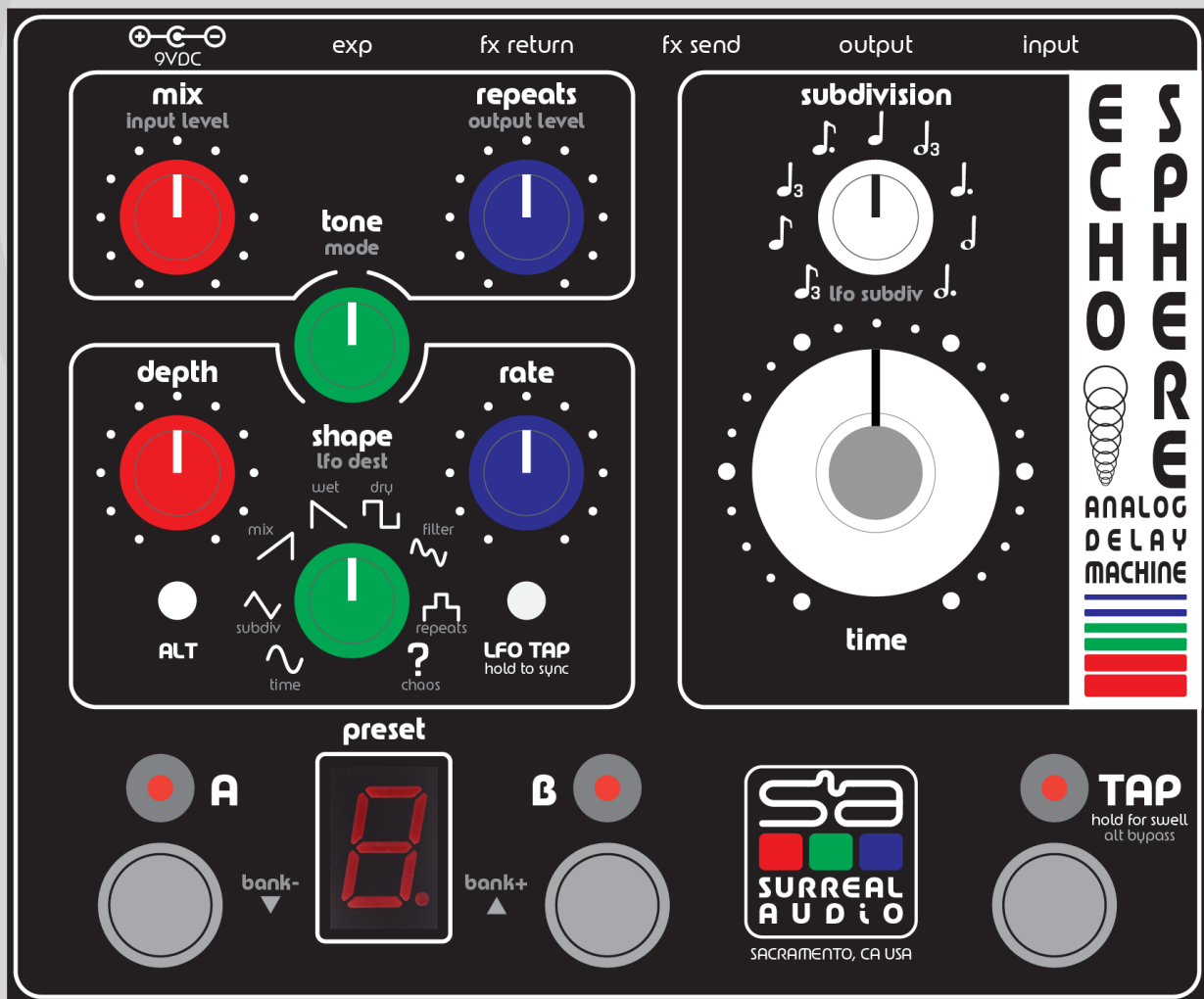




# ECHO SPHERE

ANALOG DELAY MACHINE



# Welcome to the ECHO SPHERE

## What is the ECHO SPHERE?

The **ECHO SPHERE** is an analog delay with modern controls. It features 4 of the legendary MN3005 bucket-brigade devices and a powerful modulation matrix to fully utilize all the magic inside them. The digital brain inside the **ECHO SPHERE** allows any configuration to be saved as a preset and recalled at any time. Other features include:

- Tap tempo
- Delay note subdivision
- Independent LFO tap tempo
- Expression pedal control
- FX loop for easy access to the delayed feedback loop to apply external effects.
- Stores up to 32 presets
- Selectable LFO destinations
- Swell - momentary feedback switch for self-oscillation
- Adjustable input and output levels with internal Voltage Controlled Amplifiers (VCA)
- Powerful tone control with internal Voltage Controlled Filters (VCF)
- Maximum delay time range from 40mS to 1.3 seconds.
- Selectable buffered or true-bypass modes.
- Selectable trails mode.

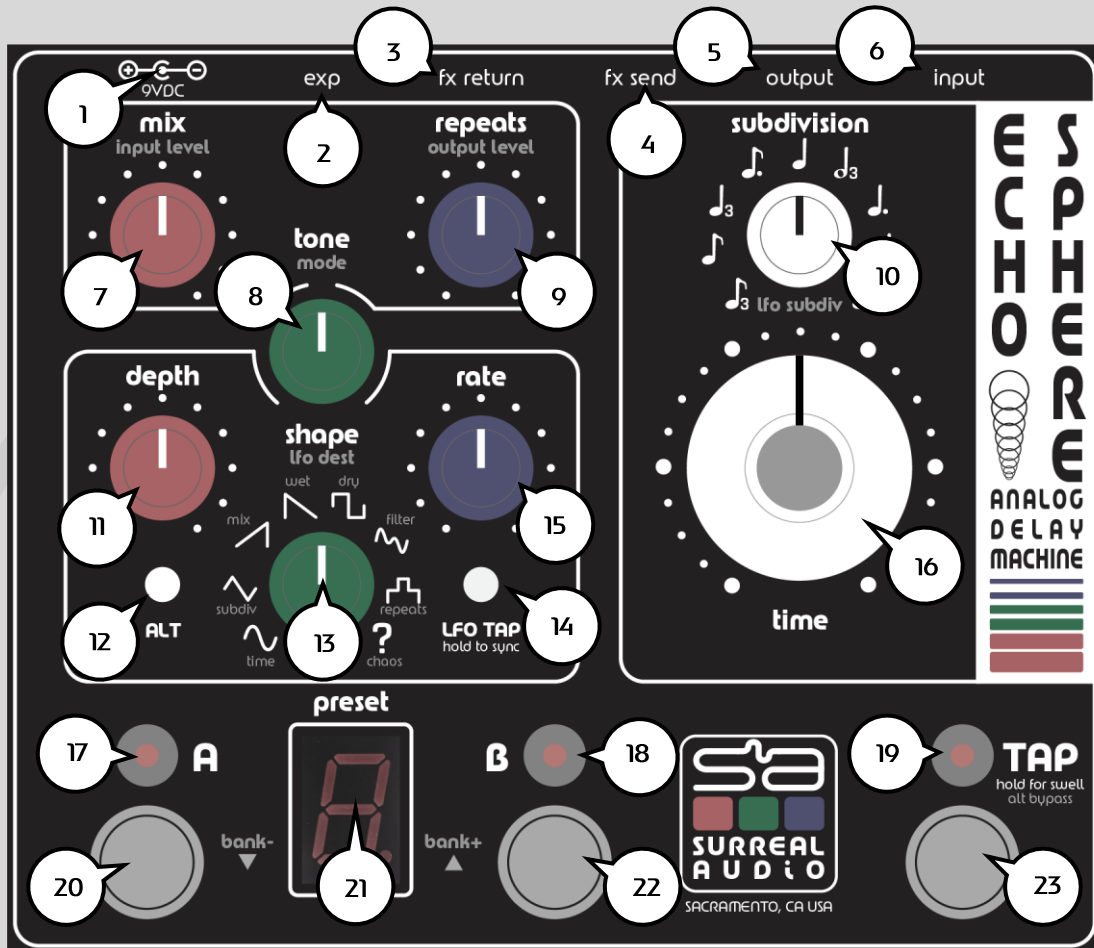
## What is a BUCKET-BRIGADE DEVICE?

In the analog realm there are limited ways to delay a signal. One of the original methods consisted of recording a signal to a tape machine and looping it back over itself. Although tape delays are still sought after for their unique warmth and saturation, a lot of magnetics and moving parts were involved in the construction that required routine service. In the early 1970's Philips Research Labs came up with a solution to remedy the complications of tape delays and the bucket-brigade device was born. It consisted of a series of switches that store the charge from an analog signal and pass it along from one capacitor to the next, creating a true analog delay line. The name comes from the analogy, "bucket-brigade", used to describe a line of people passing buckets of water to each other. Today bucket-brigade devices still hold true as one of the best ways to achieve analog delay and are also prized for their inherent tone coloration and quality.

## Why is the ECHOSPHERE different?

The ECHO SPHERE has a fully analog signal path. No analog-to-digital conversion. No 1's and 0's. Just pure analog magic with all the quirks and non-linearity that make analog effects special. However, the ECHO SPHERE is smart. It remembers every knob position to be recalled at any time from memory. This is because every parameter is adjusted by various control voltages generated by an internal processor. Inside the ECHO SPHERE there are separate Voltage Controlled Amplifiers (VCAs) controlling the input, repeats, wet and dry signal levels. There are also Voltage Controlled Filters (VCFs) consisting of a 2-pole highpass filter and two 4-pole lowpass filters that function as both tone control and anti-aliasing filters required for use with the bucket-brigade devices. This allows for an advanced modulation matrix that can not only modulate time but any other parameter as well.

# FEATURES & CONTROLS



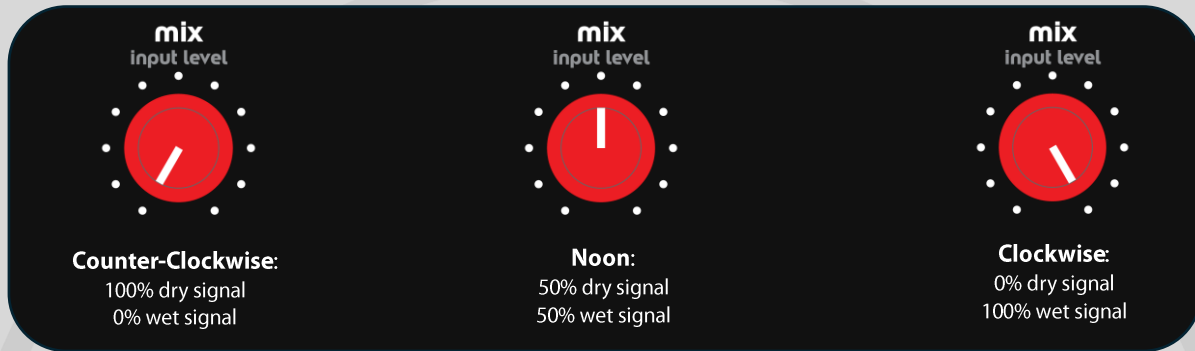
1. **POWER JACK:** 9VDC, Center negative, 2.1mm. (power supply included)
2. **EXPRESSION INPUT:** Expression pedal input. Standard TRS.
3. **FX RETURN:** ¼" TS Mono input for FX Return.
4. **FX SEND:** ¼" TS Mono output for FX Send.
5. **OUTPUT:** ¼" Mono, TS output connector.
6. **INPUT:** ¼" Mono, TS input connector.
7. **MIX:** Controls the level between the delayed/wet and dry signals. Alternate function controls the input level. See "ALTERNATE FUNCTIONS" section.
8. **STONE:** Tone control for the delayed/wet repeats. Counter-clockwise rotation applies lowpass filtering and clockwise rotation applies highpass filtering resulting in a sweep able bandpass filter. Alternate function selects different tone modes. See "STONE CONTROL" section.
9. **REPEATS:** Controls the amount of delayed repeats. Also known as "feedback". Alternate function controls the output level. See "ALTERNATE FUNCTIONS" section.
10. **SUBDIVISION:** Controls the note subdivision value of the delayed repeats. Alternate function selects the note subdivision for LFO rate. See "MODULATION" section.
11. **DEPTH:** Controls the amount of modulation applied to the delayed/wet repeats.
12. **ALT BUTTON:** Toggle switch to access alternate controls and menu.
13. **SHAPE:** Selects the LFO waveform type for modulation. Alternate function selects the LFO destination. See "MODULATION" section.
14. **LFO TAP:** Optional tap tempo to control the rate of modulation. Holding down for 2 seconds synchronizes LFO rate to delay time or tap tempo. See "MODULATION" section.
15. **RATE:** Controls the rate of modulation.
16. **TIME:** Controls the time length of the delayed repeats.
17. **PRESET A LED:** Preset A ON/OFF LED indication.
18. **PRESET B LED:** Preset B ON/OFF LED indication.
19. **TAP LED:** Global tap tempo LED indication for delay time.
20. **PRESET A FOOTSWITCH:** Footswitch control to engage preset A (ON) or bypass effect (OFF). Holding down footswitch for 2 seconds saves preset to selected memory bank. Alternate function changes memory bank. See "PRESETS" section.
21. **PRESET BANK 7-SEGMENT DISPLAY:** Displays the current bank for presets A and B. Up to 16 banks are available.
22. **PRESET B FOOTSWITCH:** Footswitch control to engage preset B (ON) or bypass effect. Holding down footswitch for 2 seconds saves preset to selected memory bank. Alternate function changes memory bank. See "PRESETS" section.
23. **TAP FOOTSWITCH:** Tap tempo footswitch to control the time length of the delayed repeats. Holding down momentarily sets repeats to max for self-oscillation. Alternate function provides a secondary bypass control and toggles trails mode on or off if held for 2 seconds. See "ADDITIONAL CONTROLS" section.

# QUICK START

1. Power on the ECHO SPHERE by plugging in the DC jack. Please use the included power supply. See "POWER SUPPLY" section for more information.
2. To enable the effect, press the **A** footswitch. The corresponding red LED above the footswitch will illuminate when the effect is on.
  - Footswitches **A** and **B** engage, bypass or toggle between two separate presets/effects available. Think "two pedals in one".
3. By default, a basic starting preset will be active on preset **A**. Use the **MIX, TONE, REPEATS** and **TIME** controls to dial-in the settings to preference. Optionally, **TIME** can also be set using the **TAP** footswitch by tapping in the desired tempo. The white LED above the **TAP** footswitch will indicate the delayed repeat time set by the **TIME** control or **TAP** footswitch.
4. If desired, adjust the **DEPTH** and **RATE** controls to modulate the delay time. This will add a slight chorusing and pitch bend to the delayed repeats. Adjust the **SHAPE** control to change the type of waveform applying modulation.
  - Optionally, **RATE** can also be set using the **LFO TAP** button by tapping in the desired tempo for the modulation rate. The white LED below the **RATE** control will indicate the modulation rate set by the **RATE** control or the **LFO TAP** button. It also indicates the waveform **SHAPE**.
5. If desired, adjust the **SUBDIVISION** control to change the note ratio of the delayed repeats. This is where you can obtain the famous dotted-eighth note delay ( ♪ . ) among many other types.
  - The tempo indicated by the white LED above the **TAP** footswitch will remain the same regardless of the note subdivision selected and always correspond to a quarter-note ( ♪ ) set by the **TIME** control or **TAP** footswitch.
6. To save the current settings as a preset, hold down the active footswitch (**A**) for at least 2 seconds until the red LED above the footswitch blinks 3 times. This will save the current settings to memory to be recalled at any time. Saving a preset on footswitch **B** functions the same way.
  - Try toggling between the newly saved preset (**A**) and the basic starting preset (**B**).
7. Notice the 7-segment display between footswitches **A** and **B**. This displays the current preset bank. To change the preset bank, press the **ALT** button once. It should be illuminated in blue. While the ALT button is illuminated, press either footswitch **A** or **B** to cycle through available preset banks. Footswitch **A** will decrement the bank and footswitch **B** will increment the bank. The 7-segment display will update accordingly. When finished, press the **ALT** button so it is no longer illuminated.
  - Banks 0-9 all contain the same basic starting preset. Banks A-F contain a variety of factory presets to showcase the range of effects the **ECHO SPHERE** can produce. Any of these preset slots can be overwritten.

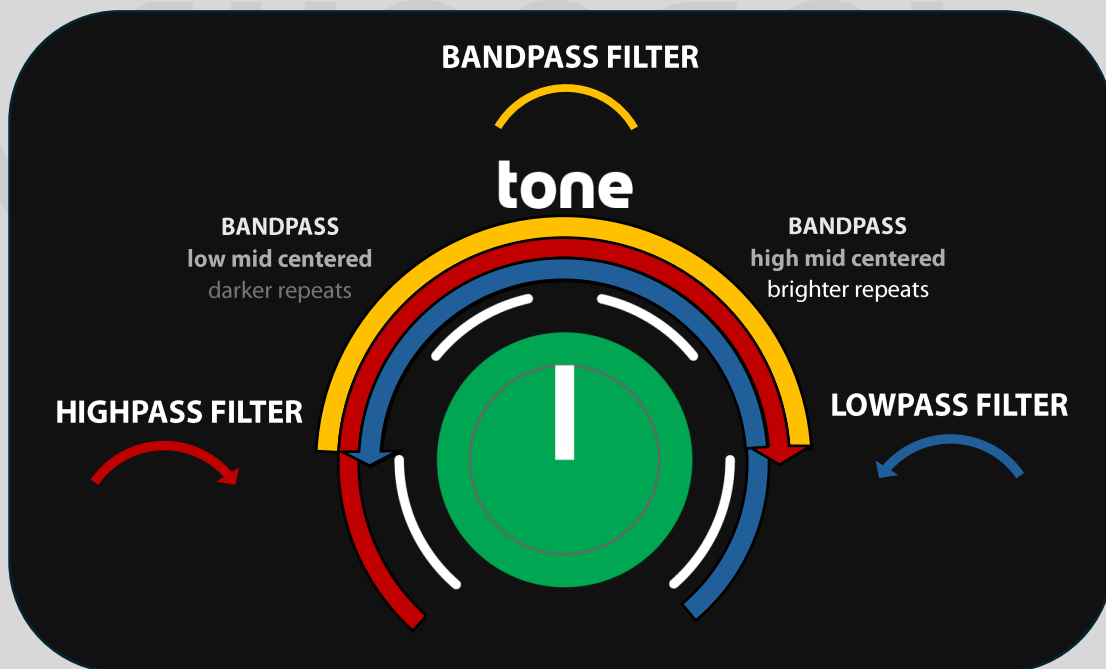
# MIX CONTROL

The **MIX** control blends the wet and dry signals without any change in the overall output level. Rotating fully counter-clockwise will mute the wet, delayed repeats so only the original, dry signal can be heard. Rotating fully clockwise will mute the dry signal so only the wet, delayed repeats can be heard. At noon, both the wet and dry signals can be heard at equal levels.



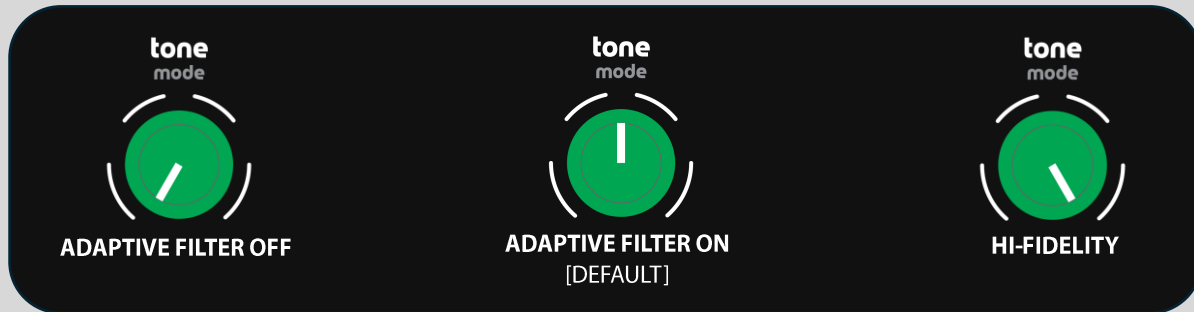
# TONE CONTROL

The **TONE** control, in its default mode, features combined lowpass and highpass filters that form a sweepable bandpass filter. Rotating counter-clockwise will cause the repeats to get darker and rotating clockwise will cause the repeats to get brighter. The red and blue arrows in the image below show the usable range of the highpass and lowpass filters as the tone control is rotated. The overlapping region, shown in yellow, displays the usable range of the bandpass filter. The tone control will only affect the wet signal.



# tone control modes

The ECHO SPHERE has 3 different tone control modes. These are accessed by toggling the **ALT** button on and rotating the tone control to 1 of 3 positions show below:



In order to understand how the different tone control modes function, a quick background on bucket-brigade devices (BBD) may be necessary.

BBD based analog delays require a lowpass filter before and after the delay line. These are known as an Anti-aliasing and a Reconstruction filters. Their purpose is to filter out the clock frequency that controls the BBD's delay time. Longer delay times require slower clock frequencies that may exist in the audible frequency range (<20kHz). Traditionally, in BBD based analog delays these filters have a fixed cutoff frequency somewhere between 5kHz-10kHz resulting in darker repeats with the higher frequency content of the signal filtered out. This ensures clock noise will never be audible on the delayed signal.

However, the ECHO SPHERE is different. The filters can automatically adjust themselves to allow the highest possible frequency content at a given delay time. So, what does this mean?

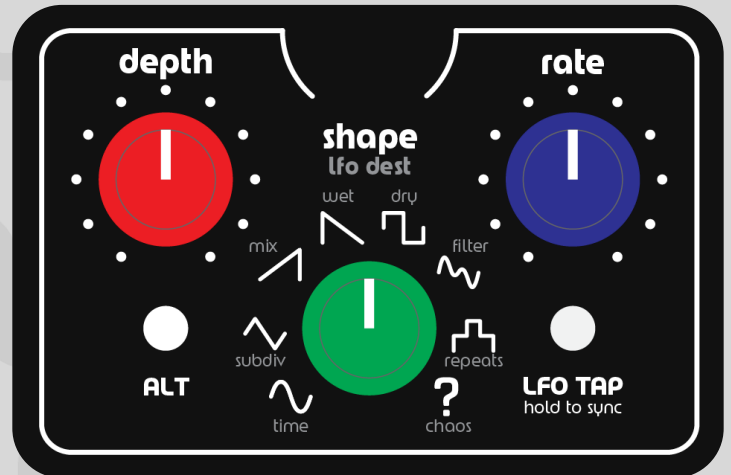
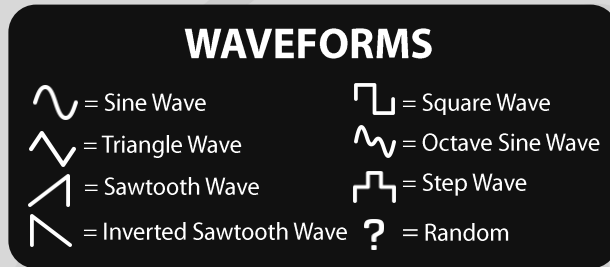
Shorter delay times will sound brighter and longer delay times will sound darker as the filters automatically adjust themselves. The tone control modes allow this adaptive filtering to be turned on or off. See below:

1. **ADAPTIVE FILTER OFF:** In this mode, the tone control functions normally and does not filter out the potential clock noise on the delayed signal. This will result in what's known as "aliasing" and sound like the delayed signal is being down-sampled or sent through a bit-crushing effect. At longer delay times it may sound lo-fi and glitchy in a pleasing way.
2. **ADAPTIVE FILTER ON:** This is the default and recommended mode for the ECHO SPHERE. In this mode, the tone control functions normally but it automatically adjusts the lowpass filter cutoff frequency to filter out the potential clock noise on the delayed signal. For example, if the tone control is set at past noon and the delay time is increased, the delayed signal will get darker and darker as the lowpass filter automatically adjusts itself.
3. **HI-FIDELITY:** This mode disables manual control of the of the lowpass filter and automatically adjusts itself to allow the highest possible frequency cutoff regardless of the tone control position. In this mode, the tone knob is only adjusting the highpass filter. Rotating the tone knob fully counter-clockwise will turn off any highpass filtering. At shorter delay times, this will result in a flat frequency response from 20Hz to 20kHz. The repeats will sound clean and clear similar to digital delays, hence the name "HI-FIDELITY".

# MODULATION

The ECHO SPHERE contains a comprehensive modulation section that allows for a variety of different effects.

- **DEPTH** controls the amount of modulation applied to the wet signal.
- **RATE** controls the speed of modulation.
- **SHAPE** selects the type of waveform that applies modulation.



Together these controls form a fully customizable **LFO** (Low Frequency Oscillation). By toggling the **ALT** button on, the **SHAPE** control changes its function to **LFO Destination** which selects what parameter modulation will be applied to.

Traditionally, modulation is applied to the **TIME** control that results in a chorusing, pitch bend effect. However, the ECHO SPHERE allows other parameters to be modulated by selecting a new LFO destination. Imagine the modulation section as an additional hand that can automatically turn the knobs on the ECHO SPHERE. The LFO destination selects which knob this imaginary hand can turn and modify.

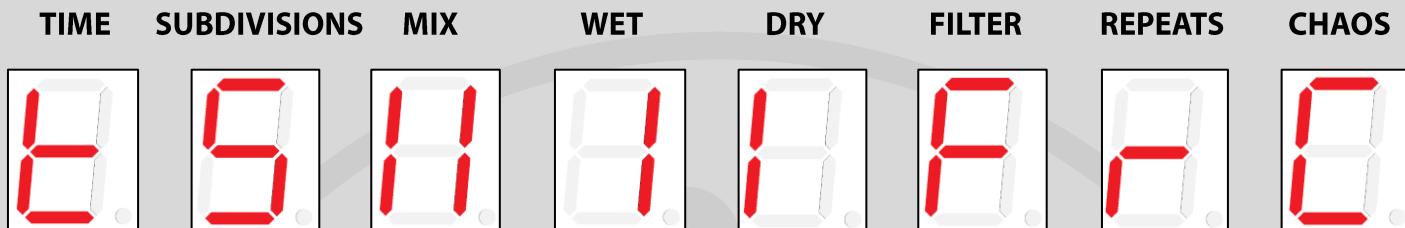
## LFO DESTINATIONS

The default LFO destination on the ECHO SPHERE is set to **TIME**. To change the **LFO destination**, toggle the **ALT** button on to access the alternate functions, and then rotate the **SHAPE** control (now **LFO destination**) to any of the destinations listed above each waveform. The 7-segment display will provide an additional symbol representing the LFO destination. When completed, press the **ALT** button off to exit the alternate functions. The LFO destinations are described below:

1. **TIME**: Modulates the TIME control to add chorusing and slight pitch bending.
2. **SUBDIV**: Modulates the note SUBDIVISION causing patterned pitch shifting.
3. **MIX**: Modulates the MIX control to automatically blend between the wet and dry signals.
4. **WET**: Modulates the amplitude of the wet signal only causing tremolo type effects.
5. **DRY**: Modulates the amplitude of the dry signal only causing tremolo type effects.
6. **FILTER**: Modulates the cutoff frequencies for the highpass and lowpass filters in the TONE control causing a filter sweeping effect on the wet signal.
7. **REPEATS**: Modulates the REPEATS control causing patterned self-oscillation and feedback.
8. **CHAOS**: Applies random modulation to TIME, FILTER and REPEATS causing...well...chaos.

# LFO DESTINATIONS & THE 7-SEGMENT DISPLAY

Each time a new LFO destination is selected, the 7-segment display will briefly change to a symbol corresponding to the new destination. This is used as additional indication that the desired destination was selected correctly. The symbols are as follows:



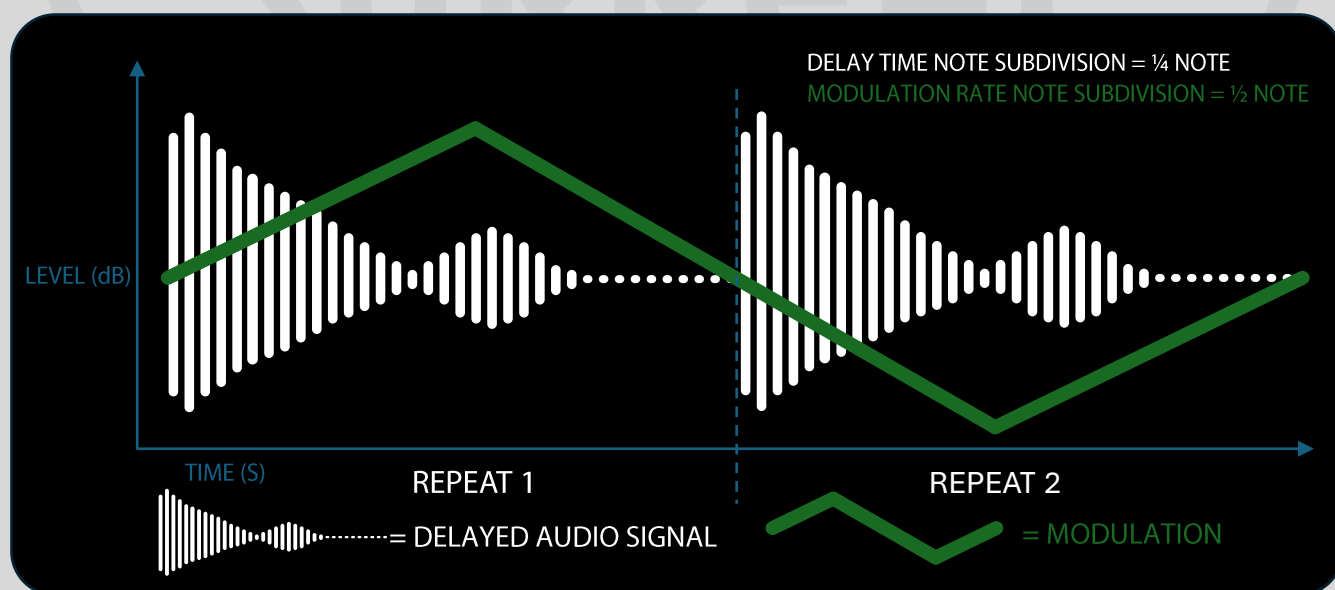
## LFO TAP & SYNC

The **LFO TAP** button provides another means of setting the rate of modulation by tapping in the desired tempo. It also provides visual feedback of the waveform shape selected.

Additionally, if the **LFO TAP** button is held for 2 seconds, the modulation rate will synchronize to the tempo set by the **TIME** control or **TAP** footswitch. This locks the modulation rate with the delayed repeat time. This allows for interesting rhythmic and patterned effects on the wet signal.

To take things even further, the ECHO SPHERE also allows control over the note subdivision of the modulation rate. Accessing the alternate functions by pressing the **ALT** button on changes the function of the **SUBDIVISION** control to now change the note subdivision of the modulation rate.

For example, if the delay time and modulation rate are synchronized, the note subdivision of the modulation rate could be set to a  $\frac{1}{2}$  note while the delay time is set to a  $\frac{1}{4}$  note. This means every two delayed repeats the modulation would cycle through its desired effect. See below:



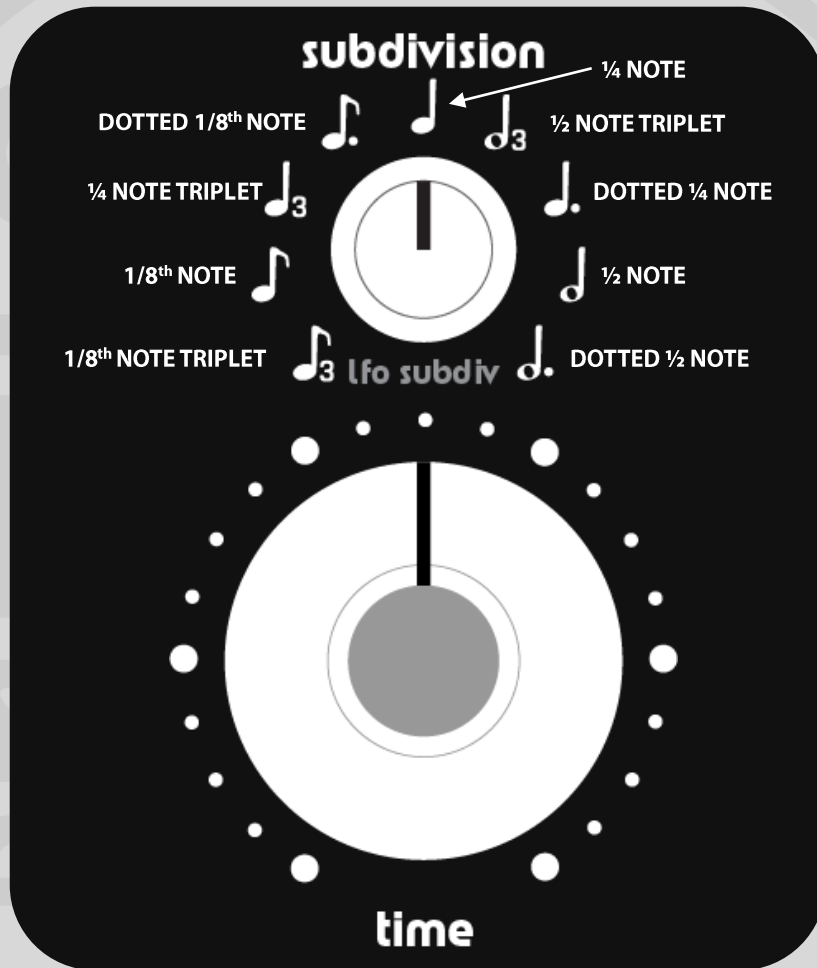
To unlock or un-synchronize the modulation **RATE** from the delay time, simply rotate the **RATE** control to a new position. It can be re-synchronized at any time by holding the **LFO TAP** button down for 2 seconds.



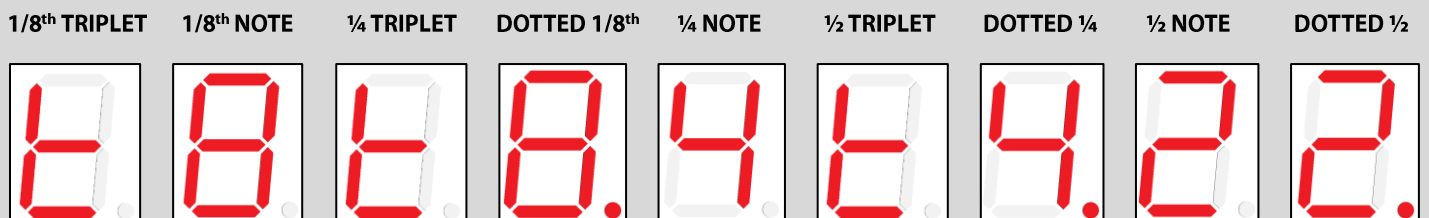
# TIME CONTROL

The ECHO SPHERE has a maximum delay time of 1.3 seconds and a minimum delay time of 40mS. This can be set by rotating the **TIME** control or tapping in the desired tempo with the **TAP** footswitch.

To change the note subdivision, rotate the **SUBDIVISION** control to the desired note ratio. The tempo indicated by the white LED above the **TAP** footswitch will remain the same regardless of the note subdivision selected and always correspond to a 1/4 note (♩) set by the **TIME** control or **TAP** footswitch.



Each time a new note **SUBDIVISION** is selected, the 7-segment display will briefly change to a symbol corresponding to the new ratio. This is used as additional indication that the desired subdivision was selected correctly. This also applies for the **LFO SUBDIVISION** accessed by the **ALT** button. The symbols are as follows:



# PRESETS

The ECHO SPHERE has two easy to access presets by pressing the **A** or **B** footswitches on/off or toggling between the two. By default, the 7-Segment Display shows the current preset bank. Each bank stores presets A and B. There are 16 preset banks available allowing the ECHO SPHERE to save up to 32 individual presets. (2 presets x 16 banks = 32 presets total)



Presets **A** or **B** can be saved in any bank at any time. To save the current settings as a preset, hold down the active footswitch (**A** or **B**) for at least 2 seconds until the red LED above the corresponding footswitch blinks 3 times. This will save the current settings to memory to be recalled at any time.

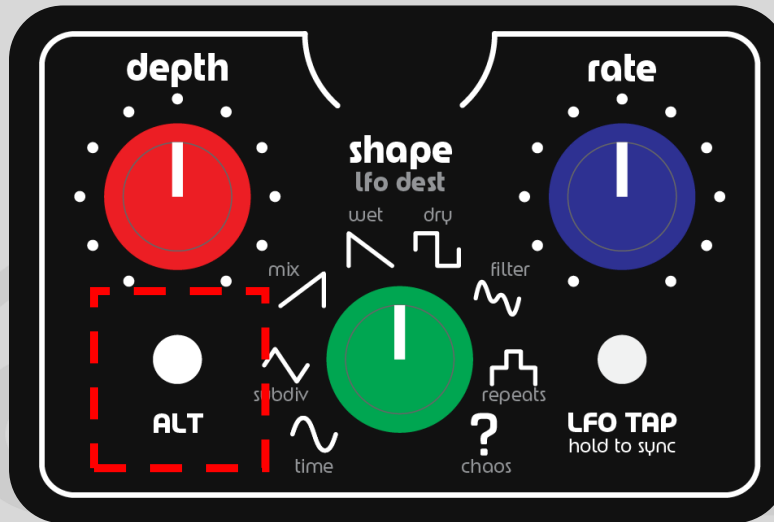
- **PRESETS CANNOT BE SAVED WHEN THE ALT BUTTON IS ON (ILLUMINATED IN BLUE)**

To change the preset bank, press the **ALT** button once. It should be illuminated in blue. While the ALT button is illuminated, press either footswitch **A** or **B** to cycle through available preset banks. Footswitch **A** will decrement the bank and footswitch **B** will increment the bank. The 7-segment display will update accordingly. When finished, press the **ALT** button so it is no longer illuminated.

- Banks 0-9 all contain the same basic starting preset. Banks A-F contain a variety of factory presets to showcase the range of effects the ECHO SPHERE can produce. Any of these preset slots can be overwritten.

It's important to note when a new preset is selected, the knob positions will no longer reflect the current settings. Any time one of the controls is changed, the dot in the lower right side of 7-segment display will illuminate indicating the current preset has been modified. If changes to the current preset aren't saved, toggling the other preset on or changing the preset bank will undo this any changes.

# ALTERNATE FUNCTIONS



For those that really want to dial in their preferences, the ECHO SPHERE has alternate functions for several of the controls. These are displayed in grey text next to the corresponding control on the face of the ECHO SPHERE. These are accessed by toggling the **ALT** button on and off. When the ALT button is on, illuminated in blue, several of the controls change to a different function and an alternate menu is available. See details below:

1. **INPUT LEVEL (MIX):** The ECHO SPHERE has a built-in pre-amp ranging from 0dB to +20dB of gain. With the ALT button on, the input level can be adjusted between this range. At higher levels, the signal will start saturating, introducing distortion that may be preferable. Lower levels will have the least amount of distortion but a slight increase in noise floor. Here's a good starting point depending on the input source:
  - Guitar - Single Coil Pickups: 1 o'clock to 3 o'clock (+12dB to +16dB)
  - Guitar – Humbuckers: 11 o'clock to 1 o'clock (+8dB to +12dB)
  - Synths & Keyboards: 9 o'clock to 12 o'clock (+6dB to +10dB)
2. **OUTPUT LEVEL (REPEATS):** This controls the total output level of both the wet and dry signals ranging from -6dB to +6dB. Useful for adding a slight boost or cut to a preset.
3. **MODE (TONE):** This selects 1 of the 3 tone control modes available. See "TONE CONTROL" section:
  - MODE 1: ADAPTIVE FILTERING OFF
  - MODE 2: ADAPTIVE FILTERING ON
  - MODE 3: HI-FIDELITY

**4. LFO DEST (SHAPE):** The LFO destination selects the parameter to apply modulation to. There are 8 destinations available:

- **TIME:** Modulates the TIME control to add chorusing and slight pitch bending.
- **SUBDIV:** Modulates the note SUBDIVISION causing patterned pitch shifting.
- **MIX:** Modulates the MIX control to automatically blend between the wet and dry signals.
- **WET:** Modulates the amplitude of the wet signal only causing tremolo type effects.
- **DRY:** Modulates the amplitude of the dry signal only causing tremolo type effects.
- **FILTER:** Modulates the cutoff frequencies for the highpass and lowpass filters in the TONE control causing a filter sweeping effect on the wet signal.
- **REPEATS:** Modulates the REPEATS control causing patterned self-oscillation and feedback.
- **CHAOS:** Applies random modulation to TIME, FILTER and REPEATS causing...well...chaos.

**5. LFO SUBDIV (SUBDIVISION):** This selects the note subdivision of the modulation rate / LFO. See "MODULATION" section.

**6. BANK- (FOOTSWITCH A):** This will decrement the current preset bank.

**7. BANK+ (FOOTSWITCH B):** This will increment the current preset bank.

**8. ALT BYPASS (TAP):** This provides an alternate means of bypassing the ECHO SPHERE when in ALT mode.

Additionally, when the alternate menu is active, the red LEDs for presets **A** and **B** will blink corresponding to the delay time or tempo of the saved preset. Useful to indicate tempo information of the saved presets and that the alternate menu is active.

It's important to note, the following controls DO NOT have an alternate function and function normally when the alt menu is activated:

- **DEPTH**
- **RATE**
- **TIME**

# ADDITIONAL CONTROLS

## EXPRESSION PEDAL

The ECHO SPHERE has a standard TRS input to allow expression pedal control of any of the main controls. The following steps detail setting up an expression pedal:

1. Insert 1/4 in. TRS cable from expression pedal into the **EXP** input between the **DC JACK** and **FX RETURN**.
2. Hold down the **ALT** button for at least 2 seconds until the 7-segment display begins to slowly illuminate the outer segments in a clockwise loop. Continue pressing **ALT** button.
3. While the 7-segment display loop is active, rotate or move one of the knobs back and forth to route expression pedal control to it. The ECHO SPHERE will record this change and route the control to the expression pedal.
4. Release the **ALT** button.
5. Expression pedal setup is complete.

The expression pedal can only control one parameter at a time. To change what the expression pedal is controlling, repeat steps 1-5 listed above. The available parameters: MIX, TONE, REPEATS, DEPTH, SHAPE, RATE, SUBDIVISION, and TIME.

## SWELL

Continuously or momentarily holding down the **TAP** footswitch will increase the repeats to max and cause self-oscillation and infinite feedback. Useful for creating a “swell” or “wall of sound” effect. Releasing the **TAP** footswitch will restore the repeats to the previous setting. This does not function when the **ALT** menu is active.

## BUFFERED BYPASS

The ECHO SPHERE is true bypass by default. However, if buffered bypass is desired, it can be toggled on or off. Follow the steps below:

1. Press the **ALT** button to activate the alternate menu. **ALT** button should be illuminated in blue.
2. Press and hold both footswitches **A** and **B** at the same time for at least 2 seconds.
3. The 7-segment display will quickly illuminate the outer segments in a clockwise loop 2 times. This signifies the bypass options were changed.
4. Buffered bypass is now active.
5. Press the **ALT** button off.

To turn off buffered bypass, repeats steps 1-4 listed above. To determine whether buffered or true bypass is active, toggle footswitches **A** or **B** on and off. An audible click will sound if true bypass is active.

# TRAILS

What are trails? Trails occur when the effect is disengaged or bypassed, but the delayed repeats are allowed naturally fade out. This adds a more natural way to bypass the effect. Fortunately, the ECHO SPHERE can toggle trails mode on or off. Follow the steps below:

1. Press the **ALT** button to activate the alternate menu. **ALT** button should be illuminated in blue.
2. Press and hold the **TAP** footswitch for at least 2 seconds.
3. The 7-segment display will quickly illuminate the outer segments in a clockwise loop 2 times. This signifies that trails mode was engaged.
4. Press the **ALT** button off.

To turn off trails, repeats steps 1-3 listed above. It's important to note, trails mode requires the ECHO SPHERE to be in buffered bypass. The ECHO SPHERE will automatically toggle buffered bypass mode on when trails mode is engaged. If trails mode is turned off, the previously set bypass mode will automatically be restored. Additionally, trails mode is saved by preset. For example, this would allow preset **A** to have trails mode on and preset **B** to have trails mode off.

# FX LOOP

The ECHO SPHERE has an FX Loop in the feedback path of the delayed repeats. This is useful for adding even more effects to the wet signal. Simply connect the **FX SEND** output to the input of outboard effects and connect the output of these effects back to the **FX RETURN** input.

# FACTORY RESET

The factory reset restores the ECHO SPHERE to its factory settings. This is useful for troubleshooting, recovering the factory presets in banks A-F, or erasing user presets stored in banks 0-9. To perform a factory reset follow the steps outlined below:

## **WARNING: THIS WILL ERASE ALL SAVED PRESETS**

1. Power off ECHO SPHERE and unplug DC jack.
2. With the ECHO SPHERE powered off, press and hold down the **TAP** and **PRESET B** footswitches.
3. While holding the **TAP** and **PRESET B** footswitches, apply power to the ECHO SPHERE.
4. The 7-segment display will quickly illuminate the outer segments in a clockwise loop 2 times and cycle to preset bank 0. This signifies that the factory reset was successful.

# POWER SUPPLY

To power the ECHO SPHERE, please use the included power supply. If an alternate power supply is to be used, please use a standalone, standard, 2.1mm, 9VDC center-negative power supply rated for at least 500mA.

# CONGRATULATIONS

You've read the entire manual.

GO MAKE NOISE.

## FOR ADDITIONAL INFORMATION

Please contact [info@surrealaudio.com](mailto:info@surrealaudio.com)

[www.surrealaudio.com](http://www.surrealaudio.com)

