

Tactile Sounds TS-Substance User Manual

Signal Generators

Substance's signal generating modules are all on the left hand side of the interface, and are coloured orange.

Oscillators



Inspired by classic analog polysynths like the Roland Jupiter 8 and the Oberheim Matrix 12, each oscillator is actually comprised of seven unison voices. The amount of detuning and panorama applied to the voices is controlled by the Performance Spread parameter.

Waveform: Chooses oscillator waveforms. Available shapes are sine, saw, ramp, triangle, pulse, white noise, and pink noise

FM Source: Chooses frequency modulation source signal.
Osc-1: LFO-1, LFO-2, EG-1, EG-2, Inverse EG-1, Inverse EG-2, LFO-1 x EG-2
Osc-2: LFO-1, LFO-2, EG-1, EG-2, Osc-1, Osc-1 x EG-2, LFO-1 x EG-2
When an oscillator is used as an FM source, Yamaha style phase modulation is employed.
When an envelope is used, direct frequency modulation is employed.

PWM Source: Chooses pulse-width modulation source signal.
Osc-1: LFO-1, LFO-2, EG-1, EG-2, Manual
Osc-2: LFO-1, LFO-2, EG-1, EG-2, Osc-1, Manual

Harmonic: Osc-1 only. Tune oscillator according to the harmonic series, harmonics 1-32. At A = 440 Hz, 1 = 440 Hz, 2 = 880 Hz, 3 = 1320 Hz, and so on. Osc-1 can be used as an FM modulator, and in order to synthesize harmonic sounds, we need harmonic ratios. Inharmonic sounds are also available via the Fine tuning parameter.

Coarse: Osc-2 only. Coarse tuning control, +- 60 semitones.

Fine: Fine tuning control, +-100 Cents.

- PWM:** Depth of pulse-width modulation. The effect depends upon PWM source, above. The range is ± 10 , with 0 providing a square wave. When an oscillator is chosen as a modulator, the pulse-width oscillates around 0 to \pm the value of PWM. When an envelope is chosen as a modulator, the pulse-width varies from 0 to the value of PWM, following the contour of the envelope. When PWM Source is set to Manual, the pulse-width is the value of PWM, thus if an ordinary square wave is required, choose Manual and set PWM to '0'. PWM only affects the pulse waveform.
- FM:** Depth of frequency modulation. As mentioned above, when an oscillator is chosen as source, phase modulation is employed, and FM controls the depth of the effect. When an envelope is chosen as source, direct frequency modulation is employed. In this case FM also controls the depth of the effect, but the range is in octaves. When Osc-1 is chosen as the modulation source for Osc-2, each of its seven oscillators independently modulates the corresponding oscillator of Osc-2, leading to far more lively sounds than is ordinary for dual oscillator FM synthesis.

Low Frequency Oscillators



Substance's semi-modular design means that the LFOs can be used to modulate almost every parameter of the synth. They can be used to trigger the envelopes, to modulate the frequency and pulse-width of the oscillators, the cutoff frequency of the filters, and the volume of the amplifier.

Controller: LFO-1 only. Choose a MIDI signal to control the level of the LFO (variable between 0 and a maximum level as set by the Level parameter). Choices: None, Mod Wheel, Aftertouch, Expression, Velocity.

Mode: LFO-1: LFO, S/H (sample & hold), LFO Free, S/H Free, Tempo LFO, Tempo S/H, Key LFO
 LFO-2: LFO, S/H, LFO Free, S/H Free-running
 In free-running modes, the oscillator is not synced to MIDI note on, but is constantly running, like an analog oscillator. In the sample and hold modes, the waveform is periodically sampled, the period being given by the Rate control.

Waveform: As per the Oscillator section, above.

Rate: LFO-1: for LFO, S/H, LFO Free, and S/H Free modes, value in Hz. For Tempo LFO and Tempo S/H, tempo-synced note value, a setting of '1' being equal to 1 bar. For Key LFO, the value

in Hz of the current note, multiplied by the fractional value shown. For example, if A = 440 Hz is held, and the fractional value is 1/256, the rate is $440/256 = 1.71875$ Hz.

LFO-2: tempo-synced note value, a setting of '1' being equal to 1 bar.

Slew: LFO-2 only. Smooths the output of the oscillator when in sample and hold mode.

Controller: LFO-1 only. Choices – None, Mod Wheel, Aftertouch, Expression, Velocity. Chooses a controller for LFO Level.

Delay: Amount of time (seconds) by which the onset of the oscillator is delayed.

Attack: Rise time (seconds) of the oscillator.

Level: Level of the oscillator.

Envelope Generators



Standard Attack, Decay, Sustain, Release envelope generators. Times for Attack, Decay and Sustain are given in seconds, however the knobs move logarithmically, as on most analog synthesizers.

Trigger Mode: Gate - envelope is triggered by MIDI note on signal only.

LFO-1 & LFO-2 - envelope is triggered by MIDI note on and then repeatedly retriggered by an LFO.

Signal Processors

Substance's signal processors are located on the right hand side of the interface, and are coloured green.

Ring Mod



Ring Mod X: Choose Osc-1 or LFO-1 as a signal to be ring modulated (multiplied).

Ring Mod Y: Choose Osc-2 or LFO-2 as a signal to be ring modulated (multiplied).

Mixer



Level: Controls the amount of the individual signals in the final mix.

Dest: Sets the destination for the three source signals. Signals can be individually routed either directly to the amplifier, to the low-pass filter, the state-variable filter, or to both the low-pass filter and the state-variable filter.

Amplifier



The amplifier is always controlled by Envelope Generator 1.

Tremolo Source: Chooses either LFO-1 or LFO-2 as the amplitude modulation source.

Tremolo: Controls the depth of amplitude modulation (tremolo).

Level: Master volume.

Velocity: Sets the velocity sensitivity of the amplifier. At '0', velocity has no effect.

Filters



Substance has both a -24dB/Octave low-pass filter, and a -12dB/Octave state-variable filter. The filters operate in parallel.

Mod Source: Chooses modulation source for the filter. Choices: LFO-1, LFO-2, Bender, Mod Wheel, Aftertouch, Expression, Inv(erse) Mod Wheel.

EG Source: Chooses an envelope to control the cutoff frequency of the filter.
LPF: EG-1, EG-2
SVF: EG-1, EG-2, Inverse EG-1, Inverse EG-2

Cutoff: Controls the cutoff or center frequency of the filter (in octaves, 5 = 440Hz).

Res: Controls the resonance (inverse Q-factor) of the filter.

EG: Controls the extent by which the envelope chosen in EG Source modifies the cutoff/center frequency of the filter. Assuming that Cutoff is set to '5', if EG is set to '10', the cutoff frequency will follow the contour of the envelope from 5 to 10 and back to 5. If EG is set to '5', the cutoff frequency will follow the contour of the envelope from 5 to 7.5 and back.

Mod: Controls the depth of modulation applied to the cutoff frequency of the filter. When LFO-1, LFO-2, or Bender is chosen as the Mod Source, only the portion of the cutoff frequency determined by the envelope generator is modulated. If Mod Wheel, Aftertouch, Expression, or Inv Mod Wheel is chosen in Mod Source, modulation affects the headroom afforded to the envelope generator.

Key: Controls the extent to which the filter's initial cutoff frequency tracks the frequency of the note currently playing. At '0' the initial cutoff frequency is completely determined by the Cutoff control, at '10', the initial cutoff frequency is completely determined by the frequency of the note currently playing.

Velocity: Controls the extent to which the filter's final cutoff frequency is determined by MIDI velocity. At '0' velocity has no effect, at '10' the final cutoff frequency (after all other modifications) is completely scaled according to velocity.

LP, HP, BP, BR: SVF only. Controls the level of low-pass, high-pass, band-pass, and band-reject signals present in the output of the state-variable filter.

Performance



Mono/Poly: Choose whether the patch is monophonic or polyphonic. In polyphonic mode, Substance has 16 voices, with 4 reserve voices before note-stealing begins.

Retrigger: Only effective in monophonic mode. If set to 'Retrigger', each new note retriggers the envelopes. If set to 'Legato', the envelopes are not retrigged.

Port: Only effective in monophonic mode, with tied notes. Controls portamento time - the time it takes to glide to the new pitch.

Spread: Controls the amount by which the seven unison voices which comprise each oscillator are detuned and spread throughout the stereo field. The maximum amount of detuning is different for each oscillator.

Bend: The amount by which pitch bend affects the pitch of Osc-1 & Osc-2, in semitones.

Tune: Global tuning control, in semitones.

Credits

Substance was made with SynthEdit, by Jeff McClintock. It uses third party modules by Chris Kerry, Dave Haupt, and Kelly Lynch.

The GUI was designed by Limeflavour.

Patches by Ingo Weidner, Ouroboros, and Tactile Sounds.

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