPE
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

OUTPUT
 VCA AMT IN
 VCA IN
 REVERB IN
 VOLUME
 ENV 1/2 3/4 DRONE
 VCA MODE
 SPRING REVERB
 MIX

FAT PLUCK BASS

ARP/SEQ

KEY OUT RATE OUT RATE

ARP SEQ (REC) NODE

DIRB: FWD / REV RDM DIRECTION

1 2 3 OCT/7/SEQ

MODULATION

RATE IN SYNC IN RATE

PITCH AMT CUTOFF AMT WAVEFORM

PULSE WIDTH AMT

OSCILLATORS

1 2

PITCH IN PFM IN OCTAVE

16" 8" 4" 32" 16" 8" 4"

WAVEFORM SYNC WAVEFORM

OCTAVE FREQUENCY WAVEFORM

MIXER

OSC 1 IN OSC 2 IN OSC 1 OSC 2

NOISE IN NOISE NOISE

HIGH PASS ATTENUATOR

FILTER

INPUT CUTOFF RESONANCE

2000Hz 2000Hz 2000Hz

1:2 OFF 1:1 KBD TRACK

ENVELOPE AMT RESONANCE

ENVELOPE

TRIGGER IN ATTACK DECAY RELEASE

SUSTAIN

OUTPUT

VCA AMT IN VOLUME

VCA IN REVERB IN

ENV: 0.5 1.5 3.0 VCA MODE

SPRING REVERB

MIX

ORGAN LEAD

ARP/SEQ

KEY OUT RATE OUT RATE

ARP SEQ (REC) NODE

DIRB: FWD / REV RDM DIRECTION

1 2 3 OCT/7/SEQ

MODULATION

RATE IN SYNC IN RATE

PITCH AMT CUTOFF AMT WAVEFORM

PULSE WIDTH AMT

OSCILLATORS

1 2

PITCH IN PFM IN OCTAVE

16" 8" 4" 32" 16" 8" 4"

WAVEFORM SYNC WAVEFORM

OCTAVE FREQUENCY WAVEFORM

MIXER

OSC 1 IN OSC 2 IN OSC 1 OSC 2

NOISE IN NOISE NOISE

HIGH PASS ATTENUATOR

FILTER

INPUT CUTOFF RESONANCE

2000Hz 2000Hz 2000Hz

1:2 OFF 1:1 KBD TRACK

ENVELOPE AMT RESONANCE

ENVELOPE

TRIGGER IN ATTACK DECAY RELEASE

SUSTAIN

OUTPUT

VCA AMT IN VOLUME

VCA IN REVERB IN

ENV: 0.5 1.5 3.0 VCA MODE

SPRING REVERB

MIX

SHORT FLUTEY ARP

ARP/SEQ
 KEYPAD IN KEYPAD OUT RATE
 ARP SEQ (REC) MODE
 DRUM ENVELOPE RANDOM DIRECTION
 1 2 3 OCT1/SEQ

MODULATION
 RATE IN SYNC IN RATE
 SYNC IN SYNC OUT
 PITCH AMT PITCH AMT
 PULSE WIDTH AMT PULSE WIDTH AMT

OSCILLATORS
 1 WAVEFORM PITCH IN PITCH IN
 32° 16° 8° 4° OCTAVE
 PITCH IN PITCH IN
 16° 8° 4° OCTAVE
 LIN PAIN LIN PAIN
 2 WAVEFORM FREQ AMT WAVEFORM
 FREQ AMT FREQ AMT

MIXER
 OSC 2 IN OSC 2 IN
 NOISE IN NOISE IN
 OSCILLATOR 1 OSCILLATOR 2
 OSCILLATOR 1 OSCILLATOR 2
 NOISE NOISE

UTILITIES
 MULT MULT
 HIGH PASS HIGH PASS
 ATTENUATOR ATTENUATOR
 INPUT INPUT OUTPUT OUTPUT

FILTER
 INPUT INPUT
 ENVELOPE AMT ENVELOPE AMT
 1:2 OFF 1:1 KBD TRACK
 CUTOFF CUTOFF
 200Hz 200Hz 200Hz 200Hz
 RESONANCE RESONANCE

ENVELOPE
 TRIGGER IN TRIGGER IN
 ENVELOPE ENVELOPE
 ATTACK ATTACK
 DECAY DECAY
 RELEASE RELEASE
 SUSTAIN SUSTAIN

OUTPUT
 VCA AMT IN VCA AMT IN
 REVERB IN REVERB IN
 VOLUME VOLUME
 ENV 1/2 3/4 DRONE VCA MODE
 SPRING REVERB MIX

SOFT SIZZLE LEAD

ARP/SEQ
 KEYPAD IN KEYPAD OUT RATE
 ARP SEQ (REC) MODE
 DRUM ENVELOPE RANDOM DIRECTION
 1 2 3 OCT1/SEQ

MODULATION
 RATE IN SYNC IN RATE
 SYNC IN SYNC OUT
 PITCH AMT PITCH AMT
 PULSE WIDTH AMT PULSE WIDTH AMT

OSCILLATORS
 1 WAVEFORM PITCH IN PITCH IN
 32° 16° 8° 4° OCTAVE
 PITCH IN PITCH IN
 16° 8° 4° OCTAVE
 LIN PAIN LIN PAIN
 2 WAVEFORM FREQ AMT WAVEFORM
 FREQ AMT FREQ AMT

MIXER
 OSC 2 IN OSC 2 IN
 NOISE IN NOISE IN
 OSCILLATOR 1 OSCILLATOR 2
 OSCILLATOR 1 OSCILLATOR 2
 NOISE NOISE

UTILITIES
 MULT MULT
 HIGH PASS HIGH PASS
 ATTENUATOR ATTENUATOR
 INPUT INPUT OUTPUT OUTPUT

FILTER
 INPUT INPUT
 ENVELOPE AMT ENVELOPE AMT
 1:2 OFF 1:1 KBD TRACK
 CUTOFF CUTOFF
 200Hz 200Hz 200Hz 200Hz
 RESONANCE RESONANCE

ENVELOPE
 TRIGGER IN TRIGGER IN
 ENVELOPE ENVELOPE
 ATTACK ATTACK
 DECAY DECAY
 RELEASE RELEASE
 SUSTAIN SUSTAIN

OUTPUT
 VCA AMT IN VCA AMT IN
 REVERB IN REVERB IN
 VOLUME VOLUME
 ENV 1/2 3/4 DRONE VCA MODE
 SPRING REVERB MIX

SILKY LEAD

ARP/SEQ KEYPAD KEYPAD RATE VCA AMT IN REVERB IN VOLUME ENV. 1 2 3 4 5 0017/SEQ MODE DIR. ENV/DIR/DIRM DIRECTION

MODULATION RATE IN SYNC IN RATE CUTOFF AMT PITCH AMT PULSE WIDTH AMT

OSCILLATORS 1 PITCH IN PW IN OCTAVE SYNC WAVEFORM 2 PITCH IN PW IN OCTAVE WAVEFORM

MIXER OSC 1 IN OSC 2 IN NOISE IN OSCILLATOR 1 OSCILLATOR 2 NOISE

UTILITIES MULT HIGH PASS ATTENUATOR

FILTER INPUT CUTOFF 200Hz 2kHz 20kHz ENVELOPE AMT RESONANCE KBD TRACK 1:2 OFF 1:3

ENVELOPE TRIGGER IN ATTACK DECAY RELEASE SUSTAIN

OUTPUT VCA AMT IN VCA IN REVERB IN VOLUME ENV. 1 2 3 4 5 0017/SEQ MODE DIR. ENV/DIR/DIRM DIRECTION

SPRING REVERB MIX

SYNCR SLINK LEAD

ARP/SEQ KEYPAD KEYPAD RATE VCA AMT IN REVERB IN VOLUME ENV. 1 2 3 4 5 0017/SEQ MODE DIR. ENV/DIR/DIRM DIRECTION

MODULATION RATE IN SYNC IN RATE CUTOFF AMT PITCH AMT PULSE WIDTH AMT

OSCILLATORS 1 PITCH IN PW IN OCTAVE SYNC WAVEFORM 2 PITCH IN PW IN OCTAVE WAVEFORM

MIXER OSC 1 IN OSC 2 IN NOISE IN OSCILLATOR 1 OSCILLATOR 2 NOISE

UTILITIES MULT HIGH PASS ATTENUATOR

FILTER INPUT CUTOFF 200Hz 2kHz 20kHz ENVELOPE AMT RESONANCE KBD TRACK 1:2 OFF 1:3

ENVELOPE TRIGGER IN ATTACK DECAY RELEASE SUSTAIN

OUTPUT VCA AMT IN VCA IN REVERB IN VOLUME ENV. 1 2 3 4 5 0017/SEQ MODE DIR. ENV/DIR/DIRM DIRECTION

SPRING REVERB MIX

WRECKED BASS

ARP/SEQ RATE KEYPAD KEYPAD/SEQ MODE

MODULATION RATE SYNC IN PITCH AMT CUTOFF AMT

OSCILLATORS 1 PITCH IN PW/IN OCTAVE 32 8 4 PITCH IN LIN P/IN OCTAVE 8 4 2

MIXER OSC 1 IN OSC 2 IN NOISE IN

UTILITIES MULT HIGH PASS ATTENUATOR

FILTER INPUT ENVELOPE AMT CUTOFF 2000Hz 200Hz 2kHz 20kHz RESONANCE

ENVELOPE TRIGGER IN ATTACK DECAY RELEASE SUSTAIN

OUTPUT VCA AMT IN VCA IN REVERB IN VOLUME

ENV 16 BLS 100% VCA MODE

SPRING REVERB MIX

SLOWFIRE Turn GLIDE to 1 o'clock.

ARP/SEQ RATE KEYPAD KEYPAD/SEQ MODE

MODULATION RATE SYNC IN PITCH AMT CUTOFF AMT

OSCILLATORS 1 PITCH IN PW/IN OCTAVE 32 8 4 PITCH IN LIN P/IN OCTAVE 8 4 2

MIXER OSC 1 IN OSC 2 IN NOISE IN

UTILITIES MULT HIGH PASS ATTENUATOR

FILTER INPUT ENVELOPE AMT CUTOFF 2000Hz 200Hz 2kHz 20kHz RESONANCE

ENVELOPE TRIGGER IN ATTACK DECAY RELEASE SUSTAIN

OUTPUT VCA AMT IN VCA IN REVERB IN VOLUME

ENV 16 BLS 100% VCA MODE

SPRING REVERB MIX

STAR-WEAVER MOD WHEEL up.

ARP/SEQ
 RATE
 ARP SEQ (REC) MODE
 DIR: FWD / BKWD / QUIT
 DIRECTION
 OCT / SEQ

MODULATION
 RATE IN
 SYNC IN
 RATE
 PITCH AMT
 CUTOFF AMT
 WAVEFORM

OSCILLATORS
 1
 2
 PITCH IN
 PW IN
 OCTAVE
 SYNC
 WAVEFORM

MIXER
 OSC 1 IN
 OSC 2 IN
 NOISE IN
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE

UTILITIES
 MULT
 HIGH PASS
 ATTENUATOR

FILTER
 INPUT
 ENV AMT IN
 CUTOFF IN
 CUTOFF
 200Hz
 2kHz
 20kHz
 ENV AMT
 1:1
 1:2
 OFF
 KBD TRACK
 ENVELOPE AMT
 RESONANCE

ENVELOPE
 TRIGGER IN
 ENV OUT
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

SPRING REVERB
 VCA AMT IN
 REVERB IN
 VOLUME
 ENV
 100% BLS
 100% DROME
 VCA MODE
 MIX

PHASES
 Adjust ATTENUATOR knob for sparkles

ARP/SEQ
 RATE
 ARP SEQ (REC) MODE
 DIR: FWD / BKWD / QUIT
 DIRECTION
 OCT / SEQ

MODULATION
 RATE IN
 SYNC IN
 RATE
 PITCH AMT
 CUTOFF AMT
 WAVEFORM

OSCILLATORS
 1
 2
 PITCH IN
 PW IN
 OCTAVE
 SYNC
 WAVEFORM

MIXER
 OSC 1 IN
 OSC 2 IN
 NOISE IN
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE

UTILITIES
 MULT
 HIGH PASS
 ATTENUATOR

FILTER
 INPUT
 ENV AMT IN
 CUTOFF IN
 CUTOFF
 200Hz
 2kHz
 20kHz
 ENV AMT
 1:1
 1:2
 OFF
 KBD TRACK
 ENVELOPE AMT
 RESONANCE

ENVELOPE
 TRIGGER IN
 ENV OUT
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

SPRING REVERB
 VCA AMT IN
 REVERB IN
 VOLUME
 ENV
 100% BLS
 100% DROME
 VCA MODE
 MIX

THE DREAM
 Adjust ATTENUATOR knob for sparkles

ARP/SEQ RATE **ENV. / KB DIS. / TRIG. / VCA MODE** **ENV. / KB DIS. / TRIG. / VCA MODE**

MODULATION RATE IN SYNC IN **ESC OUT** RATE **CUTOFF AMT** **WAVEFORM**

OSCILLATORS 1 2 **WAVE OUT** **WAVEFORM** **PITCH IN** **PWM IN** **32** **8** **4** **OCTAVE** **SYNC** **WAVEFORM** **PITCH IN** **LIN FREQ** **16** **8** **4** **2** **OCTAVE** **FREQUENCY** **WAVEFORM**

MIXER **NOISE IN** **OSCILLATOR 1** **OSCILLATOR 2** **NOISE**

UTILITIES **INPUT** **MULT** **HIGH PASS** **ATTENUATOR** **OUTPUT**

FILTER **INPUT** **EW AMT IN** **CUTOFF IN** **200Hz** **2kHz** **CUTOFF** **1-2** **OFF** **1-1** **KB TRACK** **ENVELOPE AMT** **RESONANCE**

ENVELOPE **TRIGGER IN** **ENV OUT** **ATTACK** **DECAY** **RELEASE** **SUSTAIN**

OUTPUT **VCA AMT IN** **REVERB IN** **VOLUME** **ENV. / KB DIS. / TRIG. / VCA MODE** **SPRING REVERB** **MIX**

Raise MOD WHEEL for filter bubble.
Adjust ATTENUATOR for OSC 2 vibrato / Add GLIDE.

COSMOCHORDAL

ARP/SEQ RATE **ENV. / KB DIS. / TRIG. / VCA MODE** **ENV. / KB DIS. / TRIG. / VCA MODE**

MODULATION RATE IN SYNC IN **ESC OUT** RATE **CUTOFF AMT** **WAVEFORM**

OSCILLATORS 1 2 **WAVE OUT** **WAVEFORM** **PITCH IN** **PWM IN** **32** **8** **4** **OCTAVE** **SYNC** **WAVEFORM** **PITCH IN** **LIN FREQ** **16** **8** **4** **2** **OCTAVE** **FREQUENCY** **WAVEFORM**

MIXER **OSC 2 IN** **OSCILLATOR 1** **OSCILLATOR 2** **NOISE**

UTILITIES **INPUT** **MULT** **HIGH PASS** **ATTENUATOR** **OUTPUT**

FILTER **INPUT** **EW AMT IN** **CUTOFF IN** **200Hz** **2kHz** **CUTOFF** **1-2** **OFF** **1-1** **KB TRACK** **ENVELOPE AMT** **RESONANCE**

ENVELOPE **TRIGGER IN** **ENV OUT** **ATTACK** **DECAY** **RELEASE** **SUSTAIN**

OUTPUT **VCA AMT IN** **REVERB IN** **VOLUME** **ENV. / KB DIS. / TRIG. / VCA MODE** **SPRING REVERB** **MIX**

DISCO-DRONE

PLAY / HOLD "Arp." Play one note.

ARP/SEQ

MODULATION

OSCILLATORS

MIXER

UTILITIES

FILTER

ENVELOPE

OUTPUT

TITLE:

NOTES:

ARP/SEQ

MODULATION

OSCILLATORS

MIXER

UTILITIES

FILTER

ENVELOPE

OUTPUT

TITLE:

NOTES:

ARP/SEQ

MODULATION

OSCILLATORS

MIXER

UTILITIES

FILTER

ENVELOPE

OUTPUT

TITLE:

NOTES:

ARP/SEQ

MODULATION

OSCILLATORS

MIXER

UTILITIES

FILTER

ENVELOPE

OUTPUT

TITLE:

NOTES:

ARP/SEQ

GATE OUT
 RATE
 RETRIG
 ARP SEQ MODE
 ORRR FWD/RAND/RNDM DIRECTION
 OCT/SEQ

MODULATION

RATE IN
 SYNC IN
 PITCH AMT
 CUTOFF AMT
 PULSE WIDTH AMT
 WAVEFORM

OSCILLATORS

WAVEFORM
 PITCH IN
 OCTAVE
 PITCH IN
 OCTAVE
 SYNC
 WAVEFORM
 PITCH IN
 OCTAVE
 FREQUENCY
 WAVEFORM

MIXER

OSC 1 IN
 OSC 2 IN
 NOISE IN
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE

UTILITIES

MULT
 HIGH PASS
 ATTENUATOR
 INPUT

FILTER

INPUT
 ENV AMT IN
 CUTOFF IN
 CUTOFF
 ENV AMT
 RESONANCE
 ENVELOPE AMT
 KBD TRACK

ENVELOPE

TRIGGER IN
 ENV OUT
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

OUTPUT

VCA AMT IN
 VCA IN
 VOLUME
 ENV AD FLS. BIRNIE VCA MODE
 SPRING REVERB
 MIX

TITLE:

NOTES:

ARP/SEQ

GATE OUT
 RATE
 RETRIG
 ARP SEQ MODE
 ORRR FWD/RAND/RNDM DIRECTION
 OCT/SEQ

MODULATION

RATE IN
 SYNC IN
 PITCH AMT
 CUTOFF AMT
 PULSE WIDTH AMT
 WAVEFORM

OSCILLATORS

WAVEFORM
 PITCH IN
 OCTAVE
 PITCH IN
 OCTAVE
 SYNC
 WAVEFORM
 PITCH IN
 OCTAVE
 FREQUENCY
 WAVEFORM

MIXER

OSC 1 IN
 OSC 2 IN
 NOISE IN
 OSCILLATOR 1
 OSCILLATOR 2
 NOISE

UTILITIES

MULT
 HIGH PASS
 ATTENUATOR
 INPUT

FILTER

INPUT
 ENV AMT IN
 CUTOFF IN
 CUTOFF
 ENV AMT
 RESONANCE
 ENVELOPE AMT
 KBD TRACK

ENVELOPE

TRIGGER IN
 ENV OUT
 ATTACK
 DECAY
 RELEASE
 SUSTAIN

OUTPUT

VCA AMT IN
 VCA IN
 VOLUME
 ENV AD FLS. BIRNIE VCA MODE
 SPRING REVERB
 MIX

TITLE:

NOTES:

ARP/SEQ

MODULATION

OSCILLATORS

MIXER

UTILITIES

FILTER

ENVELOPE

OUTPUT

TITLE:

NOTES:

ARP/SEQ

MODULATION

OSCILLATORS

MIXER

UTILITIES

FILTER

ENVELOPE

OUTPUT

TITLE:

NOTES:

■ SPECIFICATIONS

TYPE: Semi-Modular Analog Synthesizer

SOUND ENGINE: Analog

NUMBER OF KEYS: 32 Full-Size Keys

TYPE OF KEYS: Velocity-sensing (Velocity signal is not hard-wired – available via MIDI and **KBD VEL OUT** jack)

OTHER CONTROLLERS: Pitch Bend, Mod Wheel, Variable Glide

POLYPHONY: Monophonic

SOUND SOURCES: 2 Oscillators with selectable Waveforms (Oscillator 2 supports Sync to Oscillator 1 plus linear FM), 1 White Noise Generator, External Input jack

VCF FILTER (LOW PASS): -24dB/Octave Moog Ladder Filter with Resonance (Self-Oscillating)

STATIC FILTER (HIGH PASS): -6dB/Octave

MOD SOURCES: Modulation Oscillator (Sine, Sawtooth, Ramp, Square), S/H Output, plus Envelope and Key Tracking

ENVELOPE: Four-Stage (ADSR)

ATTENUATOR: Bipolar

MULT: Four Parallel-wired Non-buffered Patch Points

EFFECTS: Spring Reverb

ARPEGGIATOR / STEP SEQUENCER: (256 Steps; three Sequence Files)

PATCH POINTS:

41 x 3.5mm front and rear panels

21 Inputs

16 Outputs

4 Parallel-wired Mults.

AUDIO INPUT: One 1/4" TS jack (Rear Panel)

AUDIO OUTPUT: One 1/4" TRS jack for headphones or line level output (Rear Panel)

WARNING: Use a TS instrument cable for line output applications. Do not use a TRS (balanced) cable, or phase cancellation may cause a very weak signal.

MIDI I/O: 5-pin DIN In, Out, Thru; plus MIDI over USB (Rear Panel)

DIMS: 23" (58.42cm) Wide x 14 1/4" (36.19cm) Deep x 5 1/2" (13.97cm) High

POWER: Included Power Adapter 12V DC (positive tip), 2A, 100 to 240 Volts AC, 50/60Hz

WEIGHT: 16lbs. / 7.25kg

■ SERVICE AND SUPPORT INFORMATION

MOOG'S STANDARD WARRANTY

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

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

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

RETURNING YOUR PRODUCT TO MOOG MUSIC

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

MOOG MUSIC
160 Broadway St.
Asheville NC, 28801

WHAT WE WILL DO

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

HOW TO INITIATE YOUR WARRANTY

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

CARING FOR MATRIARCH

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

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

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Grandmother Dark User Manual Version 1 - August 2020

For the most up-to-date user manual and firmware updates go to www.moogmusic.com/grandmother.

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