

DISCOVERY

Analog Delay



User Guide



GUITARS | AMPLIFIERS | PEDALS | PICKUPS

Table of Contents

Overview	5
Terminology	6
Signal	6
Dry signal.	6
Wet Signal	6
Repeats	6
Milliseconds (ms)	6
Beats Per Minute (BPM)	7
Modulation	7
MIDI	7
Overview Diagram.....	8
1. 7 Segment Display.	8
2. Preset/Select/Hold To Edit Buttons	8
3. Up & Down Buttons	8
4. Mix Knob	8
5. Lo Cut Knob	9
6. Hi Cut Knob:	9
7. Bypass LED	9
8. Bypass/Preset Down Switch:	9
9. Time Division LEDs	9
10. Division Button	9
11. Regen Knob	9
12. Time Knob.	10
13. Modulation Depth Knob	10
14. Modulation Waveform Display & Select Button	10
15. Modulation Speed Knob	10
16. Tempo LED.	10
17. Tap-Tempo Switch.	10

Inputs & Outputs	11
1. 18VDC Power Input	.11
2. External Switch (Stereo TRS 1/8").	.11
3. TAP External Switch (Mono TS 1/4").	.11
4. Output (Mono TS 1/4")	.12
5. Expression Pedal (Stereo TRS 1/4").	.12
6. Input (Mono TS 1/4").	.12
7. MIDI In (5 PIN DIN).	.12
8. MIDI Out/Thru (5 PIN DIN)	.12
Controls	13
Bypass Foot Switch.	.13
Tap Foot Switch	.13
Mix Knob	.14
Time Knob	.14
Regen Knob.	.15
Hi Cut Knob	.15
Lo Cut Knob	.15
Speed Knob.	.16
Depth Knob	.16
Waveforms Button	.16
Division Button	.16
Preset Select (Edit Save).	.17
Up & Down Arrow Buttons.	.17
Presets	19
Selecting a Preset.	.19
Editing / Saving Presets	.19
Mapping Expression pedal	.20
Erasing presets	.21
Factory Reset of all Presets	.21
Live Preset Mode (Bypass / Tap)	.22

MIDI	23
Changing MIDI Channel:	23
Changing Presets With Program Changes (PC#s)	23
Changing Knob Settings With Control Changes (CC#s)	24
Setting MIDI Out/Thru Modes.	24
Accepting/Denying CC#s	26
Sending Patch Changes	27
Sending Patch Changes and Controller Change data	27
MIDI time sync	27
MIDI Sysex dump & load of memory	28
MIDI Table	28
Global Settings	30
Editing Global Settings	30
True Bypass - Buffer Bypass mode	30
MIDI Channel:	30
MIDI Sync	31
MIDI CC accept	31
MIDI Out/Thru modes	31
External Switch functions.	32
Dry On/Off.	32
Sysex Dump/Send	32
Example Settings	33
Usage Cases	34
Discovery Analog Delay > Front of Amp	34
Discovery Analog Delay > Effects Loop of Amp	35
MIDI Switching from External Device	36
Technical Specifications.	37
Warranty	38
FCC Compliance	39

Overview

The long-standing mission of Suhr has been to bring the simplicity and tone of analog circuitry to today's guitarists. The Suhr Discovery Analog Delay is the new revolutionary pedal, designed by Kevin Suhr. The Discovery Analog Delay is the first of its kind, for Suhr and the world.

Retaining the tone, vibe, and creative inspiration of iconic analog delay units, yet adding the versatility of the most modern and expandable delay pedals available today.

The finest analog delay packed with 127 savable preset spaces, Tap Tempo, High/Low-cut, with every parameter mappable to an expression pedal per preset, MIDI ins and outs, and every parameter you could ask for. That's just the beginning.

The Suhr Discovery Analog Delay is a product that has been years in the making. We took our time with this one to make it as perfect as we could in the smallest package, full of features that include a few no other analog delay has.

We knew we wanted an amazing bucket brigade style analog delay. We also knew that having only one setting was not enough for the endless amounts of sounds that could be achieved. That is why we allowed you to save up to 127 presets, recallable via MIDI. All knobs are programmable for each preset, and can also be controlled individually via MIDI. We didn't stop there. We allowed you to program the expression pedal differently for every preset to control every knob in any direction desired. We didn't stop there. We allowed you to dump all your presets to a MIDI Sysex file for backup on a computer. You can even transfer presets between units.

Terminology

Here is a list of a few common terms used in this manual. Please familiarize yourself with the terms you do not already know. Understanding these terms will better help you understand how to use the Discovery Delay, or any delay for that matter.

Signal

A signal in this text refers to an audio signal, which is a representation of sound in the form of changing level of electrical voltage. Such a signal can come from your guitar pickups, through your guitar cable and into the Discovery. It may also come from previous effect, or from your amplifiers effects send.

Dry signal

The Dry signal refers to your unaffected guitar signal, or whatever signal that has been connected to the input of the Discovery. This has no delay effect on it. When the pedal is bypassed, all you are hearing is the dry signal.

Wet Signal

The Wet signal refers to the delay effect itself only without any dry signal. A delay makes a copy of your dry signal, and plays it a certain amount of time later, which creates the wet signal. The Dry and Wet signals are then mixed to form the final output signal.

Repeats

Repeats is a term used among users of Delay effects that refers to the actual repeated dry signal that make up the wet signal. The wet signal is a repeated copy of the dry signal that feedbacks into itself and keeps repeating what you play into it. Repeats are also commonly referred to as “echoes”

Milliseconds (ms)

A millisecond is 1/1000 of a second. Milliseconds are abbreviated as “ms”. Thus, it takes 1000 ms to make up 1 whole second.

Beats Per Minute (BPM)

‘Beats Per Minute’ refers to the tempo (speed) of a piece of music. A beat refers to a quarter note in a measure, so 4 beats would equal 1 measure. 120 BPM would equate to 120 quarter notes in a minute if only quarter notes were played for a whole minute.

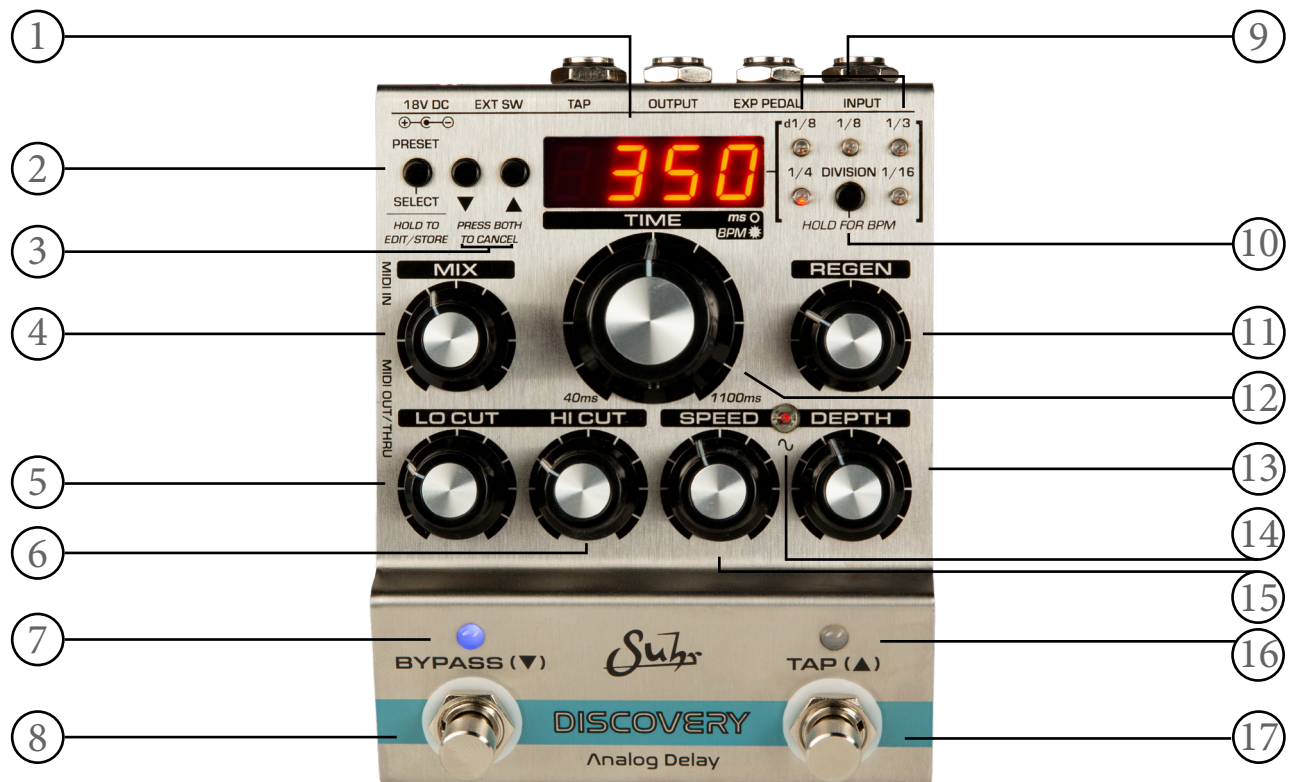
Modulation

To modulate is to continually change the value of a parameter. In the case of this delay, the parameter that is being continually altered is the delay time. The delay time is “wiggled” a certain amount of time before and after the center time, causing a change in pitch in the wet signal. The amount of wiggle is determined by the Speed and Depth controls. When this changing pitch on the wet signal is mixed with the dry signal, the result is a chorus type effect, which sounds like multiple voices are being played at once.

MIDI

MIDI is an abbreviation for Musical Instrument Digital Interface. This is a standard of digital communication between musical instrument devices that was developed in the 1980’s in collaboration with a few music manufacturers. Today, it is the leading communication protocol between musical instruments. MIDI allows you to change presets and control knob positions on the Discovery from any device that can send MIDI information.

Overview Diagram



1. 7 Segment Display

The display shows multiple information from milliseconds of the delay time (ms), to the BPM (by holding the division switch), to the preset number and global menu navigation.

2. Preset/Select/Hold To Edit Buttons

This switch allows you to access and save your presets as well navigate global settings.

3. Up & Down Buttons

These can be used to increment or decrement what you see on the display, whether that be the BPM, ms, or the options in the startup menu.

4. Mix Knob

The mix is 100% dry (no effect) when counterclockwise. When fully clockwise, it is 100% wet (only effect). When in the center, it is the 100% dry and 100% wet signals.

5. Lo Cut Knob

The low cut reduces bass from the delayed signal only. Fully counter-clockwise is no low (bass) cut. Full clockwise results in maximum low cut.

6. Hi Cut Knob:

The high cut reduces high frequencies from the delayed signal. Fully counter-clockwise is the brightest and clearest tone (no high-cut), clockwise will be the darkest.

7. Bypass LED

Turns on when the pedal effect is on and off when the pedal is in bypass mode.

8. Bypass/Preset Down Switch:

The bypass switch engages or disengages the effect. Factory default is true bypass mode. (Refer to manual to switch between true or buffered bypass mode.)

9. Time Division LEDs

Indicates which of the 5 time divisions are selected. 1/4 - Quarter Note, d1/8 - Dotted Eighth-Note, 1/8 - Eighth-Note, 1/3 - Triplet and 1/16 - Sixteenth-Note.

10. Division Button

The Division button selects one of the 5 divisions. Holding the division button will toggle the display to show milliseconds (ms) or BPM of the delay time. A dot in the bottom right corner of the display denotes BPM.

11. Regen Knob

The Regen controls how long your delay echoes last for. Full clockwise position will result in continuous oscillations.

12. Time Knob

The time knob can be used to alter the milliseconds (in 5ms increments) or BPM (range 55-250BPM), depending on which is shown on the display. The range in milliseconds accessed by the knob is 40ms - 1100ms. You can manually adjust millisecond/BPM times (in 1ms increments) with the [▲] and [▼] buttons to get specific delay times.

13. Modulation Depth Knob

The depth knob controls how intense the modulation of the delay is.

14. Modulation Waveform Display & Select Button

This button selects one of the 3 waveforms (Triangle, Sine, and Square) to modulate the delay time with.

15. Modulation Speed Knob

The speed knob controls the speed of a LFO (low frequency oscillator), which controls the delay time around the center of what is displayed on the display. This results in a chorus-type effect.

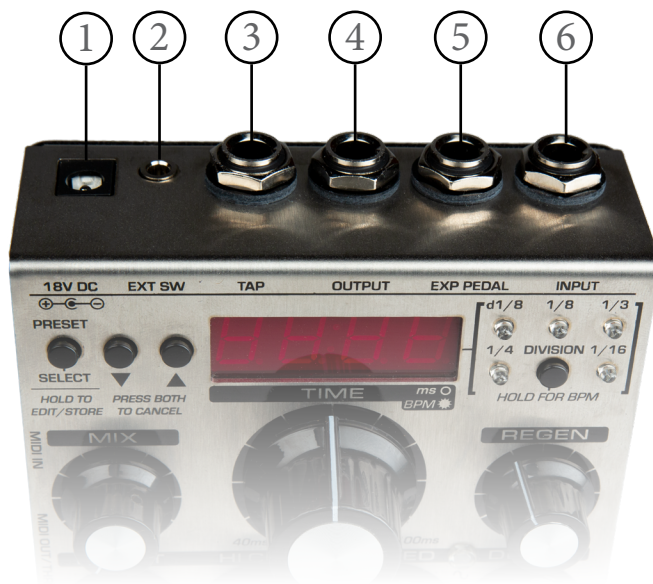
16. Tempo LED

This LED flashes at the tempo of the delay time (Milliseconds).

17. Tap-Tempo Switch

Tap more than once to set the quarter-note delay time.

Inputs & Outputs



1. 18VDC Power Input

The Discovery Analog Delay requires an 18V, center negative power supply with 250mA of available current. For more details, refer to the technical specifications on [page 37](#).

2. External Switch (Stereo TRS 1/8")

The External Switch allows you to plug in a TRS 1/8" (3.5mm) cable to connect a momentary dual foot switch to control the pedal in one of 3 modes.

It can be used to change presets, jump across presets, externally control the bypass and tap switches, and send MIDI program changes.

For more details about the different modes for the external switch and how to set it up, refer to [page 32](#).

3. TAP External Switch (Mono TS 1/4")

The TAP jack takes a momentary foot switch to externally control the delay time tap tempo.

4. Output (Mono TS 1/4")

Plug the output of the effect to the next device.

5. Expression Pedal (Stereo TRS 1/4")

The expression pedal input allows you to connect a low impedance 10K ohm expression pedal to control all the knobs per preset. For details on how to use the mapping process for the expression pedal, refer to [page 20](#).

6. Input (Mono TS 1/4")

The input should be connected to your guitar, the previous effects output, or the effects send of an amplifier or mixer.

7. MIDI In (5 PIN DIN)

The MIDI IN uses the standard DIN 5 connection for MIDI communication. Uses for this are changing presets, syncing delay time to MIDI clock, and controlling all parameters. Refer to the MIDI section in this manual for more information

8. MIDI Out/Thru (5 PIN DIN)

The MIDI OUT/THRU jack is used to pass MIDI communication from the MIDI IN jack to the next device. Depending on the global settings, this output can be set as a hardware through for ultra low latency when no MIDI information is to be generated from the Discovery itself. When set as an output, the Discovery delay can send its own messages such as Program changes and Controller changes. This can be used to control other pedals. For more information, refer to the MIDI section on [page 23](#).

Controls

Bypass Foot Switch

The bypass switch has a few functions

1. To bypass (turn off) the effect
2. To jump to a lower adjacent preset when in “Preset Mode”
3. To select a preset when using an external 2 button foot switch in the EXT SW jack

The Discovery delay has the option to bypass the effect in two ways...

True Bypass (input is physically connected to output, completely taking all circuitry out of the signal path. This will cut off any echoing repeats).

Buffer Bypass (the input to the delay path is disconnected, leaving the delays to “Trail” until they decay and leaving the guitar without the effect).

Refer to the global settings section to select whether the bypass is in True or Buffer bypass modes.

Tap Foot Switch

The tap tempo switch will count the amount of time between switch presses and set the delay time to that time when division is set to Quarter Note.

How it Works:

The Discovery utilizes an averaging algorithm that will average the last 4 successive taps, and drop the oldest tap after 4. If not pressed for longer than 1.5 seconds, the tap averaging restarts.

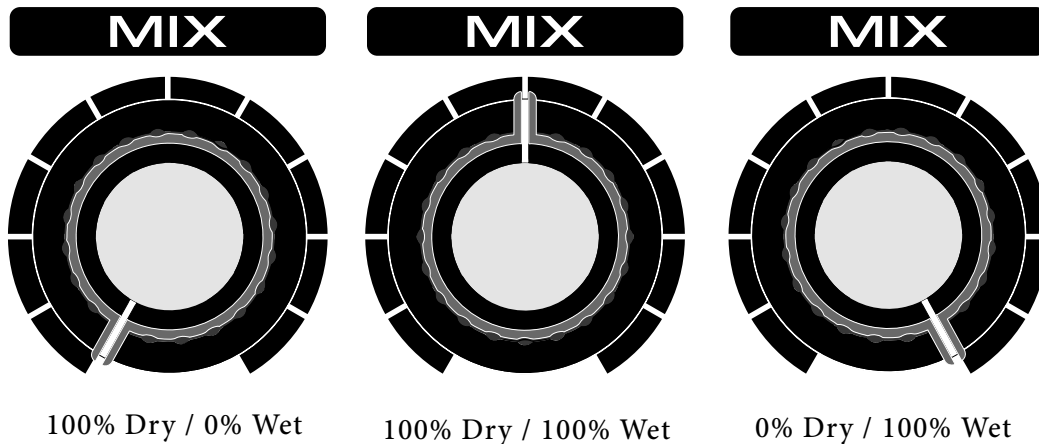
Going into “Preset Mode”:

Holding down the Tap switch for 1.1 seconds will put the pedal into “**Preset Mode**”, in which the Bypass and Tap switches take on new functions of decrementing and incrementing which preset you are on. This allows you to easily change presets with your feet.

Mix Knob

The [MIX] knob mixes in (or out) the delay effect. It also mixes in or out your guitar signal.

Example Mix Settings:



From full counter clockwise to the middle, the knob is mixing the wet delay effect from 0-100%

From middle to full clockwise, the wet delay effect stays 100%, while your dry guitar signal fades out from 100% to 0% (at full clockwise).

When the mix knob is 50% on (half way), it is 100% dry + 100% wet

Time Knob

The [TIME] knob can be used to:

1. Alter the milliseconds (40-1100ms in 5ms increments)
2. Alter the BPM (range from 55-250BPM)

depending on which is shown on the display.

The arrow buttons can also be used to push the delay beyond these limits, or increment by singular millisecond or BPM values.

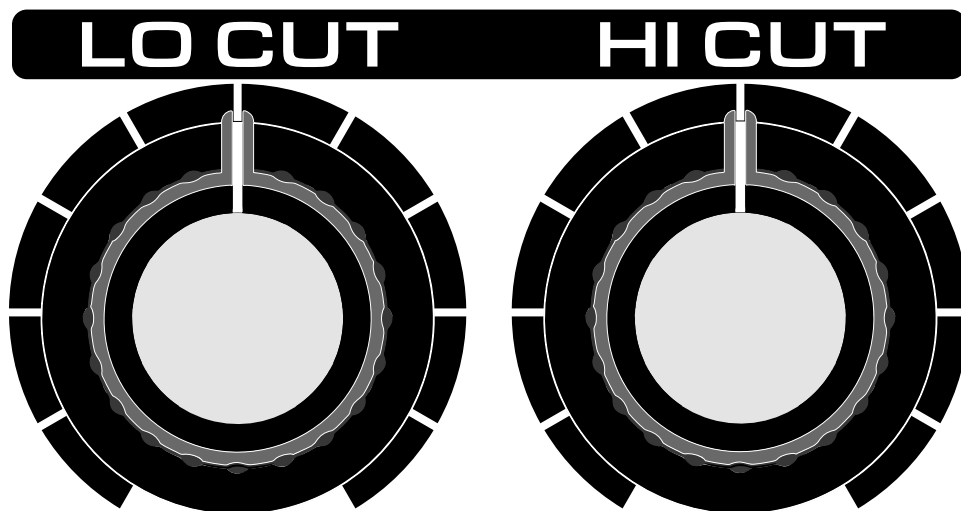
Regen Knob

The [REGEN] knob sets the amount of feedback off the delay back to its internal input mixer. This controls how long the delay repeats last until they decay away.

Due to the internal limiter in the regen circuit, maxed out regen settings allow for distorted self oscillations and sound effects.

Hi Cut Knob

The high cut reduces high frequencies from the delayed signal, giving you a “darker” sound commonly associated with bucket brigade analog delay pedals.



Fully counter-clockwise is the brightest and clearest tone. For the classic warm vintage style analog delay tones, set the knob past half way. The high cut knob also helps reduce noise and should be experimented with when running into the front of an amp or gain stage for desired tone/noise.

For the clearest low noise delay effect, place the Discovery in the effects loop of your amplifier and keep the hi cut knob fully counter clockwise.

Lo Cut Knob

The [LO CUT] reduces bass from the delayed signal only. This is helpful to echo the frequency ranges that you want to and prevent extra bass from muddying up your

tone. A full counter-clockwise position results in no low cut. Full clockwise results in maximum low cut.

Speed Knob

The [SPEED] knob controls the speed of a LFO (low frequency oscillator), which controls the delay time around the center of what is displayed on the display. Changing the delay time automatically like this causes an audible pitch bend in the delayed signal, causing a chorusing effect. This is commonly known as “modulated delay”.

Depth Knob

The [DEPTH] knob controls how intense the modulation of the delay is. With full clockwise positions, you will notice audible pitch bending on the delayed signal. At full counter-clockwise positions, there is no modulation.

Waveforms Button

The [~] button selects one of the 3 waveforms

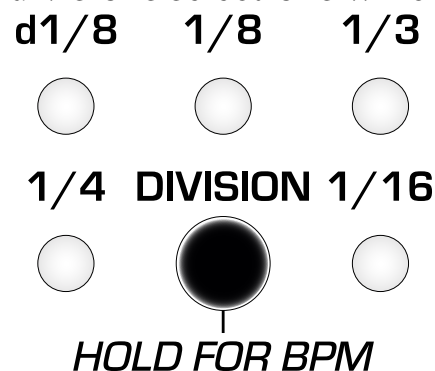
1. Triangle
2. Sine
3. Square

to modulate the delay time with. The LED also pulses to indicate both speed and depth of the modulation. The brighter the LED range, the larger the depth and intense the modulation effect.

Division Button

The [DIVISION] button selects one of the 5 divisions selections which is indicated by the 5 LEDs in the division section

1. Quarter note [1/4]
2. Dotted Eighth note [d1/8]
3. Eighth note [1/8]
4. Triplet note [1/3]
5. Sixteenth note [1/16]



Holding the division button will toggle the display to show milliseconds (ms) or BPM of the delay time. A dot in the bottom right corner of the display indicates you are looking at the BPM.



Preset Select (Edit Save)

The [PRESET SELECT] button has multiple functions.

This switch allows you to access your presets. The first time you press it, you will see **PEdL** on the screen, which is a manual mode. No settings are recalled in this mode. It's simple, the position you set the knobs is what you will hear .

Pressing [▲] will access presets 1 - 127. Using the [▲] and [▼] buttons, you can jump to another preset by pressing the [PRESET SELECT] button. Pressing the [PRESET SELECT] button again will jump back to the ms/BPM view on the display. Editing: Holding the [PRESET SELECT] button down will bring the word **Edit** to the screen. The screen will blink and you can change all the settings of the delay in preparation for saving. Once the desired settings are dialed in, pressing the [PRESET SELECT] button will prompt the display to show **Store to** . Now choose the Preset slot to save in. One last press of the [PRESET SELECT] button will store those settings in that preset location.

Up & Down Arrow Buttons

The [▲] and [▼] buttons are used for incrementing or decrementing whatever is shown on the display. It is also used for navigating which presets to recall, and for navigating the global settings menu.

Tip:

Holding the arrow buttons will cause it to continuously burst to ramp through settings quickly without having to continuously push them.

<i>Button</i>	<i>Milliseconds</i>	<i>BPM</i>	<i>Presets</i>
[▲]	add 1 ms.	Add 1 BPM	Increase 1 preset
[▼]	subtract 1 ms.	Subtract 1 BPM	Decrease 1 preset

Presets

Selecting a Preset

The [PRESET SELECT] button is used to look at what preset you are on and for selecting a preset when moving to a new one.

1. Press [PRESET SELECT].
2. Use [▲] and [▼] buttons to jump to a new location. The display will blink, indicating the new preset has not been selected yet.
3. Press [PRESET SELECT] to select new location.
4. Press [PRESET SELECT] to view delay time on the display.

Editing / Saving Presets

Creating a new preset or Editing a current preset is the same process.

1. Select the preset you want to edit.

PEDL is a good place to start for a fresh preset (the settings you currently see on the pedal will be what you hear).

2. Hold the [PRESET SELECT] button for half a second.

The display will show EDIT on the screen, followed by displaying the preset you are editing, then the display will start to blink, indicating you are editing.



3. Set the knobs to your desired settings. For expression pedal editing, refer to bottom of this page.
4. Press [PRESET SELECT] button again. The display will read **Store Lo** and show a preset location while blinking.
5. Use the [▲] and [▼] arrow buttons to select which location you want to store to.
6. Press the [PRESET SELECT] button one more time.
7. This display will show **Stored** after saving is complete.

Mapping Expression pedal

Requirement: *A low resistance 10K ohm expression pedal should be used. If the expression pedal has a limit knob, set it so the expression pedal is working with its full range.*

1. Edit a preset by holding down the [PRESET SELECT] button.
2. Once editing a preset and the display is blinking, tilt the expression pedal completely to the top (toe) or bottom (heel) position.
3. When in the top/bottom position, you should see a dot in the center of the display indicating you are in the right area. Set your controls as desired for this position.



4. Tilt the expression pedal completely to the opposite direction, and repeat step 3.



5. Tilt the expression back and forth while playing to determine if the desired mapping is correct.

6. Once mapping is as desired, press the [PRESET SELECT] to store.
7. Use the [▲] [▼] buttons to select a new location, then [PRESET SELECT] to complete the save.

Notes:

1. When creating a new preset with expression pedal mapping, it's easiest to begin in **PEDL** mode, with your desired starting settings already dialed in. Then enter **Edit** mode and continue mapping your expression range. When entering **Edit** mode, the top and bottom positions of the expression pedal are mapped to what the knob settings were before editing.
2. Divisions settings are global through the whole sweep of the expression mapping and can not be changed with the expression pedal.
3. You can manually adjust millisecond/BPM times with the [▲] and [▼] buttons to get specific delay times in the top/bottom positions.
4. When changing delay times, it is normal for the pitch to change due to the bucket brigade technology.
5. If you find yourself in “Edit Mode” accidentally and wish to exit that mode, press the [▲] and [▼] buttons simultaneously to act as a “Cancel” and you will exit “Edit Mode”.

Erasing presets

1. Press the [PRESET SELECT] button.
2. If not on the Preset you want to erase, use the [▲] and [▼] buttons to select a new preset, then [Preset Select] to select it.
3. Hold [BYPASS] foot switch while pressing [PRESET SELECT].

4. **ErSE** will temporarily show on the display. Once finished, the preset is erased.

Factory Reset of all Presets

1. With the pedal power disconnected, hold down [TAP] [WAVEFORM ~] and [DIVISION] buttons simultaneously .
2. Plug in power while keeping those buttons held.
3. **ErSE** will display on the screen, erasing all presets and global settings.

Live Preset Mode (Bypass / Tap)

1. Hold the [TAP] foot switch for 1.1 seconds until Discovery displays the preset you are on (for example, **P. 01**).
2. Use the [TAP] switch to increment the preset by 1 and the [BYPASS] switch to decrement the preset by 1.
3. To revert back to view the delay time on the display and reverting the foot switches to the normal functions, hold the [TAP] switch for half a second.

MIDI

Changing MIDI Channel:

1. Power on the unit while holding the [PRESET SELECT] button.
2. Press the [▼] button until you see **2 Ch**.
3. Use the [▲] and [▼] buttons to select the channel.
4. Press the [PRESET SELECT] button to select the channel.
5. When complete, you will see **2 Ch** on the menu again. Scroll down with [▼] until you see **done**.
6. Press [PRESET SELECT] to finishing editing the global settings.

Changing Presets With Program Changes (PC#s)

Discovery's presets can be changed via Program Changes coming from any MIDI device, being that a MIDI switcher or DAW, or really anything that can send a Program Changes via a 5-pin MIDI cable.

1. Be sure the Discovery and your MIDI device are transmitting on the same MIDI channel. For directions on changing Discovery's MIDI Channel, please refer to the instructions in the section above.
2. Connect the MIDI OUT from your MIDI device via 5-pin MIDI cable to the [MIDI IN] of your Discovery.
3. Send Program Changes from your MIDI device to change the presets of your Discovery. For a MIDI table with PC#s and corresponding a Discovery presets, refer to [page 28](#).

Changing Knob Settings With Control Changes (CC#s)

Every knob and parameter on Discovery can be controlled with Control Changes (CC#s) being sent from any MIDI device. For a MIDI Table containing the Control Change numbers and corresponding functions, please refer to [page 29](#). To set Discovery to ignore Controller Changes, refer to [page 31](#).

- 1.** Be sure the Discovery and your MIDI device are transmitting on the same MIDI channel. For directions on changing Discovery's MIDI Channel, please refer to [page 23](#).
- 2.** Send Control Change numbers (CC#s) and a value ranging from 0-127 to control the desired knob. For a MIDI table with CC#s and corresponding functions, refer to [page 29](#).

Setting MIDI Out/Thru Modes

Discovery has a few modes for the MIDI OUT/THRU jack. On factory settings, THRU is set to pass data from the MIDI IN jack.

Four different OUT modes progressively send more and more data from the Discovery to control other devices and Discovery pedals.

THRU

The MIDI OUT/THRU jack sends a hardware buffered copy of the MIDI IN to the OUT. This is the lowest possibly latency and is recommended when Discovery is not sending its own MIDI data.

OUT

The MIDI OUT/THRU jack will

- 1.** Pass MIDI data from INPUT to OUT
- 2.** Send PC (Patch Change) data when selecting new presets

OUT2

The MIDI OUT/THRU jack will send

- 1.** Pass MIDI data from INPUT to OUT.
- 2.** Send PC (Patch Change) data when selecting new presets.
- 3.** Send CC (Control Change) data for
 - Tap Tempo
 - Expression Pedal

OUT3

The MIDI OUT/THRU jack will send

- 1.** Pass MIDI data from INPUT to OUT
- 2.** Send PC (Patch Change) data when selecting new presets
- 3.** Send CC (Control Change) data for
 - Tap Tempo
 - Expression Pedal
 - Seven Segment Display View
 - Bypass

OUT4

The MIDI OUT/THRU jack will send

- 1.** Pass MIDI data from INPUT to OUT
- 2.** Send PC (Patch Change) data when selecting new presets
- 3.** Sends CC (Controller Change) data for
 - Tap Tempo
 - Expression Pedal
 - Seven Segment Display View
 - Bypass
 - All Knobs
 - Up and Down arrow buttons
 - Division Button
 - Waveform Button

Setting the mode

1. Power on the unit while holding the [PRESET SELECT] button.
2. Press the [▼] button until you see **50ut**.
3. Use the [▲] and [▼] buttons to select the mode.
4. Press the [PRESET SELECT] button to save the mode.
5. When complete, you will see **50ut** on the menu again. Scroll down with [▼] until you see **done**.
6. Press [PRESET SELECT] to finishing editing the global settings.

Accepting/Denying CC#s

The Discovery can reject incoming CC data if desired. This is done in the Global Settings.

1. Power on the unit while holding the [PRESET SELECT] button.
2. Press the [▼] button until you see **4 CC**.
3. Use the [▲] and [▼] buttons to select the mode.
 - “On”: Discovery will accept MIDI CC
 - “OFF”: Discovery will not accept MIDI CC
4. Press the [PRESET SELECT] button to save the mode
5. When complete, you will see **4 CC** on the menu again. Scroll down with [▼] until you see **done**.
6. Press [PRESET SELECT] to finishing editing the global settings

Sending Patch Changes

The Discovery can send patch changes whenever its preset has changed. This can be done using the [PRESET SELECT] button to select a new preset. It can also be done with your feed in “Preset Mode” by holding the [TAP] switch and using [BYPASS] and [TAP] to change presets.

In order to send patch changes, the global settings for the MIDI OUT/THRU jack must be set to one of the OUT modes. For more information on setting MIDI Out/Thru modes, refer to [page 31](#).

Sending Patch Changes and Controller Change data

Along with sending patch changes (As described in Sending Patch Changes), Discovery can send CC (Controller Change) data.

To achieve this, the global settings for the MIDI OUT/THRU jack must be set to one of the OUT modes (OUT2, OUT3, or OUT4). For more information on setting MIDI Out/Thru modes, refer to [page 31](#).

MIDI time sync

Discovery can be synced to a MIDI clock source, such as a computer, drum machine, guitar MIDI foot switcher etc.

In order to sync, the global setting **35nc** must be set to **0n** or **0n2**.

For more information on editing Global Settings, refer to [page 31](#).

Note:

When MIDI sync is enabled, switching to presets will not recall the saved delay time. When using devices with less stable clock timing than others, **0n2** allows for a more stable sync but takes longer (2 quarter notes) compared to the **0n** (1 eighth note) to match tempo if the tempo is changing.

MIDI Sysex dump & load of memory

Discovery has the ability to store all preset data as a MIDI Sysex (System Exclusive) file. It can even send all preset data directly to an other Discovery unit via a MIDI cable.

To Send and Receive the Sysex data, you must enter the global settings and scroll to **8545**. For more information regarding editing Global Settings, refer to [page 31](#).

Selecting **SEnd** will immediately begin transmitting all preset data to the receiving device.

Selecting **LOAD** will display four dots on the display. Once data is being received from the MIDI IN jack, a counter on the display will count up to 100, then the display will show **done** when complete.

MIDI Table

PROGRAM CHANGES (PC#)			
PC# (Decimal)		FUNCTION	
0		Preset 1	
1		Preset 2	
2		Preset 3	
3		Preset 4	
4		Preset 5	
5		Preset 6	
6		Preset 7	
7		Preset 8	
8		Preset 9	
...		...	
122		Preset 123	
123		Preset 124	
124		Preset 125	
125		Preset 126	
126		Preset 127	
127		Manual Mode (PEDL) [*Un-Writable Location]	

CONTROLLER CHANGES (CC#s)			
CC# (Decimal)	CC# (Hexadecimal)	VALUE RANGE	FUNCTION
14	0x0E	0-127	MIX
9	0x09	0-127	REGEN
3	0x03	0-127	TIME
MODULATION			
17	0x11	0-127	SPEED
18	0x12	0-127	DEPTH
21	0x15	0	TRIANGLE
		1	SINE
		2	SQUARE
FILTERS			
15	0x0F	0-127	HI CUT
16	0x10	0-127	LO CUT
DIVISIONS			
20	0x14	0 - 25	QUARTER NOTE
		26-50	DOTTED EIGHTH NOTE
		51 - 75	EIGHTH NOTE
		76 - 100	TRIPLET
		101 - 127	SIXTEENTH NOTE
MIDI SYNC			
63	0x3F	0	MIDI SYNC OFF
		1	MIDI SYNC ON (Quicker)
		2	MIDI SYNC ON 2 (Slower + More Stable)
FOOT SWITCHES			
102	0x66	0	BYPASS (Pedal Off)
		1-127	BYPASS (Pedal On)
81	0x51	Any Value	TAP TEMPO (Sends 1 Tap)
EXPRESSION PEDAL			
100	0x64	0-127	EXPRESSION
PEDAL BUTTONS			
52	0x34	Any Value	UP ARROW
53	0x35	Any Value	DOWN ARROW
54	0x36	Any Value	PRESET DOWN
55	0x37	Any Value	PRESET UP
56	0x38	0	DISPLAY MILLISECONDS
		1	DISPLAY BPM
		2	DISPLAY PROGRAM
57	0x39		PRESET SELECT BUTTON

Global Settings

Editing Global Settings

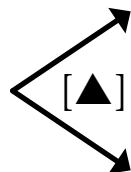
1. If the pedal is powered on, disconnect the power and wait at least 3 seconds

Note:

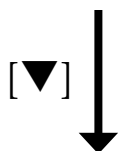
In rare instances, unplugging the power cable and replugging it too quickly can stress the regulators and cause them to pull extra current and may risk damaging your unit. Please wait at least 3 seconds before plugging it back in to prevent this.

2. Hold the [PRESET SELECT] button and power on the unit.
3. You will now enter a numbered list of global settings. Use the [▲] and [▼] buttons to scroll through the settings. Use the [PRESET SELECT] button to select a setting.
4. Once a setting has been selected, you will return to the main numbered list. When finished editing settings, scroll to the bottom of the list with [▼] until **done** is displayed. Preset [PRESET SELECT] to finish altering the settings and start the pedal.

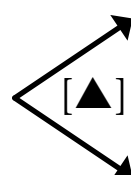
1. Bypass Mode:



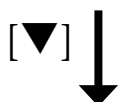
Choose between 'True' bypass and 'Buffered' bypass modes. When in 'true' bypass mode, the signal will go directly from the pedal's input to its output without passing through the pedal's effect circuitry.



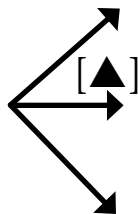
2. MIDI Channel:



Set the MIDI channel you want your Discovery Delay to communicate on, 1-16. The default is MIDI channel 1.



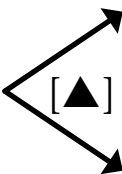
3. MIDI Sync:



Discovery Delay can be used as a MIDI clock to sync multiple MIDI devices. To enable this feature, select **00.0n** or **0n.2**.

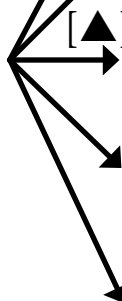
When using devices with less stable clock timing than others, **0n.2** allows for a more stable sync but takes longer (2 Quarter notes) to match tempo if the tempo is changing.

4. CC Accept:



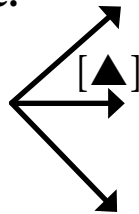
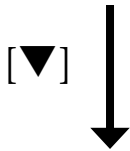
Allows you to set the Discovery Delay to reject incoming CC data.

5. MIDI Thru/Out:



Allows you to choose the various Four different MIDI OUT modes which progressively send more and more data from the Discovery to control other devices and Discovery pedals. Please refer to [page 24](#) for a description of each output mode.

6. Ext. Switch Mode:

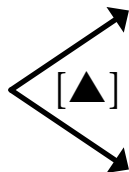
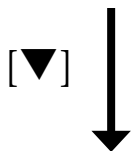


External Switch Mode-

When using a Momentary TRS foot switch: BYTP- 'Bypass Tap' means Tip will control bypass and the ring with control tap tempo. PrSt 'Instant Preset Mode', pushing the Tip with instantly go to the previous preset, pushing the ring will instantly go to the next preset.

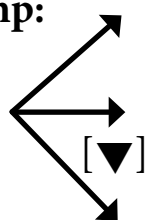
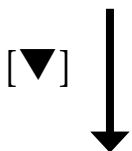
PrS2 - 'Jump Preset Mode' Ring increments to the next preset. The Tip will decrement the preset to one lower. Hitting the Bypass Switch will select the preset you choose.

7. Dry On/Off:



Allows the Dry signal to be turned off. For use in studio applications, when being used in a bus where the 'Dry' signal is not needed.

8. Sysex Load/Dump:



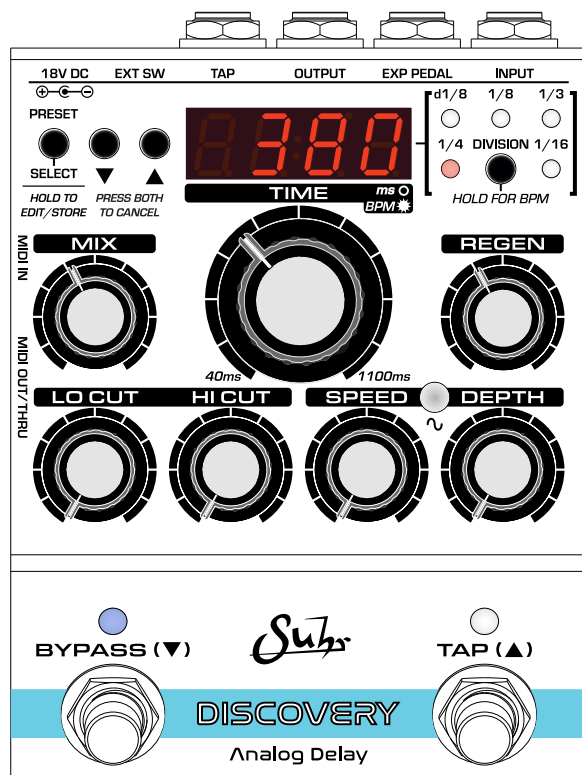
Discovery has the ability to store all preset data as a MIDI Sysex (System Exclusive) file. It can even send all preset data directly to an other Discovery unit via a MIDI cable.

To Send and Receive the Sysex data, Refer to [page 27](#) for details.

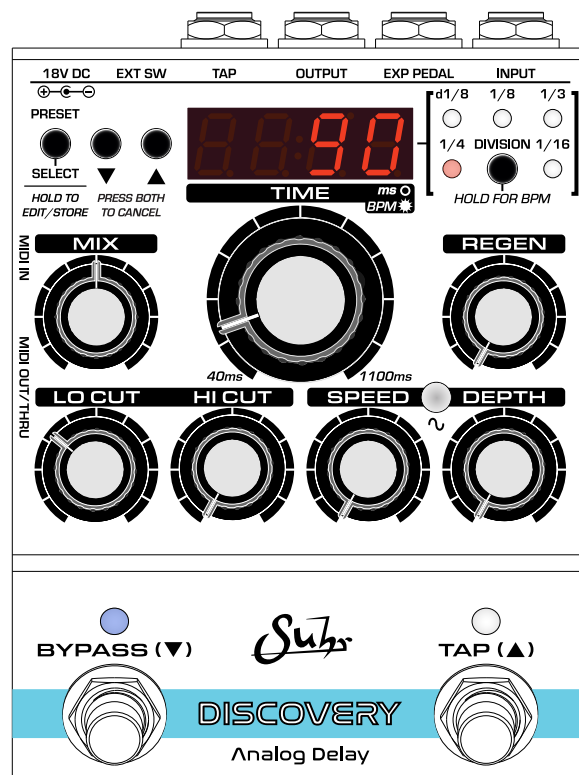
9. Done/Exit:



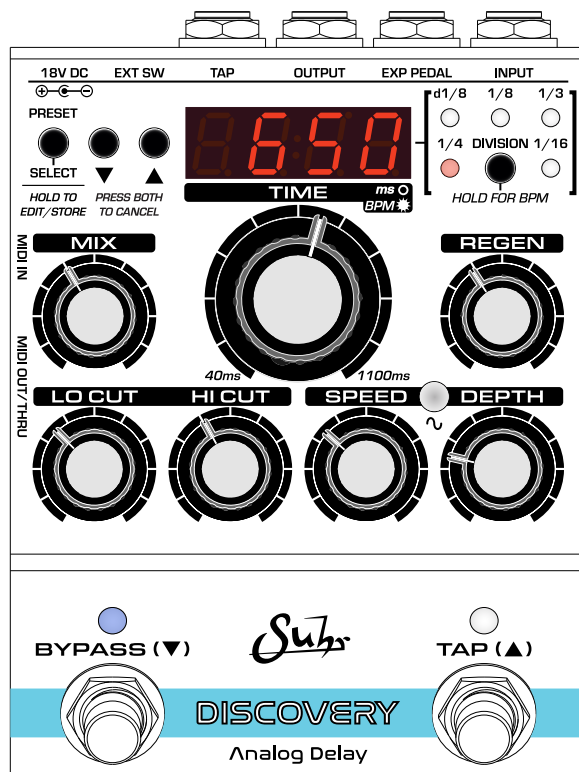
Example Settings



Basic Delay



Slap-Back Delay



Long Delay

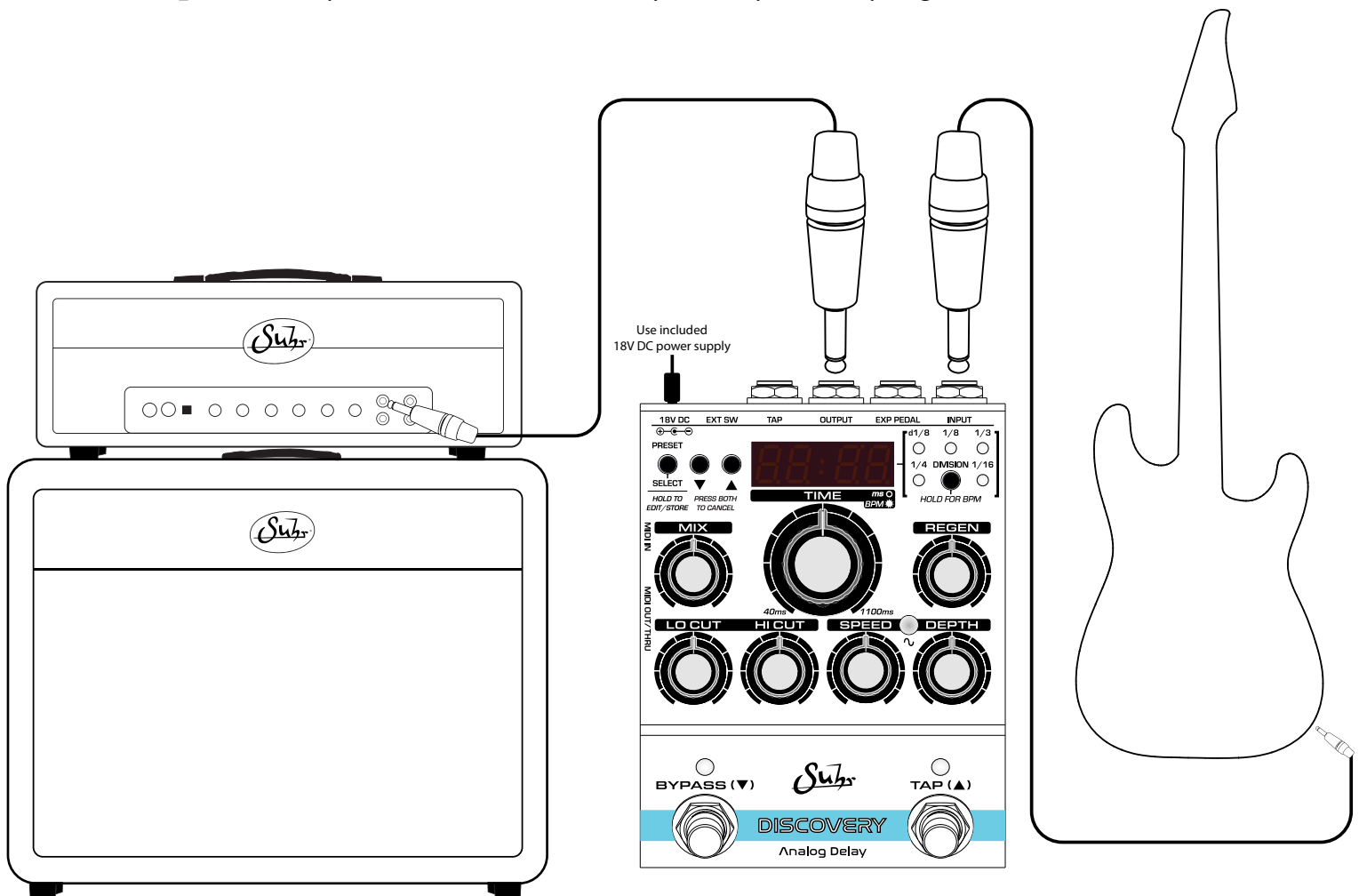
Usage Cases

Discovery Analog Delay Into Front of Amp

1. Plug in included 18V DC power supply.
2. Plug guitar into the [INPUT] via 1/4" cable.
3. Plug the [OUTPUT] to the input of your amp via 1/4" cable.

Note:

When plugging the Discovery Analog Delay into the front of an amp, especially a high-gain amp, it's easy for your tone to get messy and unwieldy because of the repeats being distorted by your amp. You may need to lower the [MIX] and [REGEN] settings and use the [LO-CUT] and [HI-CUT] to reduce the bass, treble and noise to clean up the delay to where it sits nicely with your dry signal.

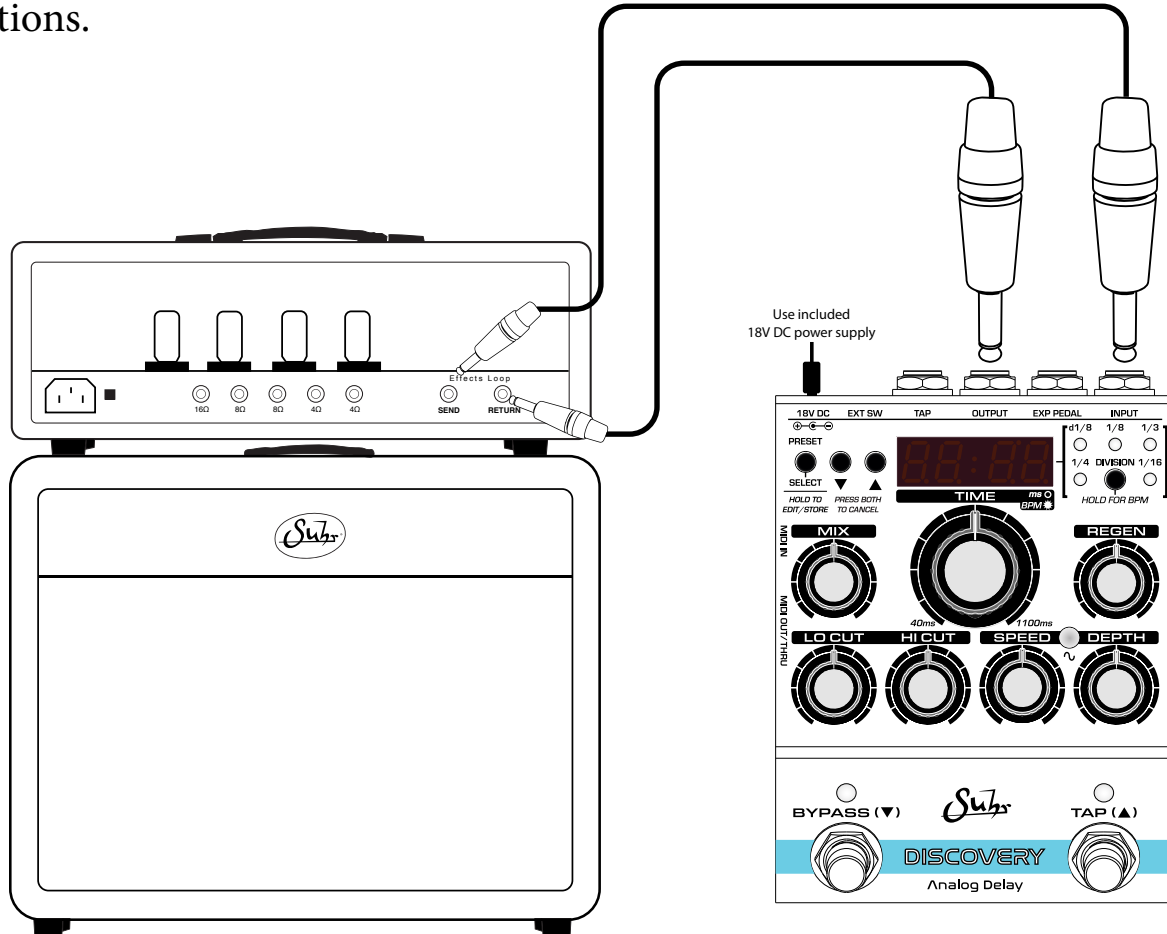


Discovery Analog Delay Into Effects Loop of Amp

1. Plug in included 18V DC power supply.
2. Plug guitar into the front of your amp via 1/4" cable.
3. Plug the SEND of your amp's effects loop in to the [INPUT] of Discovery.
4. Plug the RETURN of your amp's effect loop into the [OUTPUT] of Discovery.

Note:

This setup will give you the least amount of noise in your delay, will highlight the filtered sound of the delay more by not running it through the preamp of your amplifier, and occasionally allows more of the natural saturation of the bucket brigade chips to come through, especially when the effects loop send levels are hot. A different type of saturation may be heard as well when driving the power section of your amplifier harder, such as when Discovery has a high regen setting, causing oscillations.

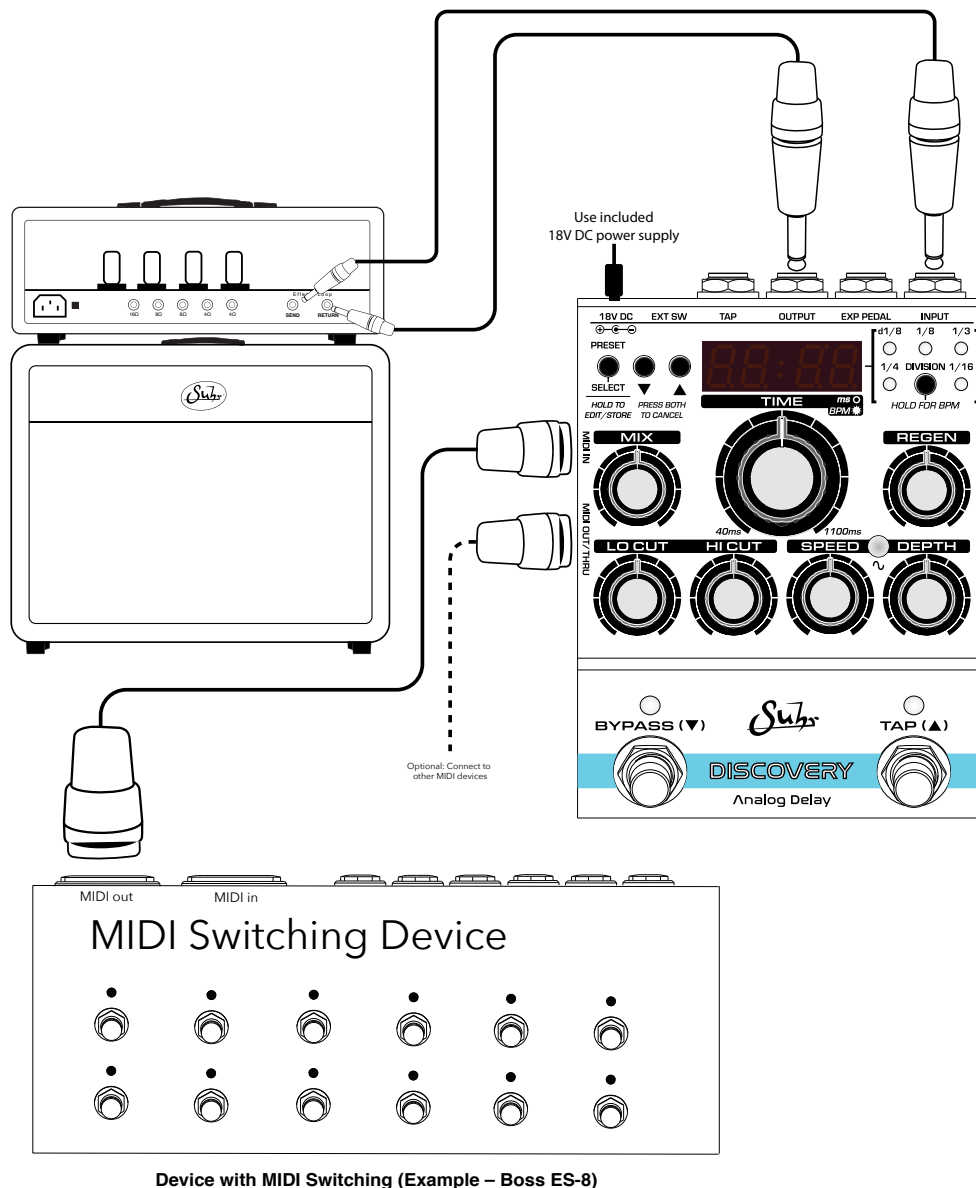


MIDI Switching from External Device

1. Plug in included 18V DC power supply.
2. Plug a 5-pin MIDI Cable from devices MIDI OUT to Discovery's [MIDI IN].
3. Optional: Plug a 5-pin MIDI Cable from Discovery's [MIDI OUT/THRU] to other device's MIDI IN.

Note:

For more information on how to set the MIDI channel of the Discovery Delay and the MIDI OUT/THRU options, please refer to [Page 23](#).



Technical Specifications

Front Panel: Bypass Switch, Tap Switch, Display, Time Knob, Mix Knob, Regen Knob, Lo-Cut Knob, Hi-Cut Knob, Speed Knob, Depth Knob Waveform LED Button, Divisions Button, Preset Select Button (Edit & Save), Up & Down Buttons

Ins & Outs: Input, Output, Exp Pedal, Tap, Ext Switch, 18V DC In, MIDI In and MIDI Out/Thru

Input Impedance: 470K Ω

Output Impedance: 100 Ω

Power Connector: 18Vdc, center negative, 2.1mm x 5.5mm

Current Consumption: 220mA max

Reverse Polarity Protection: Yes

Dimensions: 4" (W) x 5.33" (T) x 2.36" (H)

Weight: 1.3 lbs.

ROHS Compliant: Yes

*All specifications subject to change without prior notice

Warranty

For warranty information on the Suhr Discovery Delay as well as all other Suhr products, please visit <https://www.suhr.com/warranty/>

FCC Compliance

This product has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause harmful interference with radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference. 2) This device must accept any interference received, including interference that may cause undesired operation.

Notice: The FCC regulations provide that changes or modifications not expressly approved by J.S. Technologies Inc. could void your authority to operate this equipment. These limits are designed to provide reasonable protection against harmful interference in a non-residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference with radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the antenna of the radio/television receiver.
- Increase the separation between this equipment and the radio/television receiver.
- Plug the equipment into a different outlet so that the equipment and the radio/television receiver are on different power mains branch circuits.
- Consult a representative of J.S. Technologies Inc. or an experienced radio/television technician for additional suggestions.