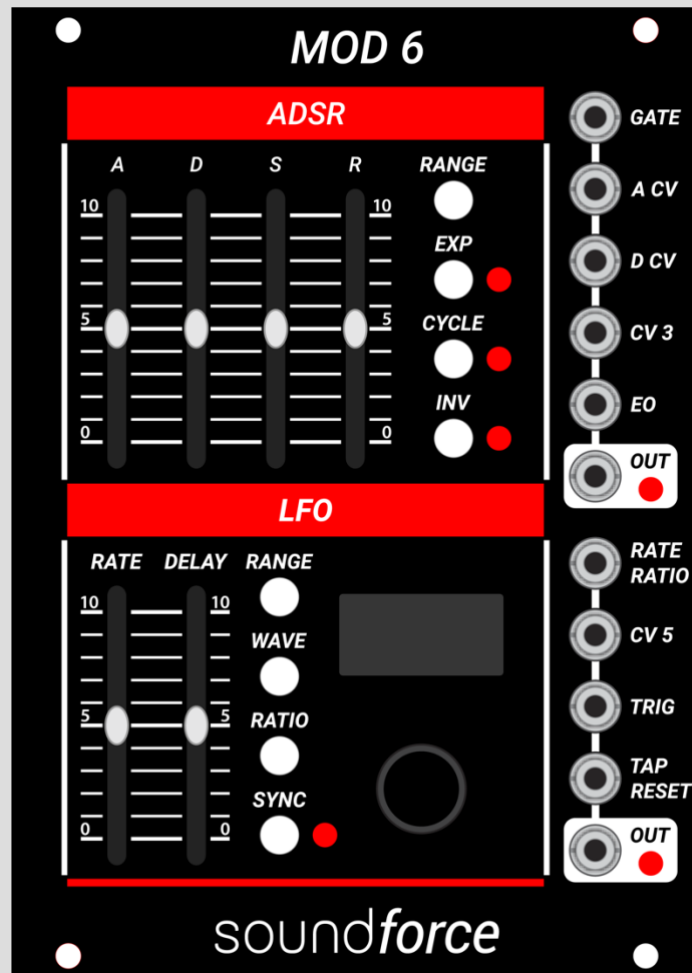


soundforce



MOD6 USER MANUAL

8 October 2024 – V1.4
Nicolas Toussaint

Thank you

Thank you so much for purchasing this module! SoundForce is a small business and I am grateful for everybody that supports it. I hope this module will bring you some fun and that it will complement your other modules well. This was my first development using a screen UI, I definitely learnt a lot and I am happy to say a lot has improved since the original Dual LFO and Dual ADSR designs.

Nicolas.

Overview

MOD 6 was designed and developed to compliment the other modules in the Juno-themed range of modules: DCO, VCF/VCA 6 and CHORUS 6. It is based on my experiences with the Dual LFO and Dual ADSR modules, with the goal of merging them together into a powerful dual-function next-level module.

It is the first SoundForce product using a screen-based UI. A small but crisp colored screen was chosen. From the start, the goal was to avoid the dreaded menu-diving user experience. The screen is used to display the module values and for advanced settings only. To keep things clean, a single menu depth is kept at all times.

The screen and digital UI opened up a lot of new possibilities in terms of user options. In an attempt to avoid the classic CV range mismatch between modules, MOD 6 is implementing an extremely flexible voltage range settings system. Using the screen and encoder, users are able to set custom ranges for each analog inputs and outputs, anywhere between -10V to +10V. This eliminates the need for external attenuator/polarizer modules. The user is able to harmonize CV signals amplitude and polarity between MOD 6 and other modules.

MOD 6 is using a STM32H743 micro-controller running at 480Mhz. Quite an overkill chip for this application, but the processing power available offers LFO frequencies up to 1khz and high sampling rates on the analog inputs, with CV modulation frequencies of up to 500hz.

The extremely fast processor allows for ultra-snappy ADSR times down to 100us. Another demonstration of the raw power of the chip used is the ability to morph the LFO waveforms using CV. Additionally, thanks to the screen UI, the user can choose the order in which the waveforms will be morphed.

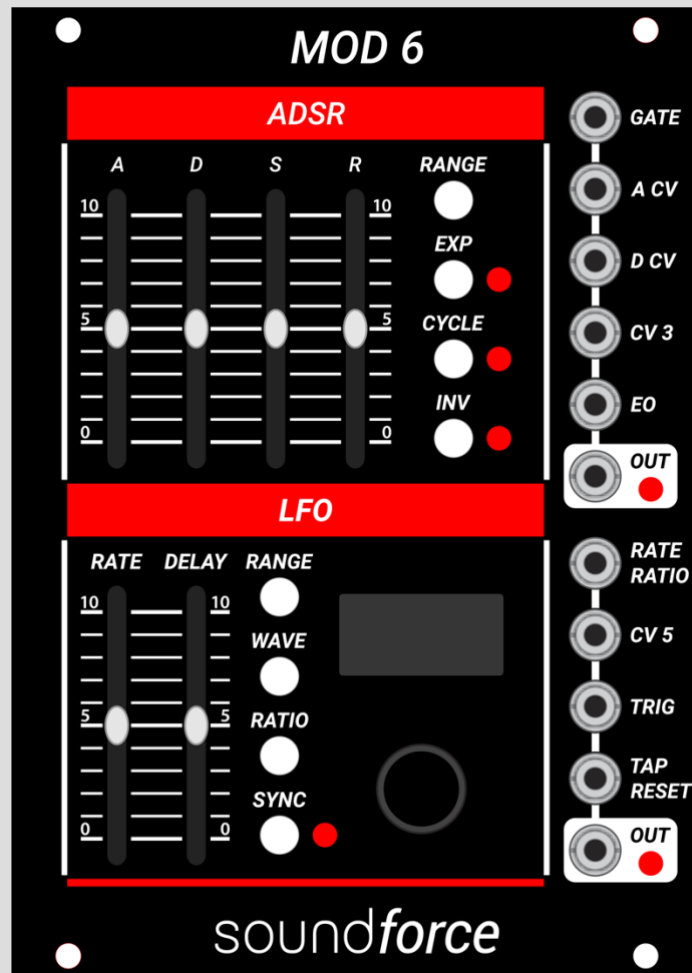
The ability to sync the LFO to an external trigger/clock/gate signals is taking the concept of the Dual LFO to the next level. Thanks to the screen, a very large collection of multiplier/division ratios can be selected from 1/64 up to x64, so users can make very musical selections on the spot.

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1. FRONT PANEL CONTROLS

A. ADSR SECTION



A slider:

This slide pot sets the time length of the envelope attack stage. The actual attack time will depend on the slider position, ADSR range selected and possible incoming CV on the A CV jack.

D slider:

This slide pot sets the time length of the envelope decay stage. The actual decay time will depend on the slider position, ADSR range selected and possible incoming CV on the D CV jack.

S slider:

This slide pot sets the level of the envelope sustain stage between 0 and 100%. The actual sustain level voltage will depend on the sustain slider position, the ADSR DAC output voltage range and incoming CV on the CV3 jack (if assigned to sustain).

R slider:

This slide pot sets the time length of the envelope release stage. The actual release time will depend on the slider position, ADSR range selected and incoming CV on the CV3 jack (if assigned to release).

GATE jack:

Input jack for the ADSR. Starts the envelope attack phase when the signal is rising and the release phase when the signal is falling. There is a 50us reaction/latency time between the GATE rising edge and the start of the ADSR attack phase.

A CV jack:

Attack control voltage input. The incoming signal will be added to the manual value of the attack slider to define the actual attack time.

D CV jack:

Decay control voltage input. The incoming signal will be added to the manual value of the decay slider to define the actual decay time

CV3 jack:

CV3 control voltage input. Can be assigned to modulate either the sustain level, the release time or the ADSR output level (as a digital VCA). When unused, set it to INACTIVE. See ADSR options for more information.

EO jack:

End of output jack. Can be set either to end of attack, end of decay or end of release. See ADSR options for more information.

OUT jack:

ADSR output signal jack.

RANGE switch:

The RANGE switch cycles through the 4 different time ranges of the ADSR: SHORT, MEDIUM, LONG and USER.

	ATTACK	DECAY	RELEASE
SHORT	From 200us to 1s	From 500us to 1s	From 500us to 2s
MEDIUM	From 1ms to 3s	From 2ms to 12s	From 2ms to 12s
LONG	From 9ms to 60s	From 30ms to 30s	From 30ms to 30s
USER	From 100us to 60s	From 100us to 60s	From 100us to 60s

To edit the ADSR USER range times, click the ADSR RANGE switch until it says USER at the top of the screen. Click the encoder once to highlight the ATTACK min value and turn the encoder to change the value. After that, click the encoder as often as needed, to go through every value of the USER range. When all values are set, click the encoder again until no values are highlighted.

EXP switch:

The EXP switch can turn on and off the exponential response of the ADSR signal. Users can set the intensity of the exponential character of the envelope in the ADSR options (from 0%/linear to 100%/fully exponential). See ADSR options for more information.

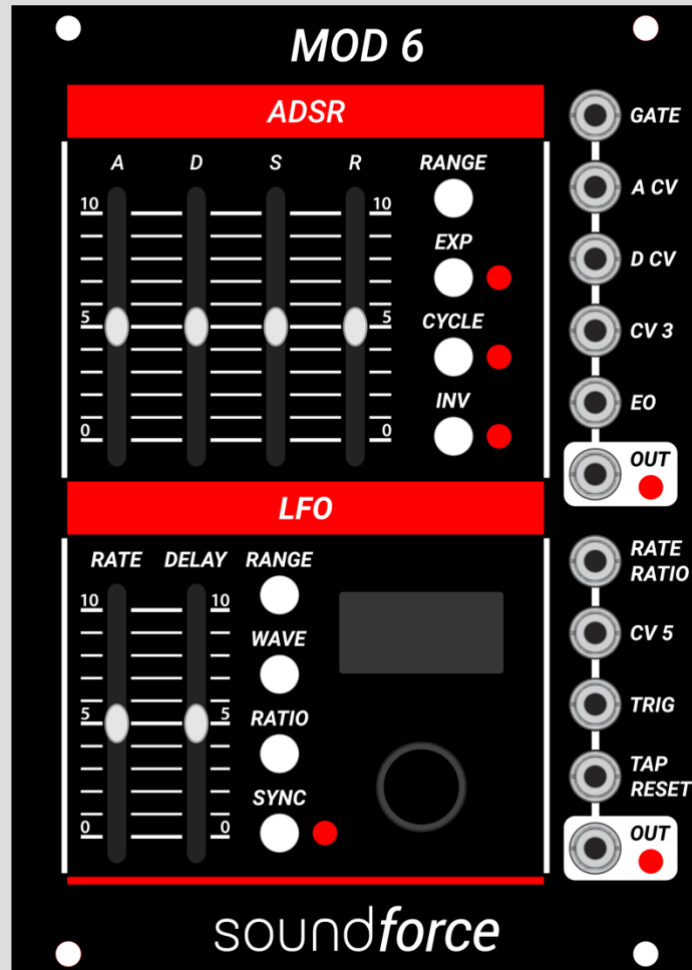
CYCLE switch:

The CYCLE switch can turn on and off the cycle function of the ADSR. When CYCLE is on, the attack phase will restart when the decay phase has ended. When the envelope enters the release phase, the cycling automatically stops.

INV switch:

The INV switch will invert the ADSR output signal. Depending on a setting in the ADSR options, INV can mirror the signal over its middle point or invert it around the 0V axis, thus making it negative if it was positive.

B. LFO SECTION

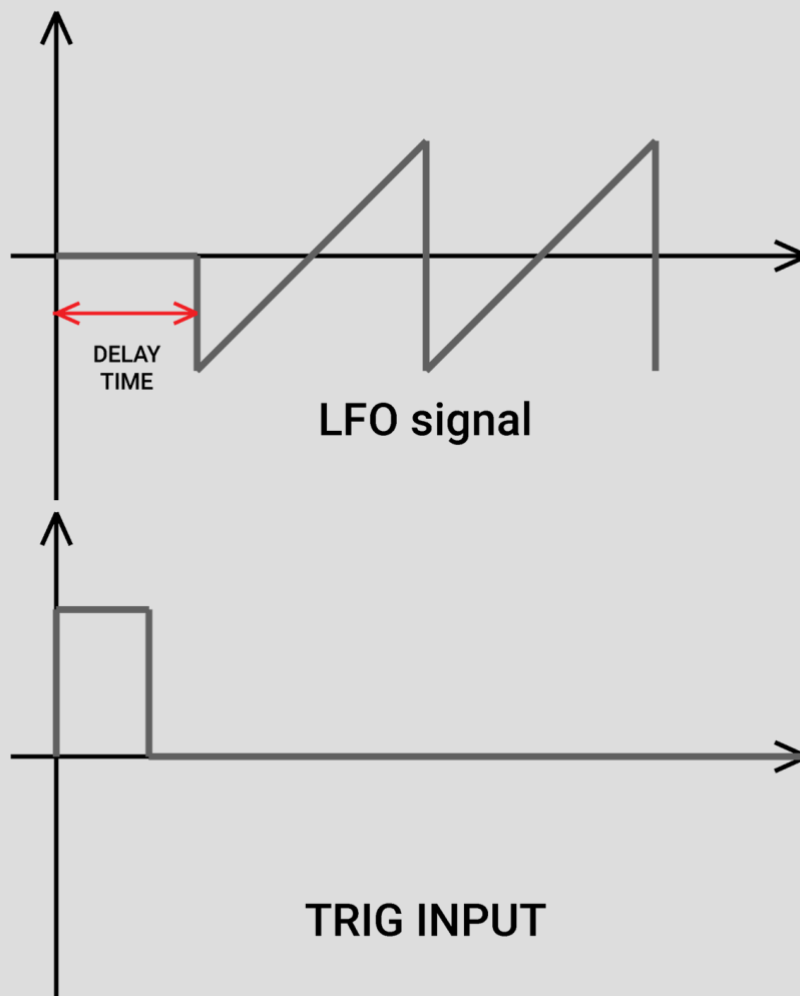


RATE slider:

This slide pot sets the rate of the LFO. It sets the LFO frequency either in Hz when the oscillator is free-running (SYNC is off) or as a divider/multiplier ratio of the base TAP input signal frequency when the SYNC is ON. The actual oscillator frequency will also depend on the possible incoming CV on the RATE/RATIO jack and also the selected LFO range when SYNC is off.

DELAY slider:

This slide pot sets the delay time of the LFO. The actual delay time will depend on the slider position and incoming CV on the CV 5 jack (when assigned to DELAY). The DELAY phase starts at a rising-edge on the TRIG jack. Trigger length has no impact on the LFO DELAY. The LFO signal can hold its center value or fade-in during the delay phase, see LFO options.



RATE/RATIO CV jack:

RATE/RATIO control voltage input. To modulate the LFO rate/frequency using CV. The incoming signal will be added to the manual value of the RATE slider.

CV5 jack:

CV5 control voltage input. Can be assigned to modulate either the delay time, the waveform selection or the LFO output level (as a digital VCA). When unused, set it to INACTIVE.

TRIG jack:

The TRIG input is used to start the delay phase of the LFO. The DELAY phase starts at a rising-edge on the TRIG jack. Trigger length has no impact of the LFO DELAY. The LFO signal can hold its center value or fade-in during the delay phase, see LFO options.

TAP/RESET jack:

The TAP/RESET JACK input signal is used to set the LFO base frequency when SYNC is ON. When SYNC is OFF, this input will reset the LFO waveform cycle back to the start.

OUT jack:

LFO output signal jack.

RANGE switch:

The range switch cycles through the 4 different time ranges of the LFO: SLOW, MEDIUM, FAST and USER.

	RANGE
SLOW	From 60s to 5hz
MEDIUM	From 1hz to 100hz
FAST	From 30hz to 500hs
USER	From 60s to 1000hz

To edit the LFO USER range times, click the LFO RANGE switch until it says USER at the top of the screen. Click the encoder once to highlight the min value and turn the encoder to change the value. After that, click the encoder again to highlight the max value and turn the encoder to change the value. When ready, click the encoder to exit edit mode.

WAVE switch:

The wave switch displays the waveform selection menu. Turn the encoder to change the selected waveform. When CV 5 is NOT assigned to WAVE, the actual LFO waveform is the one currently displayed in the waveform selection menu.

When CV 5 is assigned to WAVE, an additional OFF/ON selection is shown. See waveform CV control section for more information.

RATIO switch:

The RATIO switch displays the divider/multiplier ratio selection menu. Turn the encoder to change the selected RATIO and press down the encoder to toggle the RATIO ON and OFF. The RATIOS that are ON will be distributed across the RATE slider and RATE CV, when the LFO sync is turned ON. Only those RATIOS will be available for selection and modulation.

A long press on the encoder will reset the RATIO selection, keeping only a ratio of 1 active and setting all the other ratios to OFF.

SYNC switch:

The SYNC switch toggles the LFO between free-running operation and tempo synced/tap operation. When SYNC is ON, the LFO rate is based on the base frequency of the incoming TAP signal as well as the currently selected multiplier/divider ratio. When SYNC is OFF, the LFO rate is based on the RATE slider position, LFO RANGE selection and incoming CV on the RATE/RATIO CV input.

2. DIGITAL INs/OUTs VOLTAGE RANGE

The inputs (GATE, TRIG, TAP/RESET) will register a rising and falling edge when the signal passes the threshold of 0.7V. Signals from -12V to +12V can be tolerated by the module. Ideally unipolar signals of 0 to 5V, or 0 to 10V are used. The EO digital output signal has a range of 0V to 5V.

3. PARAMETRIC CV INPUTS AND OUTPUTS VOLTAGE RANGE

One of the most unique features of MOD 6 is a fully parametric system of voltage ranges for each CV input and output. Pairing CVs from different modules together is always a complex aspect of modular, especially for beginners. The lack of consolidated standard for CV doesn't help.

Thanks to its digital storage and UI, MOD 6 is able to implement a 100% flexible voltage range settings system. The user is able to set the voltage range anywhere between -10V to +10V for each of the MOD 6 CV input and output. This allows for full scale modulation of the MOD 6 ADSR and LFO parameters with any external CV signal.

Similarly both the ADSR and LFO outputs have parametric voltage ranges. Need a -2V to +5V LFO, no problem. A +3V to +10V ADSR, that's possible. Any integer voltages between -10V and +10V can be selected in the ADSR and LFO options menu. On top of that, the ADSR output amplitude can be modulated with the CV 3 input and the LFO output amplitude can be modulated with the CV 5 input.

For CV inputs, attenuverter ratios are available on top of the voltage range setting. It is not recommended to use the range setting to attenuate.

4. HOW CV MODULATION IS APPLIED

Based on the CV input voltage range setting and the possible attenuation ratio, an internal CV modulation is calculated. Let's take an example with the A CV input to modulate the attack time.

By default, the A CV range is -5V to +5V and the attenuation ratio is 100%. Connecting a 10Vpp bipolar sine signal to the A CV jack will result in an internal CV modulation of 100% for the attack time. This modulation is added to the manual position of the attack slider.

So if the attack slider is in the middle position, this CV signal will internally modulate the attack time between the max and min value of attack times for the select ADSR time range. This is similar to having a little robot move your attack slider all the way up and down, oscillating around the attack slider center point.

Please note that the modulation is polarized, so positive voltages are modulating parameters upwards (increasing values) and negative voltages are modulating parameters downwards (decreasing values). So, for a 0 to 10V A CV range, the attack slider start position should be all the way down in order to modulate across the full-scale of the attack time range.

The exact swing in values will depend on the calibration of the CV source used. MOD 6 CV inputs and outputs are calibrated to 1mV precision.

5. ATTENUVERTER MENUS AND CV 3/5 DESTINATION MENUS

A. ATTENUVERTER MENUS

Each CV input signal can be attenuverted using the screen and encoder. To access the attenuverter menus a long press of 2 secs is needed on the switch located to the left of CV input:

A CV att menu	->	ADSR RANGE switch
D CV att menu	->	ADSR EXP switch
CV3 att menu	->	ADSR CYCLE switch
RATE/RATIO att menu	->	LFO RANGE switch
CV 5 att menu	->	LFO WAVE switch

The ratio can be set between +100% and -100%. Negative values under 0% will invert the CV signal and attenuate.

For CV 3 and CV 5, a destination setting is also available. To switch between attenuation ratio and destination control, press down the encoder. If CV 3/CV 5 are not used, set the destination to INACTIVE to avoid any unwanted offsets.

B. CV3 DESTINATIONS

INACTIVE: Please use this destination when CV 3 is not used/unplugged to avoid unwanted offsets.

SUSTAIN: CV 3 signals are added to the sustain slider value to define the sustain level.

RELEASE: CV 3 signals are added to the release slider value to define the release time.

ADSR VCA: CV 3 signals can modulate the ADSR output signal amplitude. Amplitude modulation is applied from the bottom of the ADSR signal.

C. CV5 DESTINATIONS

INACTIVE: Please use this destination when CV 5 is not used/unplugged to avoid unwanted offsets.

DELAY: CV 5 signals are added to the delay slider value to define the LFO delay time.

WAVE: CV 5 is modulating the selected LFO waveform, based on the ON/OFF selection in the WAVE menu. See LFO waveform CV control section for more information.

LFO VCA: CV 5 signals can modulate the LFO output signal amplitude. Amplitude modulation is applied from the center of the LFO signal.

6. *ADSR OPTIONS*

To enter the ADSR options menu, press down the 4 ADSR switches (RANGE + EXP + CYCLE + INV) at the same time. By turning the encoder, you can scroll between the different options. Some options can be toggled on and off by simply pressing down on the encoder. Other options have more than 1 setting, you can start editing the settings by pressing down on the encoder to enter edit mode and press it down again to exit edit mode.

Please note that all the user settings are saved in memory 5 seconds after the last modification. Moving a slider or pressing switches will exit the ADSR options menu.

AD ONLY:

Press down the encoder to toggle between ON and OFF.

When AD only is on, the sustain and release phase are skipped and the falling edge of the Gate signal is ignored.

EO SEL:

Press down the encoder to enter edit mode and turn the encoder to change the selection and press the encoder again to exit edit mode.

The end of output can be set to either end of attack (EOA), end of decay (EOD) or end of release (EOR).

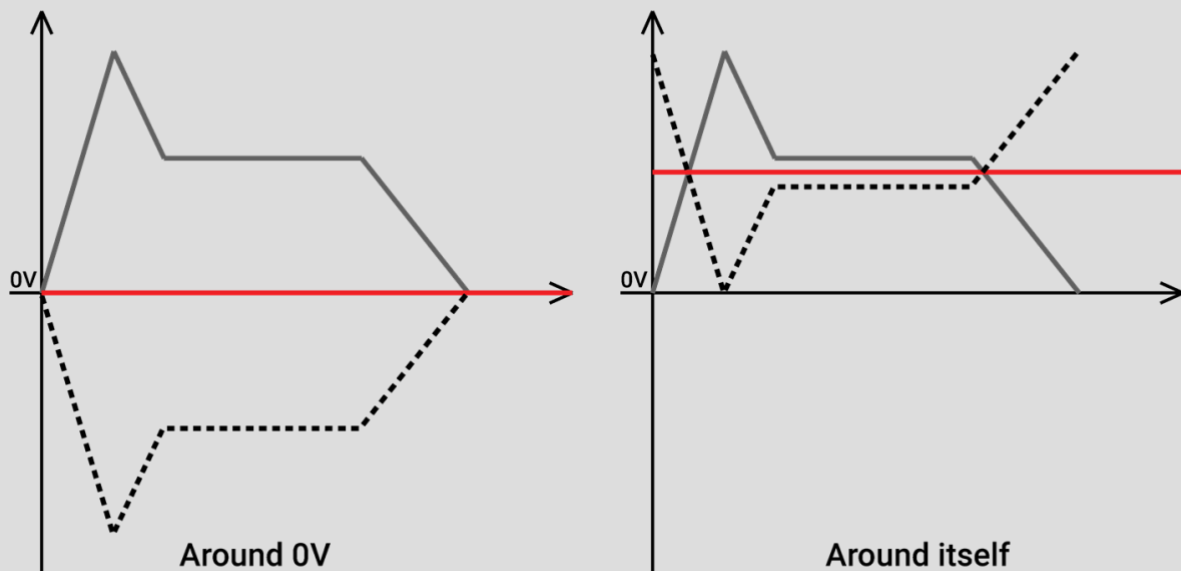
JUNO LIN ATTACK:

Press down the encoder to toggle between ON and OFF. When turned on, the attack will remain linear even in EXP mode to be true to the original Juno ADSR curve (linear attack, exponential decay and release).

INVERSION AROUND:

Press down the encoder to toggle between ITSELF and 0V axis.

The ITSELF option inverts the ADSR signal as a mirror around the middle of the ADSR DAC voltage range. While the 0V axis option inverts the ADSR signal around the 0V axis thus also inverted the sign of the voltage.



EXP AMOUNT:

Press down the encoder to enter edit mode and turn the encoder to change the percentage. The EXP AMOUNT defines the amount of the exponential character of the ADSR when the EXP switch is turned on. 100% is fully exponential, 0% is fully linear.

A CV RANGE:

Attack CV input voltage range. Press down the encoder to start to edit the range min voltage and turn the encoder to change the value. Press again to edit the range max CV and turn the encoder to change the value. Press again the encoder to exit edit mode.

D CV RANGE:

Decay CV input voltage range. Press down the encoder to start to edit the range min voltage and turn the encoder to change the value. Press again to edit the range max CV and turn the encoder to change the value. Press again the encoder to exit edit mode.

CV 3 RANGE:

CV 3 input voltage range. Press down the encoder to start to edit the range min voltage and turn the encoder to change the value. Press again to edit the range max CV and turn the encoder to change the value. Press again the encoder to exit edit mode.

DAC RANGE:

ADSR output signal voltage range. Press down the encoder to start to edit the range min voltage and turn the encoder to change the value. Press again to edit the range max CV and turn the encoder to change the value. Press again the encoder to exit edit mode.

7. LFO OPTIONS

To enter the LFO options menu, press down the 4 LFO switches (RANGE + WAVE + RATIO + SYNC) at the same time. By turning the encoder, you can scroll between the different options. Some options can be toggled on and off by simply pressing down on the encoder. Other options have more than 1 setting, you can start editing the settings by pressing down on the encoder to enter edit mode and press it down again to exit edit mode.

Please note that all the user settings are saved in memory 5 seconds after the last modification. Moving a slider or pressing switches will exit the LFO options menu.

DELAY FADE IN:

Press down the encoder to toggle between ON and OFF.

When this option is OFF, the middle value of the LFO DAC range is held during the DELAY phase. When this option is ON, the LFO signal will fade-in from 0 to the full range signal.

DELAY SYNC:

Press down the encoder to toggle between ON and OFF.

When this option is OFF, the delay time is varying from 0 to 3000ms based on the DELAY slider position. When this option is ON, the delay time is based on the divider/multiplier ratio of the incoming TAP signal frequency. The same ratios are used as for the RATE value.

WAVE CV MORPH:

Press down the encoder to toggle between ON and OFF.

When this option is OFF, CV 5 (when assigned to WAVE) will switch without transitions between the ON-selected waveforms in the WAVE menu. When this option is ON, the different ON-selected waveforms will gradually morph into each other based on the incoming CV 5 voltage.

R CV RANGE:

RATE/RATIO CV input voltage range. Press down the encoder to start to edit the range min voltage and turn the encoder to change the value. Press again to edit the range max CV and turn the encoder to change the value. Press again the encoder to exit edit mode.

CV 5 RANGE:

CV 5 input voltage range. Press down the encoder to start to edit the range min voltage and turn the encoder to change the value. Press again to edit the range max CV and turn the encoder to change the value. Press again the encoder to exit edit mode.

DAC RANGE:

LFO output signal voltage range. Press down the encoder to start to edit the range min voltage and turn the encoder to change the value. Press again to edit the range max CV and turn the encoder to change the value. Press again the encoder to exit edit mode.

SCREEN BRIGHTNESS: Press down the encoder to start to edit the screen brightness (0% to 100%) and turn the encoder to change the value. Press again the encoder to exit edit mode.

FW VERSION:

Displays the current firmware version.

RESET SETTINGS:

Hold down the encoder 5 secs until the countdown is elapsed. A message will confirm the reset and the module reboots. The calibration data is not lost after resetting the settings.

8. LFO WAVEFORM CV CONTROL

Using CV 5 it is possible to CV control the waveform selection of the LFO. First, long press the LFO WAVE switch to access the CV 5 ATT menu. Press down the encoder to focus on DEST, and turn encoder to choose WAVE as CV 5 destination.

When accessing the waveform selection menu with the WAVE switch, an ON/OFF indication is now also displayed next to each waveform. This defines which waveforms will be available during CV modulation with CV 5.

The order of selection of the waveforms in the menu also define the order in which CV 5 will traverse them. By turning ON the waveforms in the right order, users can define exactly the sequence of waveforms they desire during CV modulation.

To reset the waveform selection and start from scratch, long press the encoder until WAVES RESET is displayed. When all the waveform are OFF, only the currently displayed waveform is available.

Morphing transitions between the waveform is possible, see the LFO options to turn it ON.

9. GENERATING RANDOM WAVE SHAPES

When assigning CV 5 to WAVE, turning on an arbitrary selection of waves and finally feeding CV 5 with a random voltage generator, usual and unexpected wave shapes can be generated. Of course, constant voltages can also be fed to CV 5 for a more manual selection. Those random blends of waveforms can offer you "new" waveforms that go beyond the standard selection.

10. CALIBRATION DATA RESET

NEVER RESET CALIBRATION WITHOUT GOOD REASONS! YOU NEED A PRECISE MULTIMETER TO CALIBRATE THE MODULE ACCURATELY.

If for some reason, you need to reset the calibration, a hidden feature is available. Please don't reset the calibration without consulting me in advance. You cannot use the module without recalibrating first. You will need a precise multimeter to process with the calibration. To start calibration, navigate to the firmware version display in the LFO options, press and keep down the encoder and hold it down for 15 seconds. A countdown timer will be displayed, when the timer is elapsed the calibration data will be erased and the module reboots.

After reboot, the module will need first to go through recalibration before use. Here is the procedure:

- The first step is a screen adjustment, if the screen has a red title above and black background below, no adjustment is necessary. Some displays will look inverted and need a press on the encoder.
- If/when the screen looks right, press down on ADSR RANGE
- The module asks you to press the encoder to start calibration
- Connect a multimeter on the ADSR OUT, turn the encoder until the output gives exactly -10V
- Press the encoder and repeat the same operation for 0V
- Press the encoder and repeat the same operation for +10V
- Connect a multimeter on the LFO OUT, turn the encoder until the output gives exactly -10V
- Press the encoder and repeat the same operation for 0V
- Press the encoder and repeat the same operation for +10V
- The module will now measure the 0V offsets for all the ADC inputs, do not do anything during those few seconds
- When the module requests it, connect the LFO OUT to the A CV IN (with a short and reliable cable) and press the encoder
- When the module requests it, connect the LFO OUT to D CV IN and press the encoder
- When the module requests it, connect the LFO OUT to CV 3 IN and press the encoder
- When the module requests it, connect the LFO OUT to RATE CV IN and press the encoder
- When the module requests it, connect the LFO OUT to CV 5 IN and press the encoder
- The module will now display the calibration digits for the DAC outputs and ADC inputs, press the encoder to scroll through them until the MOD 6 logo is displayed

If you don't have any measurement equipment and you triggered the calibration by accident, you can still use the module with the estimated DAC digits. In that case, don't adjust anything during the LFO DAC CAL and ADSR DAC CAL step, just press down the encoder. But do go through the ADCs CAL steps.

11. FIRMWARE UPDATES

In the LFO options menu, you can consult the currently running firmware versions. When available, Firmware updates will be posted on the [SoundForce module update page](#).

The BOOT switch on MOD 6 is located on the bottom of the PCB, it is the most left switch on the row of the 3 small metal switches.

For firmware update tutorial, see the UPDATE TUTORIAL section on the [SoundForce module update page](#).

12. SPECIFICATIONS

Width:

18HP

Depth:

38mm including power connector

Power:

+12V 103mA, -12V 6mA

GATE/trigger inputs voltage range:

Anywhere between -12V and +12V, threshold at 0.7V, so ideally 0 to 5V or 0 to 10V.

EO output voltage range:

0 to 5V.

CV inputs voltage ranges:

User-settable between -10V to +10V

CV outputs voltage ranges:

User-settable between -10V to +10V