PROGRAMMING BASICS

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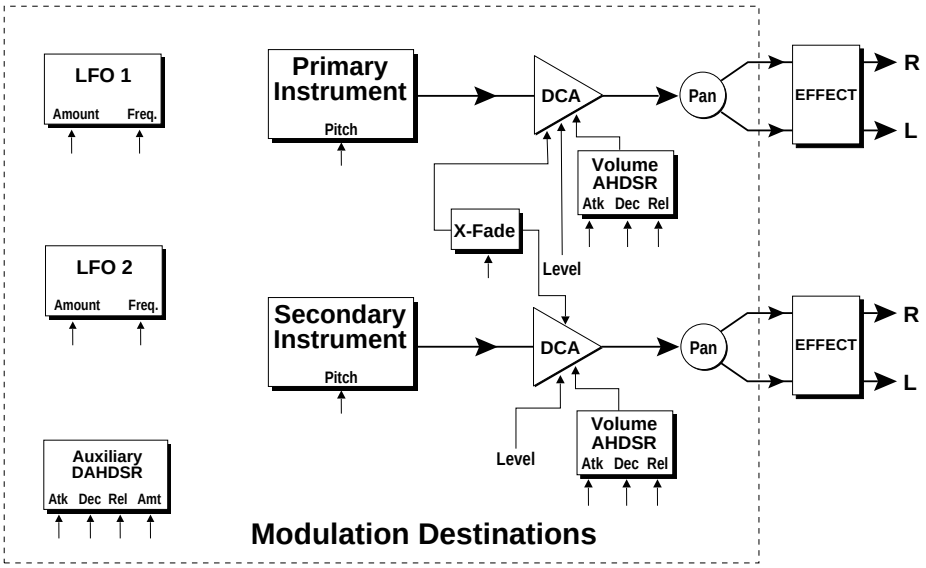
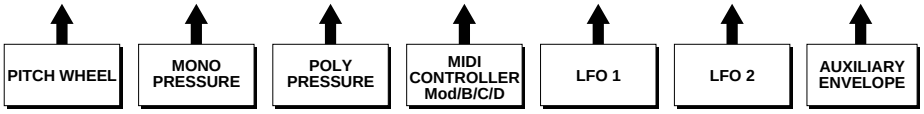
This section of the manual covers basic synthesizer operations (which are applicable to many types of synthesizer, not just Proteus), as well as several functions and concepts unique to Proteus.

Your initial involvement with the Proteus will most likely consist of using the existing presets and selecting MIDI channels. While the factory presets are very good, there are probably some things you would like to change, perhaps the LFO speed, the attack time, or the type of effects processing. You may also want to make your own custom presets using complex modulation routings. Entirely new sounds can be created by combining the attack portion of one sound with the body of another sound or by combining the digital waveforms with sampled sounds. There are 200 (100 internal, 100 card) locations available to store your own creations or edited factory presets. Best of all, it's easy to edit or create new presets using the Preset Edit menu.





Realtime Modulation Sources

This block diagram shows the layout of the Proteus. Because of the extensive modulation controls, Proteus is able to synthesize new sounds as well as emulate traditional instruments.

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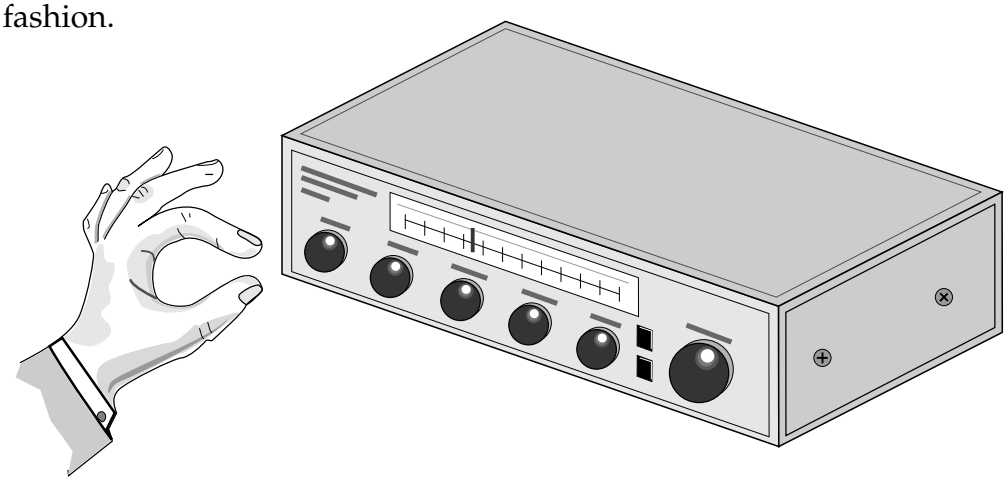
Presets can be made up of both a primary and secondary instrument. Proteus has an extensive modulation implementation using two multi-wave LFO's (Low Frequency Oscillators), two envelope generators and the ability to respond to multiple MIDI controllers. You can simultaneously route any combination of these control sources to multiple destinations.

MODULATION

Modulation means to *dynamically change* a parameter, whether it be the volume (amplitude modulation), the pitch (frequency modulation), or whatever. Turning the volume control on your home stereo rapidly back and forth would be an example of amplitude modulation. To modulate something we need a modulation *source* and a modulation *destination.* The source is your hand turning the knob, and the destination is the volume control. If we had a device that would automatically turn the volume control, we would also call that device a modulation source. The Proteus is designed so that for each of the variable parameters, such as the volume, there is an initial setting which can be changed by a modulation source. Therefore in the case of volume, we have an initial volume and we can change or modulate that volume with a modulation source. Two main types of modulation sources on the Proteus are *Envelope Generators* and *Low Frequency Oscillators*. In the example above, an envelope generator could be routed to automatically turn the volume control as programmed by the envelope. Or, a low frequency oscillator could be routed to automatically turn the volume control up and down in a repeating fashion.



Turning the volume control back and forth on your home stereo is an example of Amplitude Modulation.

MODULATION SOURCES

Proteus uses three kinds of modulation sources.

■ KEYBOARD and VELOCITY MODULATION

Values which are generated at the start of a note and do not change during the note.

Keyboard Key - Which key is pressed.

Key Velocity - How hard the key is pressed.

■ REALTIME MODULATION

Values which can be continuously changed during the entire duration of the sound.

Pitch Wheel - The left, spring-loaded pitch bend wheel on Proteus.

Modulation Wheel - The right wheel can be programmed to control various functions.

Control Pedal - A control pedal can be programmed to control volume or various other functions.

Miscellaneous Controllers (3) - Any type of MIDI controller data.

Keyboard Pressure (mono aftertouch) - Key pressure applied after the key is initially pressed.

Polyphonic Key Pressure - Pressure from a controller capable of generating polyphonic pressure data.

Low Frequency Oscillators (2) - Generate repeating waves.

Envelope Generators - Generate a programmable "contour" which changes over time when a key is pressed.

■ FOOTSWITCH MODULATION

Changes a parameter when a footswitch is pressed. The three footswitches can be programmed to switch: Sustain (pri/sec/both), Alternate Volume Envelope (pri/sec/both), Alternate Volume Release (pri/sec/both), or Cross-Switch between the primary and secondary instruments.

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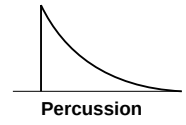
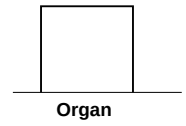
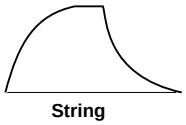
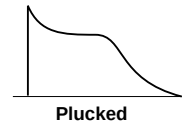
ENVELOPE GENERATORS







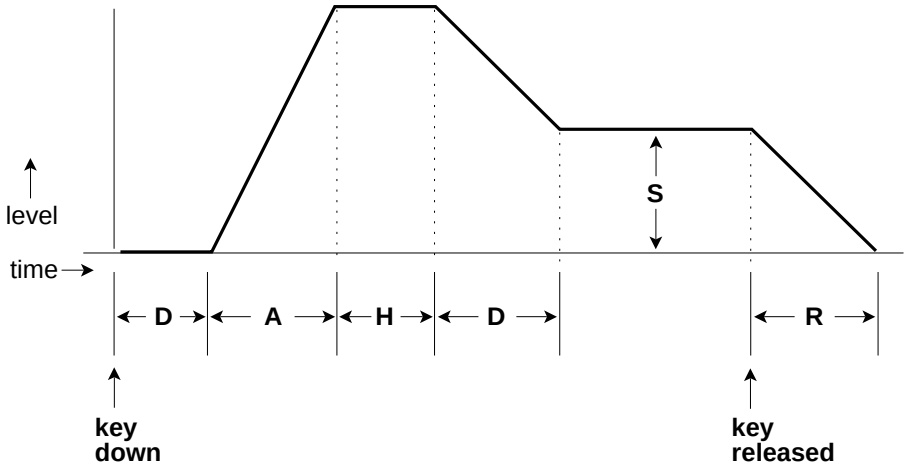


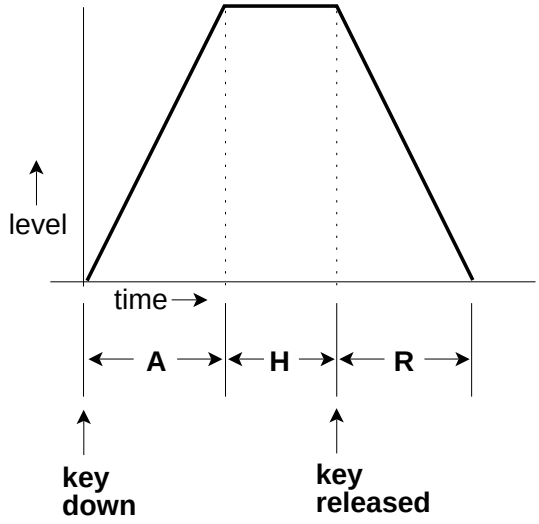
■ *The generalized envelope shapes of a few types of sounds are shown above.*

An envelope can be described as a "contour" which can be used to shape the sound in some way over time. Each channel of the Proteus contains three envelope generators. The Alternate Volume Envelopes which control the volume of the primary or secondary instrument have 5 stages: Attack, Hold, Decay, Sustain, and Release. The third envelope, the Auxiliary Envelope, can be routed to any realtime control destination and is a general purpose envelope. The Auxiliary Envelope has 6 stages: Delay, Attack, Hold, Decay, Sustain, and Release. The Envelope parameters can be described as follows:

- ***Delay -*** The time between when a key is played and when the attack phase begins.
- ***Attack -*** The time it takes to go from zero to the peak (full) level.
- ***Hold -*** The time the envelope will stay at the peak level before starting the decay phase.
- ***Decay -*** The time it takes the envelope to go from the peak level to the sustain level.
- ***Sustain -*** The level at which the envelope remains as long as a key is held down.
- ***Release -*** The time it takes the envelope to fall to the zero level after the key is released.

■ *Note: An envelope only works while there is sound. With some short sounds, slow release rates will have no effect and slow attack rates will shut the sound off.*



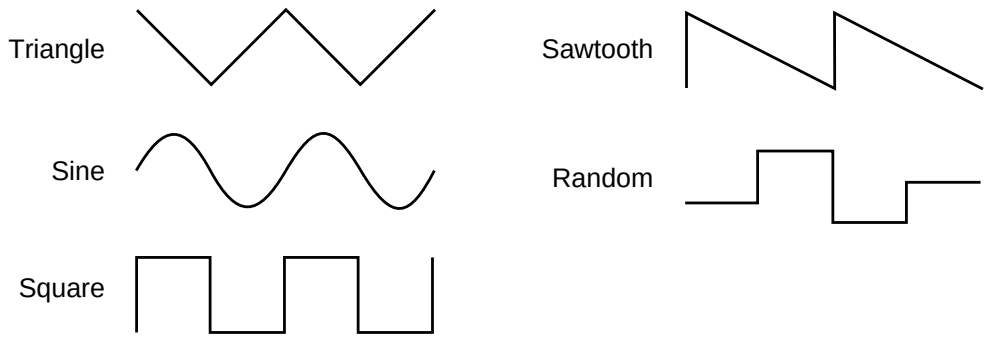


If the key is released during the Attack (A) or Hold (H) phase, the Release (R) phase begins.

LOW FREQUENCY OSCILLATORS (LFOs)

A Low Frequency Oscillator is simply a wave which repeats at a slow rate. The Proteus has two multi-wave LFOs for each of its 32 channels. The LFO waveforms are: Triangle, Sine, Square, Sawtooth, and Random, which is a non-repeating "sample and hold" type of wave.

By examining the diagram of the LFO waveforms, you can see how the LFO will affect a modulation destination. Suppose we are modulating the pitch of an instrument. The sine wave looks smooth, and will smoothly change the pitch. The square wave changes abruptly, and will abruptly change the pitch from one pitch to another. The Sawtooth wave smoothly decreases, then abruptly changes back up. The sound's pitch will follow the same course. Controlling the pitch of an instrument is an easy way to hear the effects of the LFO waves.



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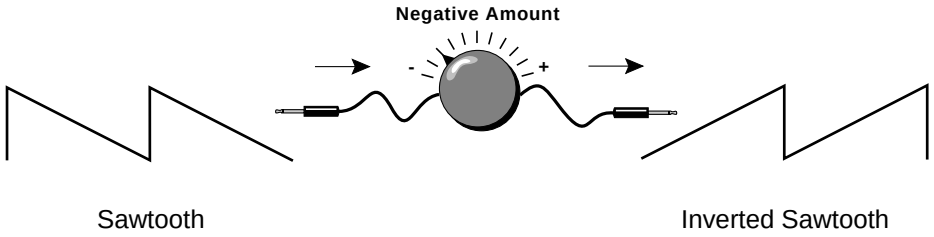
When the amount of an LFO is a negative value, the LFO shape will be inverted. For example, inverting the Sawtooth wave produces a wave that smoothly increases, then instantly resets down.



MIDIPATCH ™

Connecting a modulation source to a destination is called a *patch*. Proteus lets you connect the modulation sources in almost any possible way to the modulation destinations. You can even modulate other modulators. Each patch also has an amount parameter which determines "how much" modulation is applied to the destination. The modulation amount can be positive or negative and will either add or subtract from the initial value. Keyboard and velocity sources can be simultaneously patched to any 6 of the 33 destinations for each preset. Realtime modulation sources can be simultaneously patched to any 8 of the 24 destinations for each preset.