

# discoDSP Phantom v1.1



## Users Manual

8 Voice / 4 Operators  
Frequency / Phase Modulation  
VSTi Synthesizer

<http://www.discoDSP.com/>

## Installation

To install Phantom, simply run the provided installation application and follow the steps indicated.

The **Demo version** of Phantom has got the following limitations:

- A small noise burst will appear every two minutes.
- It won't be able to restore current state when a project is reloaded.
- No automation available.

## Description

Phantom uses four operators, offering many potential connection possibilities.



These different configurations of operator relationships are called algorithms and phantom offers 8 possible routings, which are displayed in the editor panel.

The small boxes numbered 1 through 4 are the operators.

## Features

Phantom boasts the following powerful feature set:

### General

- Eight voices, four operators phase or frequency modulation synthesizer.

### System requirements

- 2 GHz CPU recommended for full polyphony.
- Win32 VST v2.0 or higher version compliant host.

### Operators

- Key and velocity scaling.
- Initial phase (with free-run support).
- Phase modulation self-feedback amount.
- Tune (Frequency ratio).
- Octave shift.
- Amplitude LFO and AD1SD2R envelope.

### Program

- Eight Operator routing algorithms.
- Customizable pitch bend range.
- Global velocity modulation/amplitude sense.
- Glide with auto-on-legato mode.
- Full mono/legato/polyphonic operation.
- Pitch LFO and AD1SD2R envelope
- 4-Pole resonant filter (Lowpass, Hipass, Bandpass, Reject modes).
- Filter LFO and AD1SD2R envelope.
- Built-in stereo multieffects unit with chorus, delay and reverb.
- Pitch bend / Mod wheel controller.

### Extras

- Yamaha DX100/DX27/DX21 SysEx data import.
- Includes 256 presets.

## Basics of FM/PM Synthesis

The following explanation will show how Phantom's voice generator synthesizes the sound.

This information will help you to understand the process and make it easier to create and edit your own programs.

Phantom runs 4 operators per voice, which are pure sine waves oscillators that interact to create the harmonic spectrum for the voice. Each oscillator (sine) amplitude is modulated with its own envelope generator and lfo to form the operator.

Input Signal (Modulator) → Operator (Carrier) → Output

Each operator works with two inputs, the modulation input signal and the pitch (note) information.

The operator pitch input determines the fundamental frequency of the operator output signal, and the modulator input can be applied to the oscillator in two ways:

- Modulating it's phase (classic phase modulation used in Yamaha DX synthesizers and most so-wrongly-called FM synthesizers),
- Modulating it's frequency (frequency modulation, rarely featured [Clavia's Nord Lead 2 to name one]).

The main difference between **Phase Modulation** and **Frequency Modulation** is that in PM the number of sidebands produced by the operator is not dependant on the frequency of the carrier oscillator, it is always equal to the amplitude of the modulator in radians, in frequency modulation, the number of sidebands is inversely proportional to the carrier operator oscillator frequency (the higher frequency, the less sidebands).

A wide-range variety of harmonic spectrum can be achieved feeding the output of one to the input of a second operator, from triangle, square and saw tooth shapes to complex rich-harmonic shapes.

## 1. Program Options



- **Master Volume:** Global program volume.
  - **Pitch Bend -** The pitch bender allows you to drastically change the pitch of the current patch in real-time. You can modify the pitch bend by using the Pitch Bend Range knob.
  - **Glide:** Amount of time a note will make a legato with other. If **Auto** switch is enabled, the portamento will be only applied if overlapping notes are played
  - **Velocity Modulation:** Amount of positive or negative modulation applied in relation to keyboard velocity.
- **Velocity Amplitude:** Amplitude of the notes regarding keyboard velocity.
  - **Play Modes:**
    1. **Mono:** Only 1 voice of the synthesizer is used. In this mode any note played will discontinue the previous note.
    2. **Legato:** A monophonic mode in which envelopes are not restarted when new keys are played.
    3. **Poly:** Polyphonic mode allows multiple notes to be played at once.

**Note:** Morphing values (see section 3) are related to both **Mod wheel** and **Velocity Modulation**.

## 1.1 Program Pitch Section



### Pitch LFO

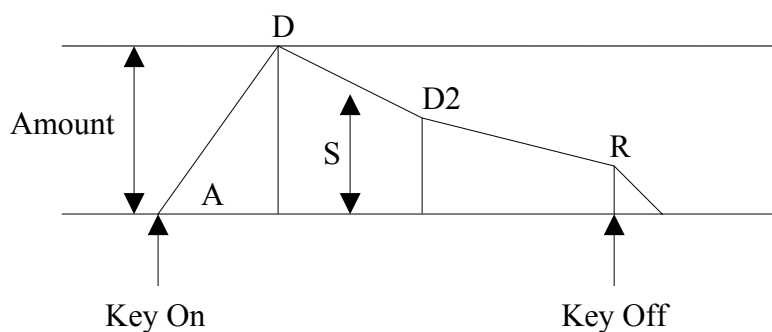
Low Frequency Oscillators operate much like the basic oscillators, only at much slower speeds.

- **Phase:** This control sets the phase (frequency) of LFO. This is used to set the starting LFO phase when a note is triggered. If you need a **phase free LFO** set the knob to max value.
- **Rate:** This control sets the speed (frequency) of LFO. Smaller values result in slower oscillations, larger values in faster oscillations.
- **Amount:** Amount control determines the amount of LFO output to use on the destination control(s). Higher values will result in a more dramatic modulation.

## Pitch Envelope



The Pitch Envelope allows easy ADSD2R (Attack, Decay, Sustain, Decay2, Release) envelope based modulation of the Pitch.



- **Attack:** Initial amplitude increase. This can be made very steep if desired
- **Decay:** The angle of initial amplitude decrease.
- **Sustain:** Sets the pitch at which envelope stays while note is continually pressed, once attack and decay have completed.
- **Decay2:** Secondary amplitude decrease. This will continue indefinitely unless 'key off' occurs.
- **Release:** Begins once the note is released, controlling the time the gain will fall from current envelope point (Sustain) until complete.
- **Amount:** The Amount option controls the amount of the Pitch envelope applied to the global pitch.

## 1.2 Program Filter Section



Once the oscillators are mixed, sound is next routed through the pitch then the filter. This section will transform the frequency response of the signal.

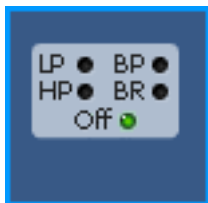
A filter is a unit that changes the magnitude of a range of frequencies of the sound, boosting or cutting these frequency values.

The two most common filter parameters are the Frequency and Resonance controls.

- **Frequency:** or 'cutoff' point. This value sets the frequency point affected by the filter response.
- **Resonance:** This value determines the amount of amplification of the range of frequencies surrounding the frequency (cutoff) point.

### Filter Types

Phantom has four filter types. You may toggle through these types by clicking the leds. The active filter is also showed as a green led.



Available filter types follow:

- **LP:** A 4 pole Lowpass Filter with -24dB per octave roll off. This functions similar to the LP 12db, but with a steeper frequency curve response.
- **BP:** A Bandpass Filter, which allows only the frequency range surrounding cutoff point to pass through. Resonance controls the size of this bandwidth.
- **HP:** The opposite of the Lowpass filters, the Highpass will pass frequencies above the cutoff point and will cut all range below. This filter type has a roll off of -24dB per octave.



- **HP:** Will pass frequencies above the cutoff point and will cut all range below. This filter type has a roll off of -24dB per octave.
- **Off:** Filter will be disabled.



### Filter LFO

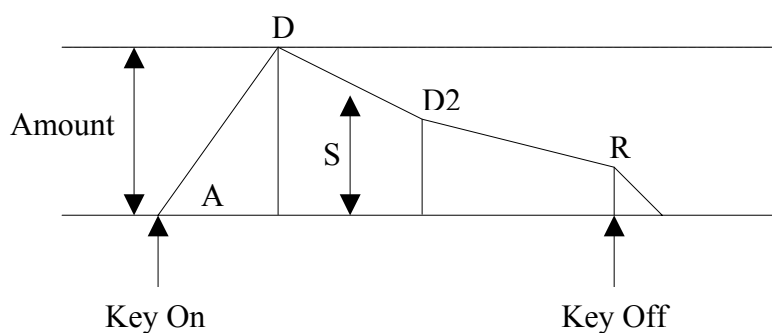
Low Frequency Oscillators operate much like the basic oscillators, only at much slower speeds.

- **Phase:** This control sets the phase (frequency) of LFO. This is used to set the starting LFO phase when a note is triggered. If you need a **phase free LFO** set it the control to max value.
- **Rate:** This control sets the speed (frequency) of LFO. Smaller values result in slower oscillations, larger values in faster oscillations.
- **Amount:** Amount control determines the amount of LFO output to use on the destination control(s). Higher values will result in a more dramatic modulation.

## Filter Envelope



The Filter Envelope allows easy ADS2R (Attack, Decay, Sustain, Decay2, Release) envelope based modulation of the filter Cutoff control.



- **Attack:** Controls for the time in which the filter envelope moves from 0 (note play) to full filter (based on the Envelope Amount, below).
- **Decay:** Controls the time length between the end of attack and the sustain level.
- **Sustain:** Sets the filter point at which envelope stays while note is continually pressed, once attack and decay have completed.
- **Decay2:** Secondary amplitude decrease. This will continue indefinitely unless 'key off' occurs.
- **Release:** Begins once the note is released, controlling the time the gain will fall from current envelope point (Sustain) until complete.
- **Amount:** The Envelope Amount option controls the amount of the Filter envelope applied to the Cutoff frequency.

### 1.3 Built-in Effects

Phantom includes three high-quality effects:



#### Chorus

- **Level:** Amount of the chorus applied. Turning it to minimum values bypass it.
- **Delay:** Controls how much of the signal is captured and repeated.
- **Fdback:** This controls how many times the signal is repeated.
- **Rate:** This controls the amount of the LFO.
- **Mod:** This controls the amplitude of the LFO.

#### Delay

- **Level:** Amount of the delay applied. Turning it to minimum values bypass it. Delay can be **synced** or **switched to cross delay** by clicking the buttons in the section.
- **Delay:** Controls how much of the signal is captured and repeated
- **Fdback:** This controls how many times the delayed signal is repeated.

#### Reverb

- **Level:** Amount of the reverb applied. Turning it to minimum values bypass it
- **Room** and **width:** This sets the length of time that the reverb lasts for - higher settings simulate larger spaces.
- **Damp:** Controls the rate at which reverberant energy is absorbed by the various surfaces in the environment.

## 1.4 Additional program options



- **Import:** Opens a dialog box to import Yamaha's DX21, DX27 or DX100 SysEx patches.
- **Reset:** Will reset current program.
- **Panic:** Will turn all the current notes off.

## 2. Operator Sections

### 2.1 Concepts

Operators are the basis of sound generation in this synthesis method. Phantom includes four of them, each with various modes and waveform types. There are four dedicated operators assigned to every channel, with the following properties:



- An operator has an input, a frequency and envelope with which to modify the input, and an output.
- The operators have two types, those whose outputs feed into another operator, and those that are summed to form the final wave form. The latter are called "slots".
- Operators may feed back into itself, resulting in a more complex waveform.

These operators may be arranged in eight different configurations, called "algorithms" which you will be able to switch by **clicking the leds** at the right of the routing LCD.

Algorithm	Layout	Suggested uses
1		Distortion guitar, "high hat chopper" bass.
2		Harp.
3		Bass, electric guitar, brass, piano, woods.
4		Strings, folk guitar, chimes.
5		Flute, bells, chorus, bass drum, snare drum, tom-tom.
6		Brass, organ.
7		Xylophone, tom-tom, organ, vibraphone, snare drum, base drum.
8		Pipe organ.

Shading indicates slots.

## 2.2 Global



### Operator

- **Pm/Fm leds:** Click the leds to switch the operator to Phase or Frequency modulation modes.
- **Vel Scaling:** Velocity scaling amount.
- **Phase:** Operator. Setting max value will set it to **phase free** operator.
- **Feedback:** Feed back amount into itself, resulting in a more complex waveform.
- **Kbd Scaling:** Keyboard scaling amount.
- **Tune:** Frequency rate amount.
- **Octave:** Root octave, click the leds to make the transposing.



## Amp LFO

Low Frequency Oscillators operate much like the basic oscillators, only at much slower speeds.

- **Phase:** This control sets the phase (frequency) of LFO. This is used to set the starting LFO phase when a note is triggered. If you need a **phase free LFO** set it the control to max value.
- **Rate:** This control sets the speed (frequency) of LFO. Smaller values result in slower oscillations, larger values in faster oscillations.

**Amount:** Amount control determines the amount of LFO output to use on the destination control(s). Higher values will result in a more dramatic modulation.

## Amp Envelope



Amplifier applies an envelope to the output gain of the current layer of sound. This is the final stage of synthesis. The following controls apply:

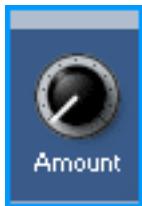
- **Attack:** Controls for the time that envelope moves from note press (0) to full volume. (Does not apply to legato mode).
- **Decay:** This knob controls the time length between envelope gain goes from upper point (end of Attack) to Sustain level.
- **Sustain:** Sets the point at which the envelope stays while note is held. This state is held until the note is release.
- **Decay2:** Secondary amplitude decrease. This will continue indefinitely unless 'key off' occurs.
- **Release:** Once the note is released, this knob will control the time in which the gain will fall from current envelope point (Sustain) into complete silence, finishing the voice use. Longer releases can result in many simultaneous voices, resulting in higher CPU usage.

### 3. Morphing

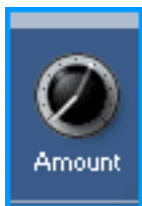
Each program contains two internal states: morph **source** and morph **sensibility**. Each state contains a unique set of all values. **Morphing** allows you to easily glide between these values.

The morph sensibility state is seen thru alpha blend, and can be modified by using **CTRL** key while adjusting the knob.

#### Original state



#### Morphed State (when using Ctrl + Click then moving the mouse)



Notice the LCD will display the amount of the morphing.



This feature is very unique and innovative regarding FM and PM synthesis so you will be able to create really fresh and expressive sounds using this technique.



## Version History

### Version 1.1

#### Additions:

- New default bank designed by Scott Solida and Jaime C. Newman.

#### Bugfixes:

- Small filter issue.
- Knobs parameter automation behaviour.

### Version 1.0

- Initial Release.

## Contact

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