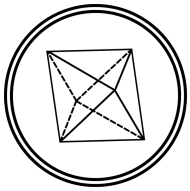


ELECTRONIC AUDIO EXPERIMENTS

Technical Manual

Sending V2

Document Rev B

Firmware v1.0.0.0

July 17, 2023

John W Snyder

Foreword

The original Sending was released in summer 2018—nearly five years ago at the time of this writing. I was a weekend warrior pedal maker in the thick of grad school, and I swung for the fences chasing a sound in my head. Analog delays are notoriously complicated. I obsessed over every detail, which manifested as a harebrained *mise en place* prototype scheme with every subcircuit on its own board, all in a giant enclosure. After multiple failed prototypes we arrived at a working product. It was a high water mark in the early days of EAE, and a process which permanently altered the trajectory of my career.

For all the excitement of its launch, Sending Version 1 was short-lived. We realized that building such a complex pedal solely by hand was a risky prospect. I found myself falling asleep at my desk trying to fill preorders, and my friends who could spare their time couldn't keep up. After building about 50 units, I paused sales so that I could optimize it for wider production. And then it sat.

Sending felt like a thing I would let myself tackle once my skills reached the appropriate point, but instead I kept moving the goalposts. It was the perpetual work in progress, pinned by the weight of its own expectations. A *Half Life 3*, a *Doors of Stone*, a Schubert's 8th Symphony. I spent years repeatedly tearing it all down and starting over.

By 2021, I was able to properly focus on redesigning each building block from scratch. Version 2 is a completely new product in all but name and inspiration. All that remains is the original goal: to make an analog delay that achieves optimal sound quality while showcasing the beautiful imperfections of the medium. To make it all work, we built a foundation of digital control that can serve a whole new generation of products.

Before we dive in, thanks are in order. First, I have to thank Rick "Hawker" Shaich, founder of Asheville Music Tools and my partner in Hypertriangle Inc. Hawker was the first to believe in Sending, and his valuable hints put us on a path to being friends and eventually co-conspirators. I also thank David Rankin, who worked with us for many months developing our firmware libraries. I'd also like to thank the team here at the EAE shop. Brad, you keep the machine moving and keep our spirits high. Miranda, your SMT soldering chops made this prototyping process go a heck of a lot more smoothly. To Charlie Carbiener and Matthew Farrow, thanks for being sounding boards on all the weird firmware edge cases. And a huge thanks to Bryan Aiken for his impeccable graphic design skills that kept this thing looking beautiful despite a much busier panel than V1—whose distinctive look I owe to the immensely talented Sarah Bogosh. I'm glad to have preserved elements and colors from their original design. To our beta testers: thank you. Without you, this would have certainly been a mess.

Finally: to everyone reading this, thanks for supporting what we do and thanks for being patient while this thing took shape. We hope you stick around—after all, we're just getting started.

John Snyder
May 24, 2023

Contents

1 Introduction

Thank you for purchasing the Electronic Audio Experiments Sending. This manual is an in-depth guide for properly understanding, using, and enjoying your pedal.

Sending is an analog delay that melds the archaic voice of bucket brigade devices with a fully modern toolbox of digital control. It embraces the character and idiosyncrasies of the medium while delivering high quality sound and performance-friendly features worthy of the modern musician.

Using two MN3005 BBDs and comprehensive analog processing techniques, Sending can delay a sound up to a full second without clock noise, and it can be pushed to even longer times for compelling sonic degradation. At the input is a discrete preamplifier capable of subtle enhancement or warm saturation that melds perfectly with the delay line. A dual-mode feedback filter can be used to shape the repeats for deep pulses or dub-style bright echoes. Its flexible LFO engine can modulate the delay time to create gentle movement or musical chaos. Conducting this analog ensemble is a 32-bit, 100MHz processor granting deep user control, preset functionality, and MIDI access to every parameter.

Sending is our love letter to the antiquated yet enduring technology of analog delay. As you explore its many shades of interplay between past and future, we hope you find it as immersive as we do.

(Also, since folks have been asking about the name: Sending references a couple things. The D&D spell Sending lets you send a message to someone you know anywhere in the world. It makes me think of delay for some reason. But the real reference is to a type of magic in Garth Nix's Old Kingdom series. A Sending is an ethereal magical construct that performs a task in an endless loop—kind of like a delay. I was reading those books back when I designed V1, and the name stuck.)

2 Setup

2.1 Power

To power your Sending, please use a standard, reliable 9VDC center-negative power supply with a 2.1x5.5mm barrel tip. Sending has a current draw of up to 380mA when active. Therefore, we recommend a power supply rated for 400mA or greater. When using Sending with other pedals, we recommend the use of an isolated supply. We have had the greatest success with Cioks™, Truetone™, and Voodoo Lab™power supplies.

Sending will function on a daisy chain power supply provided the maximum current of the 9V source is not exceeded. If using a daisy chain, please note that there may be additional noise in your signal chain due to spurious interactions between multiple pedals.

The power input is protected against over-voltage and reverse polarity conditions up to ±20V in either direction. The unit will not turn on if an incorrect power supply is used. If your unit is not powering on, check that you are using the correct supply.

In the event Sending is not receiving enough current, it will either spontaneously shut down or it will automatically power cycle. If this occurs, unplug the pedal and try again with a higher current power supply.

Finally, please note that Electronic Audio Experiments products are not designed to use batteries. (For what it's worth, this particular model will drain a standard 9V battery in well under an hour.)

2.2 Signal I/O

Sending has a row of five 1/4" audio jacks along the top face. The jacks are assigned as follows:

Input: unbalanced, mono 1/4" audio input with high input impedance

Output: unbalanced, mono 1/4" audio output with low output impedance

Loop: TRS insert to patch external effects into the feedback loop. The loop send is on the tip, and the loop return is on the ring. For more information refer to Section 4.3.

MIDI: MIDI input. The pinout adheres to the 2018 standard for TRS MIDI. Sending can be used with or without a MIDI box style adapter. For MIDI instructions refer to Section 6.

EXP/CV: 1/4" jack for expression and external voltage control, with a current-limited 5V supply on the ring. To understand the expression system, refer to Section 4.5.

Use standard shielded 1/4" mono cables to patch Sending into a pedal chain. The input and output jacks are labeled using arrows. Sending can be used with amplified instruments, synthesizers, or any line level signal. Note that the bypass signal is always buffered. Sending will only pass a signal if it is powered.

3 Control Panel

This section explains the functions of all the front panel controls. Sending has seven knobs, two momentary footswitches, two RGB indicator LEDs, and four illuminated tactile buttons. Most of the knobs have secondary functions which are accessed using the Shift button. For a more detailed look at how these controls work together, refer to Section 4. Or, check out the suggested settings in Section 5. All settings are saved between power cycles.

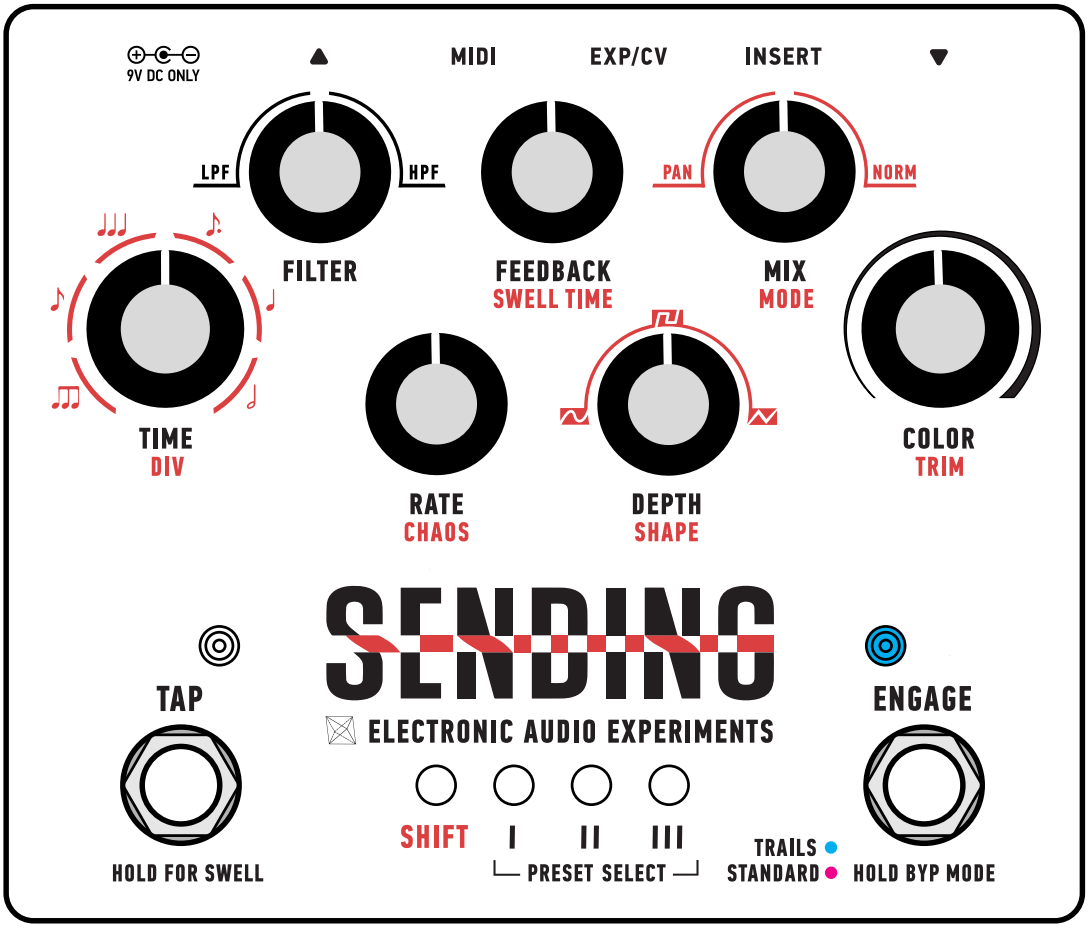


Figure 1: Sending front panel.

3.1 Color

The Color knob controls the preamplifier gain and output level in tandem. This allows the user to overload the preamp and delay line elements while maintaining a consistent output volume level. This knob has three effective regions. In the first region of its rotation, the preamp adds a subtle warming effect. In the second region, the delay line begins to overload gracefully while the dry signal remains relatively clean. In the third region, both the delay

line and the preamp will overload with a full-bodied and clear overdrive texture. The exact onset of clipping will depend on the strength of the input signal. Note that when in Trails bypass mode, the preamp is still active. This means you can use the Color knob on its own when the delay is off. **Secondary function: Volume Trim.** Use this setting to adjust the output level, from -6dB to +6dB. At halfway the volume is even with the bypass level.

3.2 Time

This knob controls the delay time, smoothly adjustable from approximately 5ms to 1 second as it is turned clockwise. **Secondary function: Tap Divisions.** Change clock subdivisions based on note settings from eighth note triplets to half notes. This changes both the tap tempo behavior and the range of the clock, and can be adjusted in real time for arpeggiated sounds. For note division values, see Table 1.

Note Symbol	Tempo Multplier
♪♪♪	1/3
♪	1/2
♩♩♩	2/3
♪.	3/4
♩	1/1
𝅗𝅥	2/1

Table 1: Tap tempo subdivisions.

3.3 Feedback

This knob sets the number of repeats by controlling how much of the delayed signal is fed back into the input. The taper is optimized to easily dial in an infinite bed of echoes at the threshold of self-oscillation but, of course, also capable of achieving runaway feedback and self-oscillation. **Secondary function: Swell Time.** Set the feedback swell ramp time (when holding the Tap footswitch) from virtually instant to very gradual.

3.4 Mix

This control sets the mix of dry and delayed signals, with two operational modes. In the default PAN mode, the Mix knob functions as a crossfader. Turning clockwise increases the level of delayed signal while decreasing the level of the unaffected signal, or vice versa. This mode is more commonly found in rackmount or desktop processors, and is handy if you use a parallel effects loop. In NORM mode, the dry level is fixed and the Mix knob only affects the delay level. This behavior is similar to a traditional stompbox. **Secondary function: Mix**

Mode. When turned counterclockwise past the center, the mixer is in PAN mode. When clockwise past the center, the mixer is in NORM mode.

3.5 Filter

This knob controls a dual mode filter located at the output of the delay line. Changing the tone of the delay changes how the repeats evolve over time. At the center position, the filter is effectively out of the circuit. Clockwise from center engages a high pass filter and increases its cutoff frequency to attenuate bass frequencies so that each repeat becomes successively brighter. Rotating counter-clockwise from center engages a low pass filter and decreases its cutoff frequency to attenuate treble frequencies for a murky sound where each repeat gets successively darker. Note: this control has no secondary function.

3.6 Rate

The Rate knob sets the frequency of the delay time modulation LFO, from imperceptibly slow to low audio rates. **Secondary function: Chaos.** Adjusts randomization level of LFO. See Section 4.2 for more details.

3.7 Depth

This knob sets the amplitude of delay time modulation LFO, from fully off to over-the-top. **Secondary function: LFO shape.** Changes the LFO from sine, to square, to triangle. See Section 4.2 for more details.

3.8 Engage Footswitch

This switch toggles the bypass state when pressed. The bypass LED is always on, but changes brightness to indicate the status: bright for engaged, dim for disengaged. (This allows you to see the bypass mode regardless of whether the effect is active.) Hold the footswitch for 2 seconds to change bypass mode between trails and standard bypass modes. In trails bypass mode, the LED turns blue. In this mode, when the effect is turned off, your repeats will fade out gradually. In addition, the preamp remains active. In standard bypass mode, the LED glows pink. In this mode, the delay is turned off completely and your signal passes through a transparent buffer.

3.9 Tap Footswitch

The left footswitch is used for tap tempo. Each successive press is added to a running average to ensure accurate performance. When the Tap footswitch is held, this activates the Feedback Swell function which ramps the feedback up to maximum. The speed of this ramp is set by the Swell Time secondary function on the Feedback knob, allowing for immediate feedback or gradual builds. When released, the Feedback immediately returns to the setting on the control panel. The corresponding LED is used as a tempo indicator. This LED blinks

white in time with the quarter note tempo. When a MIDI clock is active, the color will change to blue/green. When Feedback Swell is active, it will change to pink.

3.10 Shift and Preset Buttons

There is a row of four backlit tactile buttons for secondary functions and preset selection. The **Shift** button is used to access secondary functions. When pressed it will light up, indicating that the secondary functions are accessible. Press Shift again to return to the normal state. Long pressing the Shift button will configure the pedal to accept a preset save command via MIDI. Refer to Section 6 for details.

The buttons labeled **I, II, III** each correspond to preset slots 1-3. At any time, you may long press one of these buttons to save the current settings to the corresponding preset slot. Upon a successful save, the button will flash. Short press a button to recall that preset. For more details about how presets work, visit Section 4.4.

You can also access some special functions using Shift plus the preset buttons. Pressing Shift then Preset I will reset the expression/CV mode. Pressing Shift then Preset II will reset the controls to their default values.

4 Detailed Operating Instructions

4.1 Signal Flow

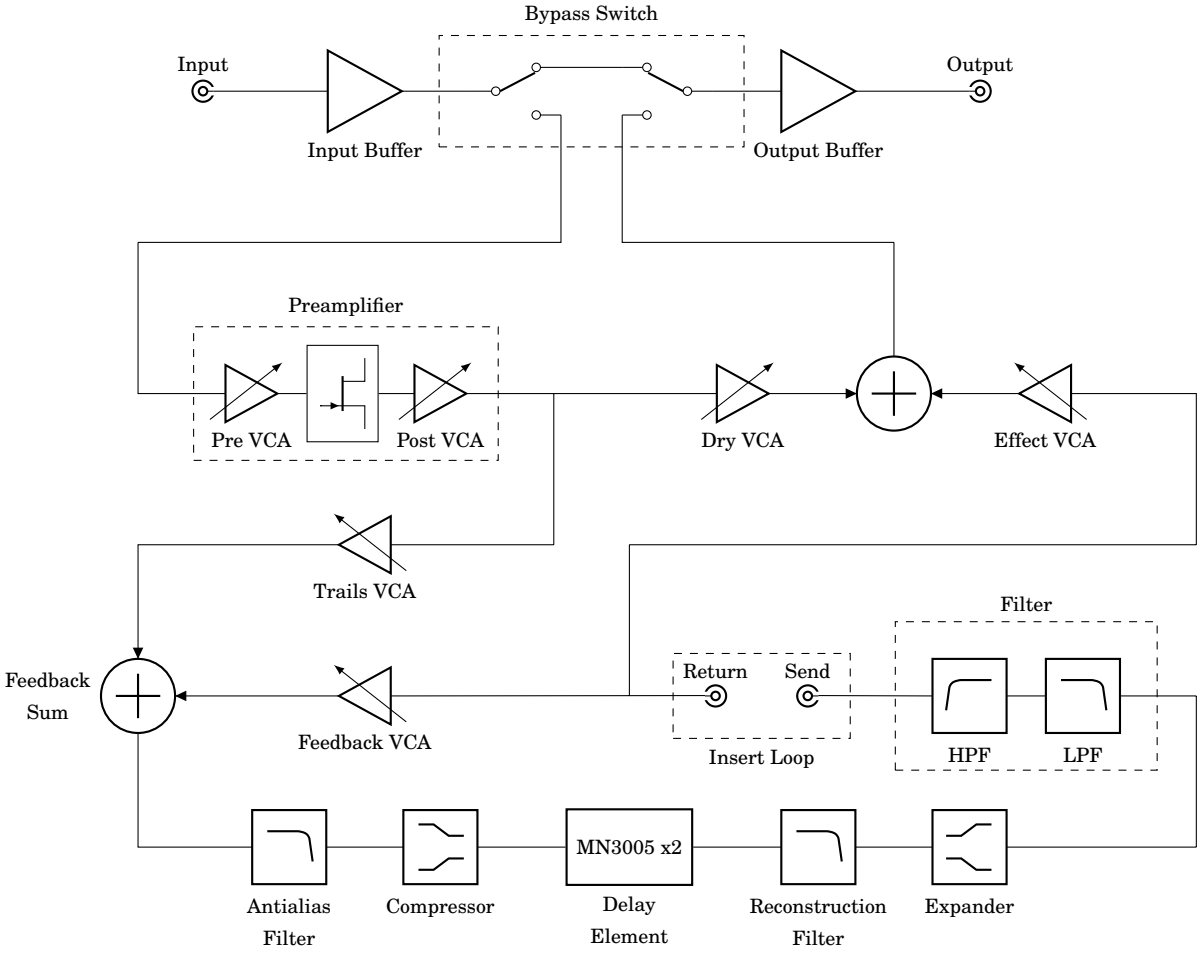


Figure 2: Signal flow block diagram.

To best describe how Sending works, it helps to understand the signal path. A block diagram is shown in Figure 2. At first glance, it follows a fairly traditional analog delay implementation. However there are some interesting twists which we explain below.

The incoming signal first passes through an input buffer. In standard bypass mode, the signal goes through the output buffer and on to the next thing in your signal chain. When active, the effect is routed into the preamplifier. The preamp affects the dry and effected signals together. It uses a unique JFET/BJT gain stage which produces a uniquely warm overdrive tone with a flat frequency response. This gain stage is sandwiched between a pair of VCAs to control the incoming/outgoing signal levels. As the Color knob is increased, more signal is fed into the transistors via the Pre VCA, and the Post VCA (and output mixer) are adjusted to maintain a constant level. Therefore, you may overdrive the preamp and delay line without changing the output volume. From here, the signal is split into the delay line input and to the output mixer. The output mixer uses two VCAs to balance the delayed

and effected signals. The Volume Trim secondary function applies an offset to the mixer to increase/decrease output volume as needed.

At the input of the delay line is another VCA mixer to combine the incoming audio with the feedback signal. The Trails VCA is used to smoothly mute the input signal when in Trails bypass mode. The Feedback VCA changes the amount of delayed signal fed into the input. This mixer features a soft limiter to add character at higher Color settings and/or at higher Feedback settings.

The combined input and feedback signal passes through anti-alias filtering and a compressor. The filter removes frequency components that the BBDs cannot replicate. The compressor amplifies small signals above the noise floor of the BBDs and attenuates hot signals that might cause them to distort[1]. The two MN3005 BBDs delay the signal for a length of time based on the frequency of the clock generated by the digital control system. The LFO moves the clock frequency up and down to produce various pitch-bending and other modulation effects.

Now, because the delay time depends on a clock frequency, this has a few implications. To increase delay time, the clock frequency must go down, which also means the sample rate of the BBDs is going down! This is what produces the grainy sound of a BBD[2]. It also means there can be residual clock noise present in the signal. The output of the BBDs is filtered again to remove this clock noise, as well as any frequencies that could not be readily reproduced by the sample rate. Our filter is extremely steep to allow as much high frequency content as possible before sharply cutting off. Then, an expander reverses the action of the compressor. This restores the dynamic range and attenuates the noise floor of the BBD to a lower level.

The delay output then passes through the two variable filters which are associated with the Filter pot. Turning Filter clockwise engages the HPF, and turning it counterclockwise engages the LPF. Because these filters are placed in the feedback loop, frequency cuts have an additive effect as the filter is applied during each successive repeat. From there, the signal enters the insert loop for processing with external effects. Finally, the signal reaches the effect level VCA of the mixer, where it is combined with the dry signal and routed to the output jack.

4.2 The LFO

The LFO is used to modulate the delay time. At its most basic, the LFO consists of a sine wave controlled by the Rate and Depth controls. Both controls have a wide range. Their tapers favor subtle settings, but you may get extreme pitch bending as well. The LFO secondary functions alter the shape and character of the waveform. The Shape control offers Sine, Square, and Triangle waveforms. Sine waves have a gentler transition at the extremes, which suits subtle sounds and classic vibrato sounds. Triangle waves are good for

[1]Pro tip: BBD distortion actually sounds terrible. If a delay pedal handles hot signals gracefully, it means that the designer incorporated a nice soft limiter somewhere in the signal chain!

[2]For more on this topic, look up Nyquist's Theorem. It is fundamental to understanding audio systems.

larger pitch bends or long, slow ramps. The Square wave setting can be used for rhythmic pitch jumps or wild, glitchy sounds.

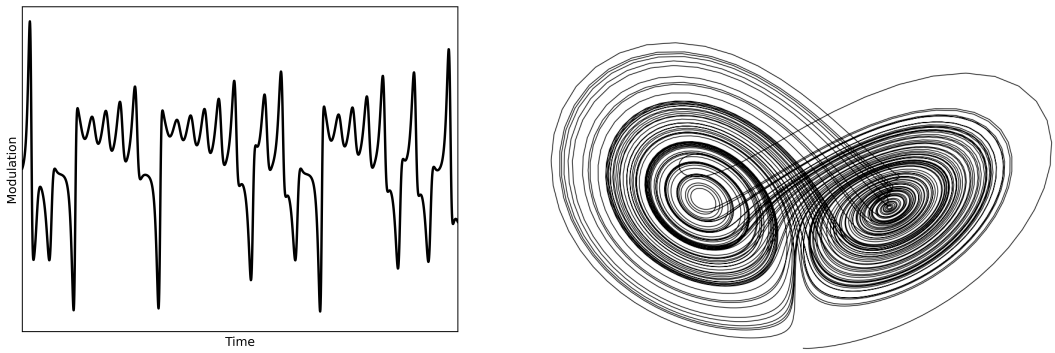


Figure 3: Chaos LFO (left) derived from a Lorenz attractor (right).

The Chaos function is the most unique element of the LFO. As it is turned up, a randomized waveform is blended in with the LFO until it becomes entirely random. This waveform is generated using a Lorenz system, which is a series of equations that generate a chaotic solution. The output of these equations has a smooth, random motion which never repeats. When plotted in 3D space, the equation forms a distinct shape called an “attractor,” which you can see in Figure 3. The path loops around two points, never quite taking the same path twice while also never going totally off the rails. This approach to random modulation is highly organic in its nature, reminiscent of old tape or other systems which are naturally random.

4.3 Insert Loop

The insert loop allows external effects to be patched into Sending’s feedback path. In this configuration each repeat can be passed through the loop successively, creating unique effects. Use a TRS to TS Y cable. The loop send is on the tip, and the loop return is on the ring. The loop output is attenuated by -6dB to preserve headroom when using standard effects pedals. Some examples:

- Use another delay pedal for multi-tap echoes.
- Add your favorite modulation, such as a phaser, to add a unique swirl to the delay repeats.
- Add a static or envelope-controlled filter to give the echoes an evolving quality.
- Use reverb or granular pedals to create soundscapes that have the warm filtering and overdrive of Sending’s analog processing.
- Use a splitter to send the delayed signal to a second amp for pseudo stereo effects.

Despite the loop attenuation, some effects pedals may still clip when using higher Color settings. Be sure to check your gain staging where possible.

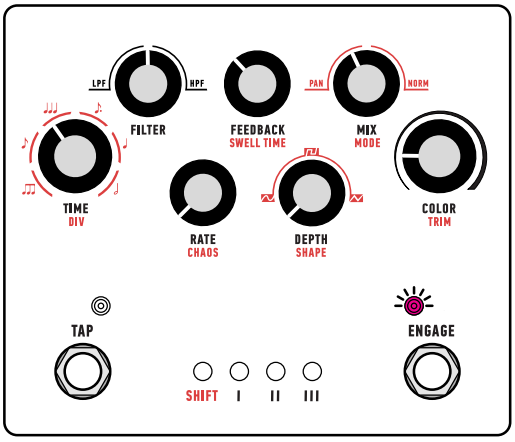
4.4 Presets

Sending stores 32 presets, including the "live" settings when no preset is recalled. Presets save all primary and secondary knob functions as well as the bypass mode, expression control, and any settings exclusively controlled via MIDI CC. The bypass state (engaged or bypass) is not saved, to allow for preset changes prior to activating the pedal. To save a preset, long press one of the preset buttons until it lights up. At any time, you may press that button again to recall the corresponding preset. The button will stay illuminated until settings have changed. If you adjust a control while a preset is active, the LED will blink to indicate it has been edited. In this mode you can change only the settings you want to edit, then long press to save again. If a preset is active and you press the button again, the pedal will return to the settings it had prior to the preset being recalled. Preset slots 4 to 31 may be accessed via MIDI program change messages. See Section 6 for more information.

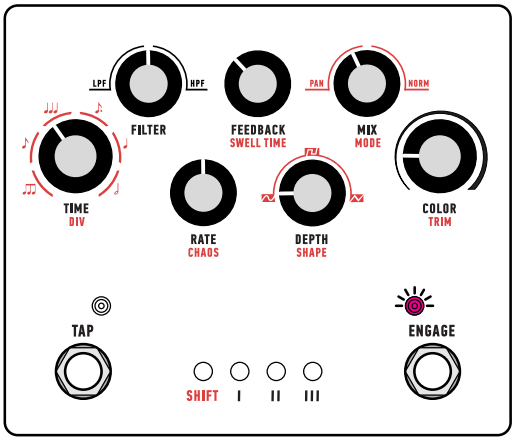
4.5 Expression/CV Control

The expression input can accommodate a physical expression controller (expression pedal, slider, etc) or a control voltage source generated by a pedal, synthesizer, or DAW. The Expression value may also be accessed as a MIDI CC value. This function can be used to dynamically morph between any two front panel settings, including primary and secondary controls. When an expression pedal or CV source is connected, this mode is enabled. First, move the expression controller to the minimum position (equivalent to a 0V control voltage) and adjust the front panel knobs to the desired settings. Then, move the expression controller to the maximum position (control voltage of 5V) and change any knob parameters you wish to control. Wait for one second to ensure the settings auto-save. Once set, moving the expression pedal or control voltage from minimum to maximum will change all associated parameters in tandem between these two points. Expression values can be saved as part of each preset. If you find yourself stuck, you can press Shift and then press the preset I button to clear expression values. Note that if tap tempo or MIDI clocking is active, the Time control cannot be ramped using the expression function.

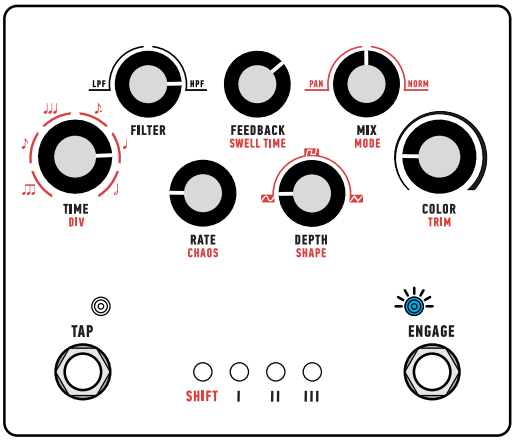
5 Suggested Settings



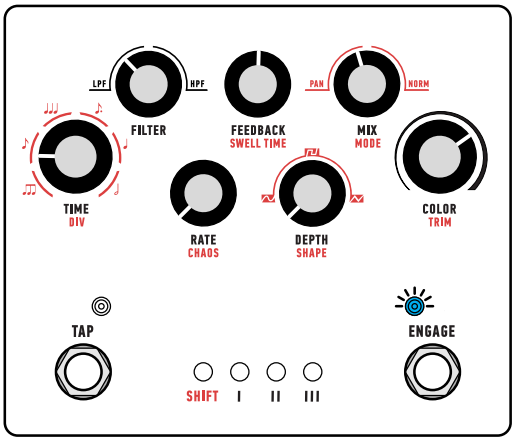
(a) **Basic delay.** A good starting point. Try tapping in different tempos and adjusting the Mix or Feedback knobs as desired.



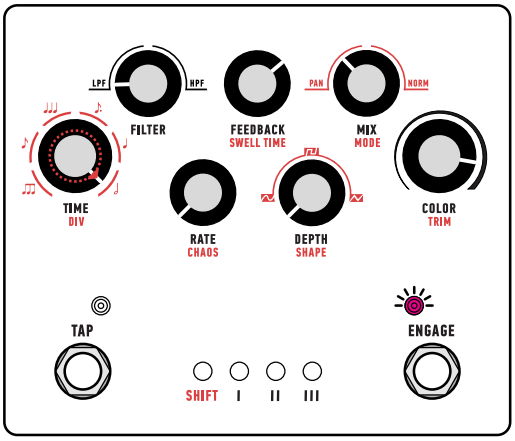
(b) **Basic w/ Mod:** Basic delay with subtle pitch modulation on the repeats for a chorused echo effect. Very classic.



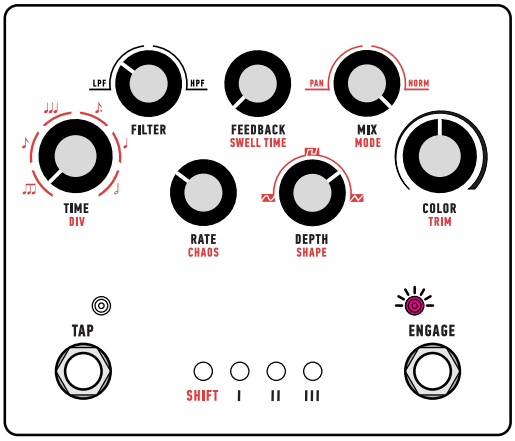
(c) **Floating Echoes:** Push the Time knob into a longer range and increase the Feedback for a floaty bed of echoes. By turning the Filter knob clockwise, each repeat gets successively brighter. Now you're free to tremolo pick over a weird street preacher sample.



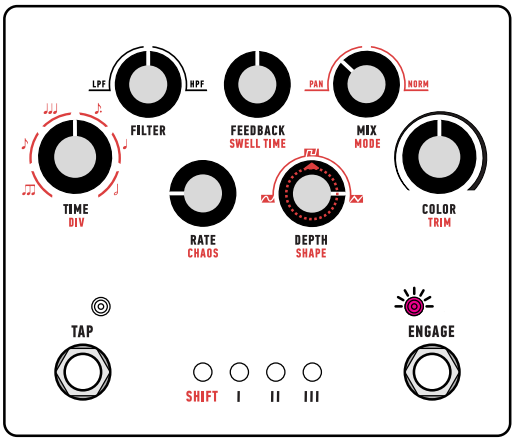
(d) **Preamp Time:** Set the delay for a shorter time and turn up the Color knob to hear the preamp in action. Adjust to best suit your guitar's pickups. If you set the bypass mode to Trails, the preamp does double duty as an always-on overdrive.



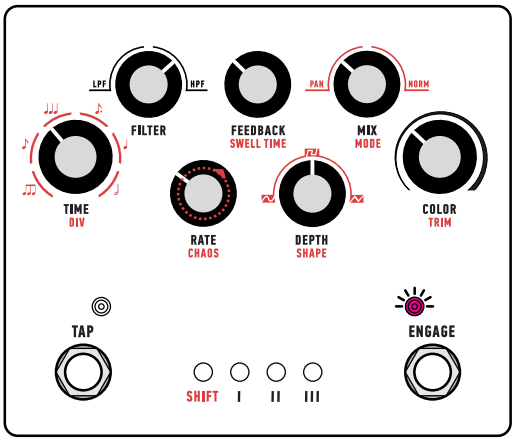
(e) **Crushed:** Push the time to its maximum and divide it by 2 using the half note tap division. The result is gorgeously aliased repeats that don't suffer from clock noise. Use Color to push the delay line extra hard, and Filter to roll off or accentuate the aliasing artifacts.



(f) **Vibrato:** At very short Time settings and with the Mix set to full wet, Sending produces a lush vibrato. Try adding extra grit via the Color knob to lean into the melted tape sound!



(g) **Square Wave:** Set the LFO to square wave mode and tune the Depth knob for rhythmic octave jumps. Try different ratios of Time and Rate to achieve different arpeggiated effects!



(h) **Chaos Mod:** Blend in some Chaos (Rate secondary function) to introduce organically moving modulation. Adjust the Rate and Depth controls to hear how the periodic and chaotic LFOs interact. Also sounds great at short Time settings with Mix at maximum, similar to the Vibrato setting.

6 MIDI

Sending has a complete MIDI implementation, enabling external control of every function within the pedal plus a couple of convenient utility functions.

6.1 Connectivity

Sending is designed to accept MIDI data through a 1/4" TRS patch cable. A standard TS patch cable will not work. If you are using a standard 5-pin DIN connector, any adapter conforming to the MIDI.org 2018 TRS standard. We recommend the Disaster Area Designs MJ-5P cable or a comparable product. If using 1/8" MIDI, all you need is a 1/4" to 1/8" TRS conversion plug.

Sending does not require a MIDI box, but can be used with one if you are combining it with other pedals. The pinout on Sending is typically referred to as "Tip Active." Please refer to the manual of your MIDI Box or MIDI controller for additional instructions. Due to inconsistencies in MIDI Box standards we cannot guarantee operation with every brand, but every one we have tried so far has worked.

6.2 CC Messages

Each front panel control, secondary parameter, and footswitch state is assigned a CC number. A couple bonus functions, like a clock divider and MIDI clock ignore, also have dedicated CC numbers. For a complete list of CC assignments, refer to Table 2 in Appendix A.

6.3 PC Messages

Sending a program change (PC) message selects that preset. The first three presets are accessible via the front panel, and MIDI enables the use of additional presets up to 31. To save settings to preset 4 and beyond, hold the Shift button for >2 seconds. The current front panel state will be saved to a channel corresponding to the next incoming PC message. Sending PC 0 will revert the pedal to the last state of the control panel. You can also save a preset by sending the desired PC number plus 64. For example, to execute a save to preset slot 4, you would send PC 68. This is easier for some controller setups.

6.4 MIDI Clock

If a MIDI clock is present, Sending will sync to that clock as long as the MIDI Clock Ignore CC is not active. The Tap LED will turn turquoise when the MIDI clock is present. Just like tap tempo, the MIDI clock will set the quarter note tempo. You may use the Tap Division secondary function to change the rhythmic intervall. When using the MIDI clock, tap tempo is disabled. If you turn the Time knob while a MIDI clock is active, you can momentarily disrupt the clock before it snaps back into place, which is extremely fun.

6.5 MIDI Channel

The default MIDI channel is 2. To assign the MIDI channel, hold down the Shift button during startup to enter Configuration Mode. Then, send a PC message on your desired channel. The pedal will automatically set itself to that channel. For more information on Configuration Mode refer to Section 7.

7 Configuration Mode

Configuration Mode is used for global utility functions as well as factory debugging. To enter Configuration Mode, apply power to Sending while holding down the Shift button. Keep it held until it begins to blink. It should remain blinking to indicate this mode is active. In Configuration Mode you may perform the following actions:

- **Set MIDI Channel:** Send a PC message on a desired MIDI channel, and the pedal will update automatically to that channel. This is a global setting saved in system memory.
- **Reset MIDI Channel:** Long press the I button to set the MIDI channel to the default (Channel 2).
- **Clear Presets:** Long press the II button to clear all presets from system memory. This is effectively a factory reset.
- **Debug Presets:** Short pressing the three preset buttons will activate presets used for debugging the signal path. If you are experiencing difficulties with your Sending unit these are a helpful reference. Preset 1 passes signal through the preamp only with Color at minimum, Preset 2 is the preamp only with Color at maximum, and Preset 3 passes signal through the delay line only with a fixed delay time. All controls are disabled in this mode.

To exit Configuration Mode, hold down the Shift button until it stops blinking.

8 Firmware Updates

Sending may be updated through the use of MIDI System Exclusive ("Sysex") messages and our portal at `electronicaudioexperiments.com`. All you need is a compatible MIDI cable and an audio interface with a MIDI output. As of firmware V1.0.0.0 (initial production release), this functionality is enabled. When firmware updates are released, we will provide instructions through the interface on our website. If you find any bugs please do not hesitate to reach out via our contact form.

A MIDI CC Assignments

CC	Parameter	Values
12	Color	0-127
13	Mix	0-127
14	Feedback	0-127
15	Filter	0-127
16	Rate	0-127
17	Amount	0-127
18	Time	0-127
20	Level Trim	0-127
21	Mix Mode	0-63 = crossfade, 64-127 = effect only
22	Ramp Time	0-127
24	Chaos	0-127
25	LFO Shape	0-42 = sine 43-85 = square 86-127 = triangle
26	Tap Divisions	0-22 = dotted eighth 23-44 = eighth 45-67 = quarter note triplet 68-89 = dotted eighth 90-111 = quarter note 112-127 = half note
27	Clock Divisor	0-63 = normal, 64-127 = half speed
89	MIDI Clock Ignore	0-63 = normal, 64-127 = ignore clock
93	Tap Tempo	Value > 63 is registered as a tap
97	Feedback Swell	Value > 63 activates feedback swell
100	Expression	0-127
102	Bypass	0-63 = bypass, 64-127 = active
103	Bypass Mode	0-63 = standard, 64-127 = bypass

Table 2: MIDI CC assignments.

Document Revision History

Revision	Changes
B	Added preset LED blink and exp clear functions for V1.0.0.0 firmware release. Small typo fixes.
A	Original Release