

Sequential Circuits™ Pro-One

Introduction

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NOAH - Tactive Instrument Modeller

Pro-One

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Introduction

Structure and Overview

From today's perspective the structure of the Pro One could be called "classic". For sound production it features two multi-function oscillators capable of producing multiple waveforms – simultaneously! The oscillator signals are combined with white noise or an external signal in the mixer section and then sent to a 24dB lowpass filter with resonance, and finally to an amplifier. Two envelope generators, each with adjustable attack, decay, sustain and release, are available to modulate both the filter and the amplifier.

A modulation matrix lets you interconnect the filter envelope, oscillator B, and the LFO to achieve a wide range of modulation effects. The combinations of modulation sources and targets available through the selector switches rank this capability as one of the Pro One's notable highlights. Another performance feature, Auto-Repeat, can be used to gate both internal and external signals. Or you can use the envelope follower with adjustable threshold to gate the signal by analyzing an external signal.

Through the use of special *Circuit Modeling procedures* the audio signal is rendered faithful to the original – completely free of aliasing. And those familiar with the concept of aliasing know how unnatural it sounds when recreating an analog signal. The various possibilities for modulation and the resulting sounds benefit from this procedure. Wild modulations can produce signals, such as the distortions and sidebands that develop from frequency modulation, that can easily fill the full range of the audio spectrum. Signal rendition free of aliasing is absolutely essential for reproducing such spectra.

Other components of the synthesizer also profit from circuit modeling. Because the oscillators produce the full bandwidth, they produce more highs. The floating effect when oscillators are slightly detuned has even more vitality when more highs are available. You can also use filter resonance to produce distortions; filter FM (frequency modulation) is possible

thanks to the high-quality algorithms. The analog character of the original is captured completely.

Although being true to the original design was the highest goal during the development of the Pro One, we couldn't help adding a few enhancements. The envelope generators of the plug-in can be modulated by MIDI velocity, the envelope follower has an adjustable threshold, and we added support for MIDI clock control.

Our love of detail is also expressed in the graphic control surface. All controls were specifically designed to maintain a correspondence with the positions of the original controls. If you still have original patch sheets you can transfer them to the plug-in's graphic surface and then (finally) save the settings as presets!

Operation

The Pro One features a work surface consisting of two switchable views (pages) – **Main** and **Additional**. The surface is divided into individual sections. The layout of the sections corresponds to the original and roughly describes the synthesis structure. The **Main** view contains the oscillators, the mixer section, the filter with envelope generator, and the amplifier with envelope generator. Other extensions are on the **Add** page.



The two switches located to the right of the Sequential Circuits Wine Country logo switch between the *views*.

In the upper right corner of the graphic surface you'll find a display for the current preset, and an icon to open the *Preset List*. The *On Top* and *Close* buttons for the surface are also located here.



Enabling *On Top* keeps the work surface visibly in the foreground. The *Close* button removes the surface, and the Preset List, if open, from the screen.

Oscillator A, B

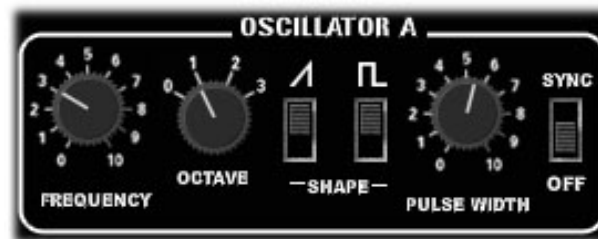
Except for a few differences, oscillators A and B are identical. Selector switches for each oscillator enable or disable the various waveforms. For oscillator A the available waveshapes are sawtooth and pulse; for oscillator B, sawtooth, triangle, and pulse. Because all waveforms can be enabled simultaneously, a mixture of all five oscillator waveshapes is possible. Pulse width can be adjusted manually, or modulated by another signal. If using oscillator B as a modulation source, it is disconnected from keyboard frequency control. Oscillator B can also be switched to operate at low frequencies to serve as an LFO. Oscillator A can be synchronized to oscillator B.

Octave

Sets the octave base for the oscillators. Available values are 0, 1, 2, and 3. Use 0 and 1 for bass instruments, and 2 or 3 for lead sounds.

Frequency

Use this control to detune the oscillators. Mixing the two oscillator signals will produce a livelier sound. The range extends to an octave.



Sawtooth On/Off

Switches the sawtooth wave shape on or off.

Pulse On/Off

Switches the pulse wave shape on or off.

Triangle On/Off

Because oscillator B can also be used as an LFO, it provides a triangle wave (especially useful in a LFO). This button switches the triangle wave on or off.

Pulse Width

Manual adjustment of the pulse width. To hear the effect, the pulse waveshape must be switched on. The range extends from approximately 5% to 100% of the total period. See the Modulation section for information on pulse width modulation.

Sync On/Off

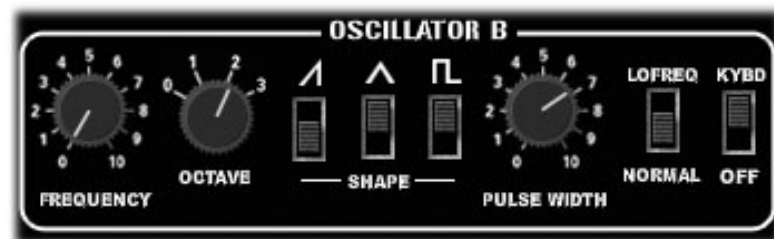
Enables or disables hard sync of oscillator A to oscillator B. Hard sync restarts oscillator A's waveform at the beginning of each cycle of oscillator B. In effect, this transfers the pitch of oscillator B to oscillator A. Depending on the octave, frequency setting, and frequency modulation of oscillator A various spectral effects can be produced.

Lofreq/Normal

Scales the frequency range of oscillator B. When set to Lofreq, the oscillator cycles much more slowly, below the audio range, allowing it to serve as an additional LFO in the modulation matrix.

Kybd On/Off

Disconnects oscillator B from keyboard control. The oscillator no longer follows the keyboard, but operates at the frequency fixed by the Octave, Frequency and Lofreq controls. This allows it to be used as, for example, a modulation source with adjustable frequency.



Audio Mixer

Here the audio signals are mixed before going to the filter. Oscillators A and B each have their own volume controls, while a third controls the level of either the *noise* or an *external* signal, depending on which is selected in the Envelope Follower section. The noise signal is always „white“ noise.

In the original the external audio signal is switched on when the envelope follower is enabled. In the plug-in, enabling the envelope follower and enabling the external signal are separate functions to add flexibility. Find more about this in the Envelope Follower section.



Mixer

Controls the levels of oscillators A and B, and the noise or external signal.

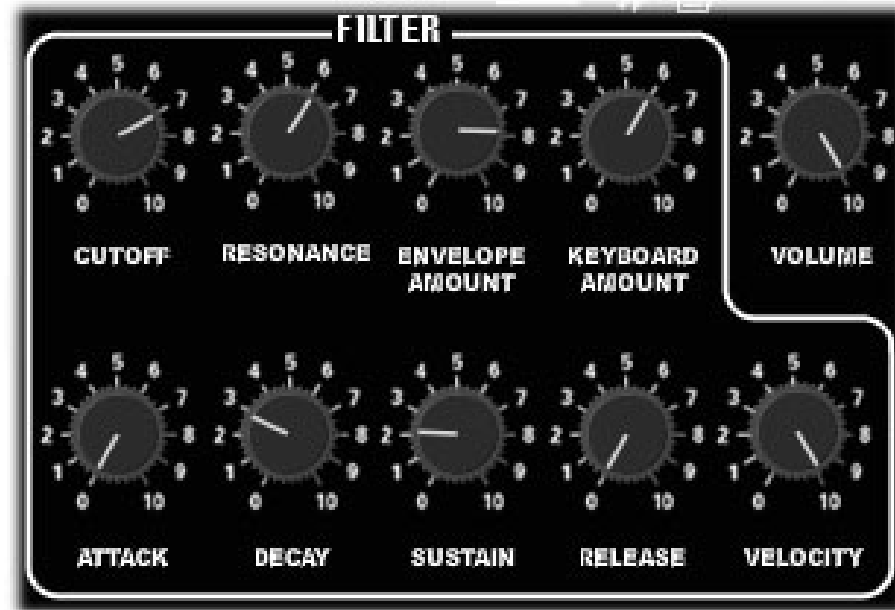
Filter Section

The filter section consists of a modulatable low-pass filter with resonance that can be tuned to the point of oscillation. Together with the envelope generator and other modulation sources, it provides dynamic low-pass filtering. The filter has a slope of 24dB/octave. Frequencies below the cut-off frequency remain unaffected, hence the designation „low-pass“. Frequencies lying above the cutoff are attenuated at a slope of 24dB/octave.

Resonance is implemented by feeding the filter's output back into the input, reinforcing the frequencies surrounding the cutoff frequency. Thanks to the *Circuit Modeling process* the filter duplicates the peculiarities of the original. The cutoff settings and resonance behavior display the typical Pro One character. For modulation, the filter uses its own envelope generator, the keyboard, and sources configured in the modulation matrix.

Cutoff

The Cutoff Frequency is the frequency above which the audio spectrum is attenuated, reducing the strength of the overtones. This control provides a manual adjustment of the base Cutoff Frequency.



Resonance

Resonance results from feeding the filter's output back into the input, thereby reinforcing the frequencies lying near the cutoff frequency. At full resonance, the filter oscillates, producing a sine wave at the cutoff frequency. For this reason, the filter can also be used as another sound source.

Envelope Amount

The intensity of the envelope signal. The cutoff follows the changing envelope level according to the adjusted intensity. The beginning and end points of the envelope lie at the adjusted base cutoff frequency.

Keyboard Amount

Controls the influence of the keyboard position over the cutoff frequency. With Keyboard Amount set to 7, the influence over the frequency is 100% - that is, the cutoff frequency doubles with each octave increase in key position.

Attack

The duration of the first envelope segment. The envelope level rises to its maximum value during the time adjusted here. The intensity of the effect is governed by the Envelope Amount parameter. The actual maximum is determined by the Cutoff frequency and Envelope Amount settings.

Decay

The duration of the second envelope segment. In the decay phase the envelope falls to the Sustain level during the time adjusted here.

Sustain

The third segment of the envelope. This is the level the envelope holds after the decay phase.

Release

During the release phase the envelope falls to its minimum level. This value is the amount of time it takes to fall to minimum. The actual level it falls to is the adjusted base cutoff frequency.

Velocity

The amount of modulation of all envelope levels through keystroke intensity. The levels of the envelope are modulated between minimum and maximum according to the adjusted modulation strength. This influences the tone quality through keyboard activity.

Voltage Controlled Amplifier

With the help of an envelope generator, the amplifier determines the changing level of the volume of the audio signal. An ADSR envelope generator is provided to modulate the amplifier. A Volume control is also a component of this section.



Attack

The duration of the first envelope segment. The volume level rises to its maximum value during the time adjusted here.

Decay

The duration of the second envelope segment. In the decay phase the envelope falls to the Sustain level during the time adjusted here. If Decay is enabled in the Controllers section, then the time set here is overridden.

Sustain

The third segment of the envelope. This is the volume level held after the decay phase.

Release

The fourth envelope segment, active only if the Decay switch is On. The envelope falls back to minimum (silence) during the release phase. This control adjusts the amount of time it takes to fall to zero.

Velocity

The amount of modulation of all envelope levels through keystroke intensity. The levels of the envelope are modulated between minimum and maximum according to the adjusted modulation strength. This influences the volume level through keyboard activity.

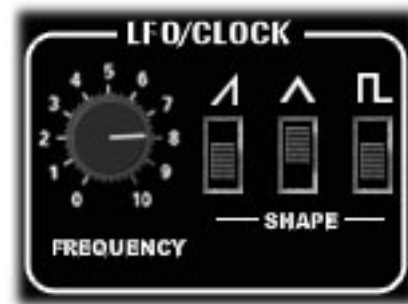
Volume

The synthesizer's overall volume level.



LFO/Clock

Like oscillator B, the Pro One's LFO provides three waveforms selectable via three switches. All, or any combination of the three waveforms can be active simultaneously leading to some very interesting results. The target and intensity of the LFO is configured in the modulation matrix. Some extensions to the original functionality are available on the **Add** page. Here you can synchronize the LFO to MIDI clock, or enable the keyboard to restart the LFO in phase with each key struck. The LFO also serves as the master clock for the Repeat. That is, the LFO frequency controls the speed of these three functions. Alternatively, they can be synchronized to an incoming MIDI clock. This option is also found on the **Add** page.



LFO Freq

Adjusts the frequency of the LFO.

Sawtooth On/Off

Switches the sawtooth wave on or off.

Pulse On/Off

Switches the pulse wave on or off.

Triangle On/Off

Switches the triangle wave on or off.

LFO Settings



Restart/Free Run

Select between *Restart* and *Free Run* modes. In the Free Run mode, the LFO runs continuously. In Restart mode, the LFO resyncs to the waveform phase position (restarted) whenever a key is struck on the MIDI keyboard.

Phase

Adjusts the phase position at which the LFO resyncs when a key is struck and the LFO is in Restart mode.

MIDI/Hertz

Selects between manual or MIDI control of the LFO frequency. If MIDI is enabled, a drop-down list containing a selection of note lengths is available on the Main page. The length of the note corresponds to a single period of the LFO.

Modulation

The Pro One has three modulation sources – filter envelope, oscillator B, and LFO – and five modulatable targets – oscillator A, oscillator B, oscillator A pulse width, oscillator B pulse width, and filter cutoff frequency. You can connect the modulation sources to the targets directly, or route them through the modulation wheel. The basic intensity of the modulation is adjusted at each source. If the modulation involves the modulation wheel, then the wheel also influences the final modulation depth. The filter envelope generator and oscillator B are polyphonic modulation sources; they operate per voice. The LFOs are monophonic; they operate on the overall sound (all voices simultaneously).

From

In this section you establish the basic intensities of the modulation sources and decide if the signal goes directly to the target or first to the modulation wheel for additional control over the target modulation.



Filter Amount

Sets the modulation depth of the filter envelope for all selected targets.

OSC B Amount

Sets the modulation depth of oscillator B for all selected targets.

LFO Amount

Sets the modulation depth of the LFO for all selected targets.

Route Wheel/Direct

Selects the the bus for the modulation signal. The signal can be sent directly to the targets (Direct), or to the modulation wheel (Wheel) for additional manual control of the target modulation.

To

In this section you connect the targets to the modulation busses. In the Off position, modulation is disabled.

Wheel/Off/Direct

Here you choose whether the respective modulation target is modulated at all, directly, or through the modulation wheel.

Wheel Modulation

The intensity of the modulation signal in the Wheel bus is controlled by the modulation wheel. In the original synth, this was the only control over this bus. In our version we added modulation intensity and offset for even more control. The pitch intensity through the Bender is similarly adjustable (see the **Add** page).



Bend Range

Adjusts the maximum pitch deflection of the Pitchbend wheel in semitones. The range is from 0 to 24 semitones.

Modulation Intensity

Sets the maximum intensity of the modulation signal for the wheel bus. This is the intensity produced when the wheel is fully open.

Modulation Offset

Fundamental intensity of the modulation signal for the wheel bus (with wheel at the 0 position). The modulation wheel increases the modulation beyond the basic level depending on the offset and intensity settings.

For these settings to produce modulation with a basic intensity the signal must be switched to the wheel bus. Then select the target and adjust the settings to produce the desired effect.

Glide

With Glide enabled the pitch glides from one note to the next at a preset rate. Glide has two modes: *Auto mode* in which glide operates only on notes played with a legato style; and *Normal mode*, in which the pitch always glides whenever a new key is played.



Rate

The time it takes for the pitch to glide from one note to the next. The Glide function does not have to be specifically activated – it is only necessary to enter a glide rate to enable it. Glide is off when the rate is 0.

Auto/Normal

Selects the Glide mode. In Auto mode only notes played with a legato style glide from one to the next. In Normal mode, each new note activates the Glide function.

To play a typical lead sound using Glide, you should be in Single mode. **Only in this mode does the Pro One plug-in behave exactly like the original.** If Single mode is switched off, polyphonic glide is also possible. Single mode is an extension found in the Global section.

Aftertouch

The original Pro One filter had only a CV (control voltage) In for external control of the filter. This modulation is now controlled by MIDI aftertouch. The pitches of the oscillators can also be modulated by aftertouch. The intensity of aftertouch is individually adjustable for each target.



Pitch Osc A/B

Intensity and polarity of the pitch modulation of the oscillators by aftertouch. This lets you control pitchbend with key pressure. Selector switches direct the modulation to oscillator A, oscillator B, or both.

Filter

Intensity and polarity of the filter cutoff frequency modulation by aftertouch. This lets you apply filter sweeps using key pressure (aftertouch).

Mode

The settings in this section essentially define the *trigger* behavior of the envelope generators. Apart from the Trigger mode which determines how the envelopes start when a new key is played, there is also *Auto Repeat*, which re-triggers the envelope with the clock or envelope follower, and a *Drone mode*, in which all played notes freeze and/or stop playing.

Retrig/Normal

Establishes the trigger behavior. In Normal mode the envelope is not re-started when stealing voices. This means that legato passages, in which the envelope is not triggered with each new note, is possible. In *Retrig mode* the envelope re-starts regardless of voice-stealing. This mode is appropriate for percussive sounds, for example, in which each new note retains its attack whether played legato or not.

In the original Pro One, 'low note priority' applied in Normal mode, and 'last note priority' in Retrig mode. In the plug-in version the priority settings were separated from the trigger mode for added flexibility. Note priority is now independently adjustable and located in the Global section.



Repeat/External, Normal

In the *Normal* position the envelope responds as you would expect, with each key struck on the keyboard. By enabling *Repeat/External* you can have the envelopes trigger automatically via the LFO clock, the MIDI clock, or the Envelope Follower. To use the LFO clock, select *LFO* under Clock settings. Select MIDI to use the MIDI clock (16th notes). In either case, the Envelope Follower will be used for envelope triggering if it has been enabled. For the envelope follower, an audio signal must be present and the threshold adjusted appropriately. The envelope will then start when the threshold has been exceeded, and continue until it falls below the threshold level. Because automatic triggering takes place only when a key is struck on the keyboard, „gating“ individual tones or whole chords is possible. Remember to adapt the envelope times to the tempo.

Drone/Normal

You can think of Drone as a manual MIDI sustain pedal that you can turn on with this switch. If you enable Drone before or while playing a note, the note will be held, or sustained. This also applies to chords. If the adjusted polyphony is exceeded, notes are dumped. Drone behaves exactly like a MIDI sustain pedal.

Both Repeat and Drone modes were improved in the plug-in such that polyphonic play is possible. Therefore Repeat and Drone now function only when a key is pressed.

Global Settings

This section contains the parameters that apply to the entire instrument. The global controls are located on the **Add** page.

Master Tune

This control changes the pitch (tuning) of the entire instrument. The range is +/- 5 semitones.

Low Note/Last Note

Switches between low-note and last-note priority. When set to low-note priority, high notes will be 'stolen' before lower notes when maximum polyphony is exceeded. When set to last-note priority, notes played earlier will be turned off in favor of the notes played later. Interesting effects develop through the interaction of voice stealing with envelope triggering as configured by the trigger modes on the **Main** page.

In the original Pro One, low-note priority automatically applied in Normal mode, and last-note priority in Retrigger mode. Of course, this behaviour can also be configured in the plug-in version with the appropriate settings.



Single On

Enables correct single voice administration regardless of how many voices are active. This ensures the correct production of sounds when using solo and/or glide.

MIDI/LFO

Here you choose whether the Repeat function synchronize to the LFO or the MIDI clock.

Envelope Follower

The Envelope Follower analyzes an incoming audio signal and derives an envelope from it. The Pro One uses this signal to produce a gate for triggering the envelopes with Repeat/External switched on, or to derive a clock to step the sequencer or arpeggiator. The threshold – the level at which the gate opens or closes – is adjustable. The controls for the Envelope Follower are located on the **Add** page.



Env Follower/Off

Enables the Envelope Follower. If *Repeat/External* is switched on, the envelopes are triggered by the envelope follower *gate*. That is, when the threshold is exceeded the envelope starts and holds at the sustain level as long as the gate is open. When the signal falls below the threshold the envelope enters the release phase.

Threshold

Here you set the level at which the envelope follower produces a gate signal. When the incoming signal rises above the level a gate is produced, and remains open until the signal falls below the threshold. Adjust the level so that, for example, certain level peaks in a drum loop produce a gate signal. The gate can then step the sequencer or arpeggiator rhythmically, or, in Repeat/External mode, trigger the envelope generator. Use this to produce all kinds of interesting rhythmic effects depending on the incoming raw material.

External/Noise

Selects the signal at the Noise/Ext control in the mixer. Originally in the Pro One switching on Repeat/External in the envelope follower automatically assigned the external signal to the third volume controller. This control can now be configured for either Noise or the External signal.

Ext Source

Select the external source here (Slot1, Slot2, Slot3, Slot4, Analog, USB).

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