intellijel

Atlantis

Dual Oscillator Subtractive Synth Voice

Manual (English)
Revision: 2021.04.26

TABLE OF CONTENTS

COMPLIANCE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Intellijel Designs, Inc. could void the user's authority to operate the equipment.

Any digital equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

This device meets the requirements of the following standards and directives:

EMC: 2014/30/EU
EN55032:2015 ; EN55103-2:2009 (EN55024) ; EN61000-3-2 ; EN61000-3-3

Low Voltage: 2014/35/EU
EN 60065:2002+A1:2006+A11:2008+A2:2010+A12:2011

RoHS2: 2011/65/EU

WEEE: 2012/19/EU

INSTALLATION

Intellijel Eurorack modules are designed to be used with a Eurorack-compatible case and power supply. We recommend you use Intellijel cases and power supplies.

Before installing a new module in your case, you must ensure your power supply has a free power header and sufficient available capacity to power the module:

- Sum up the specified +12V current draw for all modules, including the new one. Do the same for the -12 V and +5V current draw. The current draw will be specified in the manufacturer's technical specifications for each module.
- Compare each of the sums to specifications for your case's power supply.
- Only proceed with installation if none of the values exceeds the power supply's specifications. Otherwise you must remove modules to free up capacity or upgrade your power supply.

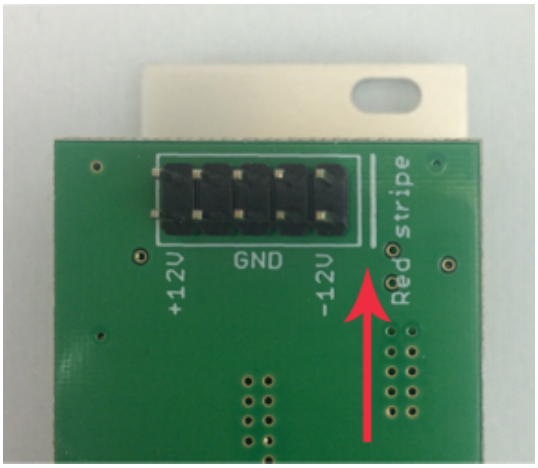
You will also need to ensure your case has enough free space (hp) to fit the new module. To prevent screws or other debris from falling into the case and shorting any electrical contacts, do not leave gaps between adjacent modules, and cover all unused areas with blank panels. Similarly, do not use open frames or any other enclosure that exposes the backside of any module or the power distribution board.

You can use a tool like ModularGrid to assist in your planning. Failure to adequately power your modules may result in damage to your modules or power supply. If you are unsure, please contact us before proceeding.

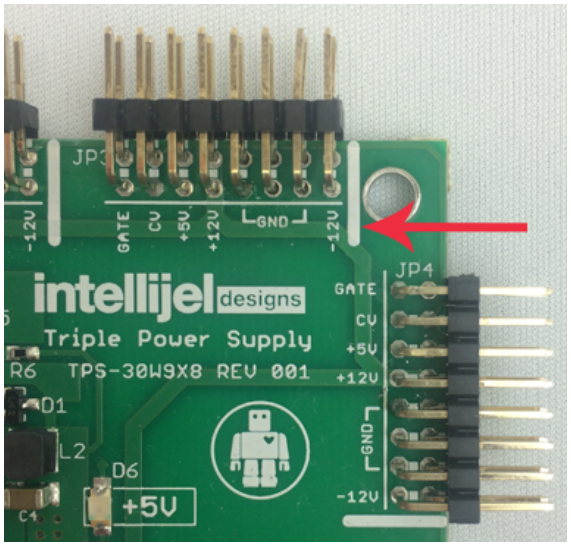
Installing Your Module

When installing or removing a module from your case always turn off the power to the case and disconnect the power cable. Failure to do so may result in serious injury or equipment damage.

Ensure the 10-pin connector on the power cable is connected correctly to the module before proceeding. The red stripe on the cable must line up with the -12V pins on the module's power connector. Different modules use different ways to indicate the -12V pins. Some may be labelled with "-12V;" a white stripe next to the -12V pins; the words "red stripe;" or some combination of these. Additionally, some modules may have shrouded headers, thus preventing backward connections.



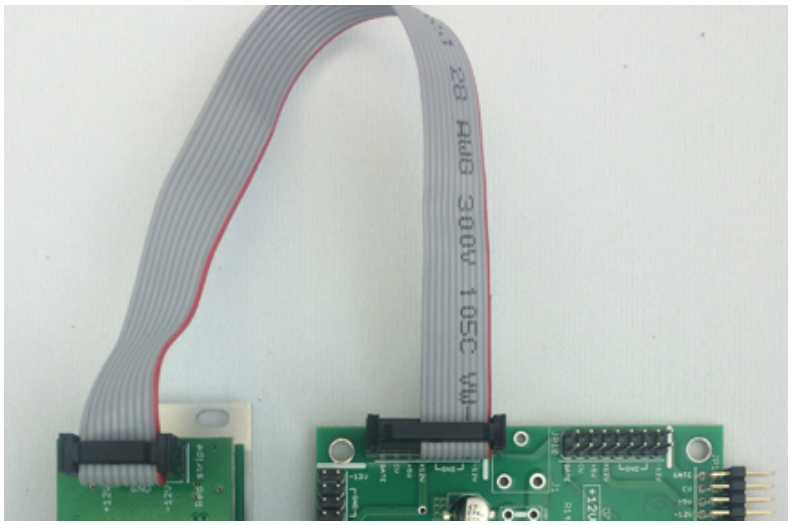
Most modules will come with the cable already connected but it is good to double check the orientation. Be aware that some modules may have headers that serve other purposes so ensure the power cable is connected to the right one.



The other end of the cable, with a 16-pin connector, connects to the power bus board of your Eurorack case. Ensure the red stripe on the cable lines up with the -12V pins on the bus board. On Intellijel power supplies the pins are labelled with the label "-12V" and a thick white stripe. Sometimes the connectors are shrouded, ensuring the cable can only be oriented in one direction.

If you are using another manufacturer's power supply, check their documentation for instructions.

Once connected, the cabling between the module and power supply should resemble the picture below:



Before reconnecting power and turning on your modular system, double check that the ribbon cable is fully seated on both ends and that all the pins are correctly aligned. If the pins are misaligned in any direction or the ribbon is backwards you can cause damage to your module, power supply, or other modules.

After you have confirmed all the connections, you can reconnect the power cable and turn on your modular system. You should immediately check that all your modules have powered on and are functioning correctly. If you notice any anomalies, turn your system off right away and check your cabling again for mistakes.

OVERVIEW

Atlantis is a complete analog, monophonic synthesizer voice in a single, skiff-friendly eurorack module. It contains a carefully matched selection of the most desirable subtractive synthesis components including: two analog oscillators (VCOs); a sub oscillator; a noise generator; a multimode, self-oscillating resonant filter (VCF) capable of both 2-pole and 4-pole operation; a 4-stage ADSR envelope; a mixer; a voltage controlled amplifier; and an overdrive circuit.

These components are all pre-connected behind the front panel, enabling Atlantis to generate sound without patch cables. Furthermore, these normalized routings can be changed instantly using any of the numerous routing switches sprinkled across the Atlantis' front panel. This allows for all manner of useful techniques, such as pulse width modulation, oscillator sync, linear and exponential frequency modulation (FM), low frequency (LFO) capabilities, and even sample & hold. Musicians can thus create a tremendously wide sonic palette without ever connecting a patch cable.

For those seeking maximum sonic control, patch points are provided to all these components — meaning you can reconfigure Atlantis' architecture in any way you please — including the ability to route voltages to or from any other eurorack modules in your system.

In this regard, Atlantis becomes not just a single synth voice, but a collection of independent modules. Need to filter the sound coming from that Intellijel Shapeshifter? Patch it into Atlantis' filter. Want some weirdly slewed pitch wobble injected into one of the oscillators? Patch in an Intellijel Noise Tools.

So what is Atlantis? It's all of the following:

- A fully featured, fixed-architecture synth that you can happily use without patch cables, just like many traditional synthesizers.
- A semi-modular synth that enables you to override the various normalled connections, and reroute the signal flow for experimental sound design.
- An extensible synth that allows you to enhance its sonic palette by patching in external modules to further shape and define your sound.
- A collection of individual, high-quality synth modules — ready to combine with any and all other modules in your eurorack system.

Basic Features

The following is a quick breakdown of Atlantis' various synthesizer components, patching and routing options:

Sound Generators

- VCO (primary): triangle core with Hard Sync, Octave switch, Linear/Exp FM and PWM.
- MOD (second VCO): triangle core with a Hard Sync option, and a Link switch to couple its pitch to the Primary VCO.
- SUB OSC: additional oscillator with either a square or pulse wave output pitched either 1 or 2 octaves below the primary oscillator.
- NOISE: Noise source with with either Pink and White output.

Filter

- Cascaded 4-Pole multimode (Lowpass; Highpass; Bandpass) OTA filter, switchable between 2-pole and 4-pole.
- Special LP boost mode.
- Built in soft clipping.
- Allows for inverting ADSR mod source.

Modulators

- ADSR envelope with manual gate, and external level (velocity) control.
- Envelope has looping option, re-trigger, and selectable time range.
- Global modulation bus with four VCO waveforms, noise and S&H options.

Mixing and Output

- 27 jacks for creative and complex patching options — patch points for every synthesis section.
- Mixer section includes an external source, which is normalled to a sinewave.
- Three position output clipping circuit.
- Output VCA has two stage clipping circuit.

GETTING STARTED

If your previous experiences with learning to use synthesizers involved stepping through presets, then you're in for a shock — and a treat! Atlantis has no presets. Like modules and synths of yore, the parameters on Atlantis are meant to be tweaked, twiddled and performed in real time. The sound it generates correlates directly with the settings on its front panel — there is no such thing as patch memory. What you see is what you hear.

While this makes Atlantis infinitely rewarding to sound designers and synthesists, it can be slightly daunting to new users, since at least a modicum of basic knowledge is required to coerce it into making the sounds you hear in your head.

In this *Getting Started* section, you'll jump right into making sound, while simultaneously getting comfortable with Atlantis' front panel and layout. From there you'll learn a bit about Atlantis' architecture and some fundamentals of subtractive analog synthesis before delving into the *Reference* section, where you'll find a more detailed discussion of Atlantis' many features and capabilities.

Quick Start

Make a sound

1. Connect the jack labelled **OUT** to your system's audio output.
2. Set all sliders to their minimum (bottom) positions.
3. In the **MIX** section, set the leftmost slider (**PULSE**) to its maximum.
4. In the **VCO** section, make sure **SYNC** is off (switch position at the bottom).
5. In the **VCF** section, set the **FREQ** slider to its maximum.
6. In the **VCA** section, set the **ENV/GATE** switch to the "**GATE**" position.
7. Push the **GATE** button (small red button beneath the **ENV/GATE** switch). You should hear a sound that sustains for as long as you hold the button.
8. In the **VCO** section, rotate the **OCTAVE** and **FINE** knobs to tune the oscillator as you like.

Audition the waveforms and filter types

1. In the **MIX** section, raise and lower all the sliders and make note of how the sound changes as different waveforms are mixed together in varying amounts.
2. In the **VCF** section, set the top switch to "**LP**," the **POLES** switch to "**2**," and turn on **LP BOOST**. Raise and lower the **FREQ** slider, and notice how the filter is removing high frequency content.

3. In the **VCF** section, set the **RES** slider to its midpoint, then raise and lower the **FREQ** slider. Notice how the filter's cutoff frequency is now more pronounced.

4. While still in the **VCF** section, experiment with different settings of the **LP/BP/HP** switch and the **2-POLE/4-POLE** switch. Notice how these change what frequencies are being filtered and how "steep" the filter sounds.

Modulate the filter

1. In the **MIX** section, set the leftmost slider (**PULSE**) to its maximum, and set all the other MIX section sliders to their minimum.

2. In the **VCF** section, set the filter type to "**LP**," the **POLES** switch to "**4**" and set all the sliders to the bottom, except **FREQ**, which you should set at the midpoint.

3. In the **MOD** section, set the **VCO/LFO** switch to "**LFO**;" set the **RATE** fader to the midway point, and use the **TYPE** knob to select a triangle wave.

4. Back in the **VCF** section, raise the **MOD** slider to its midpoint. Notice that the filter's cutoff frequency is now being modulated by the MOD oscillator.

5. Back in the **MOD** section, raise and lower the **RATE** slider to change the rate at which the LFO modulates the filter's cutoff frequency. When finished, go to the **VCF** section and reduce the **MOD** slider back to minimum.

Add an envelope

1. In the **ENVELOPE** section, set the **CYCLE** switch to its OFF position, and the **x1/x10** switch to the "**x1**" position. Set the **A** (attack) and **S** (sustain) sliders to the bottom, and the **D** (decay) and **R** (rate) sliders to the top.

2. In the **VCA** section, set the **ENV/GATE** switch to "**ENV**."

3. Push the red button beneath the **ENV/GATE** switch and notice how the sound no longer sustains indefinitely, but decays over time.

4. In the **VCF** section, set the filter type to "**LP**," the **POLES** switch to "**2**" and set all the sliders to the bottom, except **FREQ**, which should be about one-third of the way up.

5. Set the **ENV POLARITY** switch to the right (normal polarity) and press the red button in the **VCA** section. You are probably hearing a fairly dark, quiet sound. If you don't hear anything, try increasing the **FREQ** slider until you just barely hear some signal passing through the filter.

6. In the **VCF** section, slowly increase the **ENV** slider as you continue to press the little red trigger button. Notice that the envelope shape is now being applied to the filter — making it sound brighter at the beginning, then duller as the sound decays.

Try a little FM

1. In the **MOD** section, turn on **LINK** mode (switch position is up), set the **VCO/LFO** switch to "**VCO**" and set the **RATE** slider to its midpoint.
2. In the **VCO** section, set the **EXP/LIN** switch to the "**LIN**" position, and slowly raise the **MOD** slider to its midpoint while continuing to press the little red GATE button. Experiment with different **MOD** levels in the **VCO** section and with different **RATE** levels in the **MOD** section and notice the range of tonal variance that's possible.

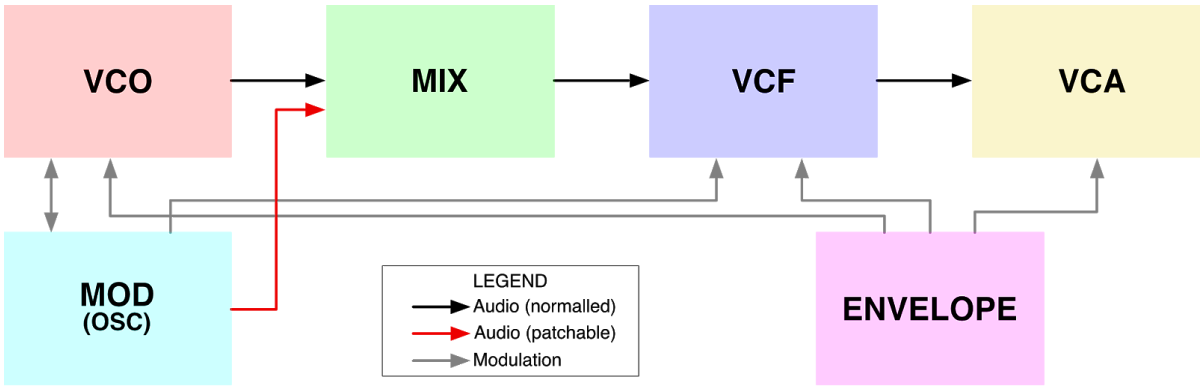
Use a sequencer (or CV keyboard)

1. Connect the gate output of your sequencer or CV keyboard to the **GATE** input at the top of Atlantis.
2. Connect the pitch output of your sequencer or CV keyboard to leftmost **1V/OCT** input at the top of Atlantis.
3. Run the sequencer (or play the keyboard), and you should hear Atlantis playing the melody.
4. In the **VCO** section, tune Atlantis by rotating the **OCTAVE** knob to set the desired pitch range, and rotate the **FINE** knob to fine tune the pitch.

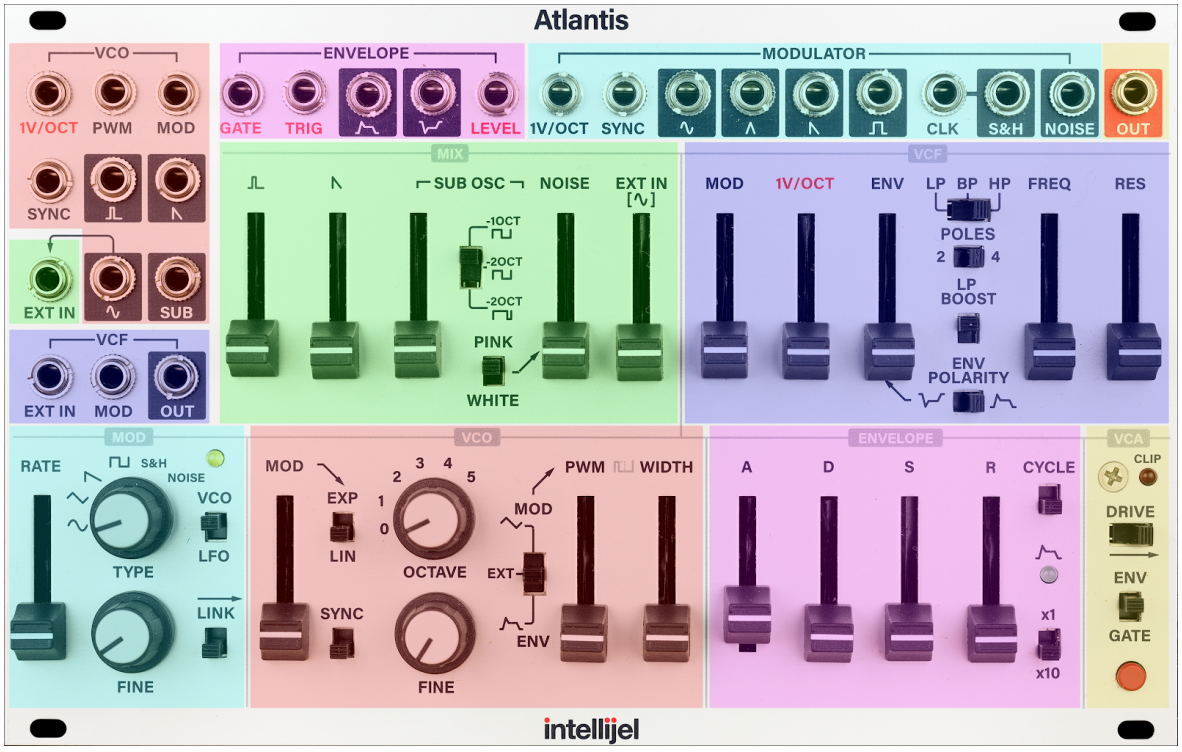
Now that you've explored some very rudimentary sounds, it's time to dig into some analog synthesis basics and learn a bit about Atlantis' basic voice architecture.

Basic Architecture

Atlantis is comprised of several synthesis modules — wired in a normalled configuration, with patch points for overriding the default connections (or for integrating with other modular gear). The basic architecture looks as follows:



Using the same color-coding, the following illustration shows the location of these modules (and their corresponding patch points) on Atlantis' front panel:



An introduction to each of these modules appears in the sections below. See Panel Reference for a detailed discussion of each module, knob, switch, slider, and jack.

VCO Overview

The **VCO** generates several different types of waveforms, including pulse, triangle and sine. All waveforms are simultaneously accessible, and you can mix them together in varying amounts using Atlantis' MIX section (described below). The pitch of the VCO is set using its OCTAVE and FINE knobs. The VCO will track an input source (such as a keyboard or sequencer) plugged into Atlantis' 1V/OCT jack, allowing for melodies.

Additional controls such as pulse width modulation (PWM); frequency modulation (FM); and oscillator SYNC all alter the harmonic character allowing you to create richer, more harmonically complex waveforms.

MIX Overview

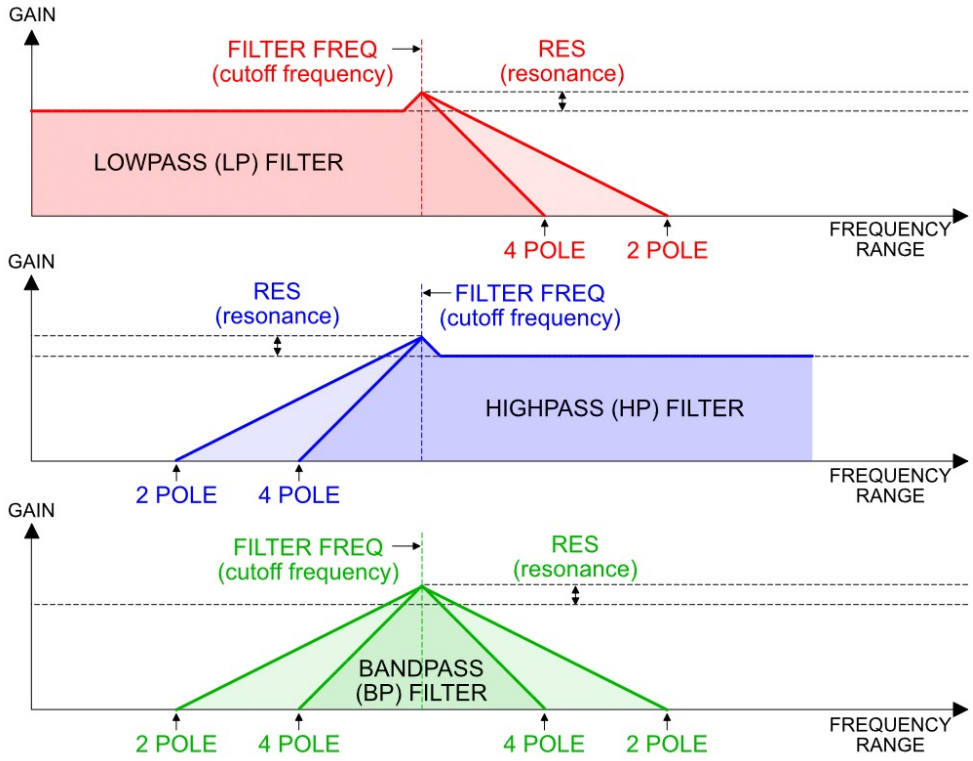
The various waveshapes generated by the VCO are fed into the **MIX** section, where you can blend them together in varying amounts. Different waveforms have different sonic characteristics, so combining them in different ways results in a wide variety of timbres. For example, sine waves are pure and void of harmonic content; square waves contain odd numbered harmonics, making them sound richer and slightly "hollow;" sawtooth waves are bright and brassy since they contain both even and odd harmonics.

This section adds two additional audio sources, which you can also blend into to the mix: NOISE and a SUB OSCILLATOR. There is an additional input for bringing external audio into the mix (which, when done, replaces the sine wave output from the VCO).

VCF Overview

The output of the MIX section feeds the Voltage Controlled Filter (**VCF**), which subtracts certain frequencies and harmonics. This type of synthesis, in which you generate a richly harmonic waveform and then remove certain frequencies with a filter, is called "subtractive synthesis."

Atlantis uses a 4-stage cascaded OTA filter similar to the type Roland used in the SH-101, Jupiter-8, Juno-60 and other classic synths. In general, OTA filters produce less internal distortion than Moog-style ladder filters, and are somewhat "smoother" sounding (though with Atlantis' built-in boost and drive options, there's plenty of opportunity to rough up that sound). In general, you can select between one of three types of filters: Lowpass (**LP**); Bandpass (**BP**); and Highpass (**HP**). LP filters allow low frequencies to pass through the filter, meaning that higher frequencies are removed, which results is a deeper sound; HP filters allow high frequencies to pass through the filter, meaning that low frequencies are removed. BP filters allow only a certain band of frequencies to pass through the filter, removing frequencies that are both above and below the desired frequency.



The **FREQ** slider sets the frequency at which the filter activates. For example, if you selected the LP filter and set the slider at maximum frequency, you would hear no effect. That's because you've told Atlantis that you want to pass all frequencies below this value — and since you set the value is at the top of the audio range, you hear everything. By gradually reducing the FREQ slider (in LP mode), you remove more and more high frequency content until, at the bottom, you remove all audio content.

The filter can operate in either **2-pole** or **4-pole** mode. The number of poles a filter has determines how aggressively the filtered frequencies are attenuated. A 2-pole filter reduces frequencies by 12 dB per octave. So if you used the **FREQ** slider to cut all frequencies above middle C (C3), then you would still hear frequencies corresponding to C4 — but they would be attenuated by 12 dB. A 4-pole filter reduces frequencies by 24 dB per octave. So in this case, if you set the filter to cut all frequencies above C3, then the frequencies corresponding to C4 would be 24 dB quieter.

In addition to setting the FREQ at which you want signals to attenuate, you may also set a **RES** (resonance) level. High resonance values accentuate the cutoff frequency, and the higher the resonance, the more the filter seems to ring (or resonate) at that frequency. When RES is set to maximum, Atlantis' filter will self-oscillate — which means it resonates so much that it becomes a sine wave oscillator whose pitch corresponds to the FREQ setting, and which tracks an external keyboard or sequencer plugged into the filter's 1V/Oct jack.

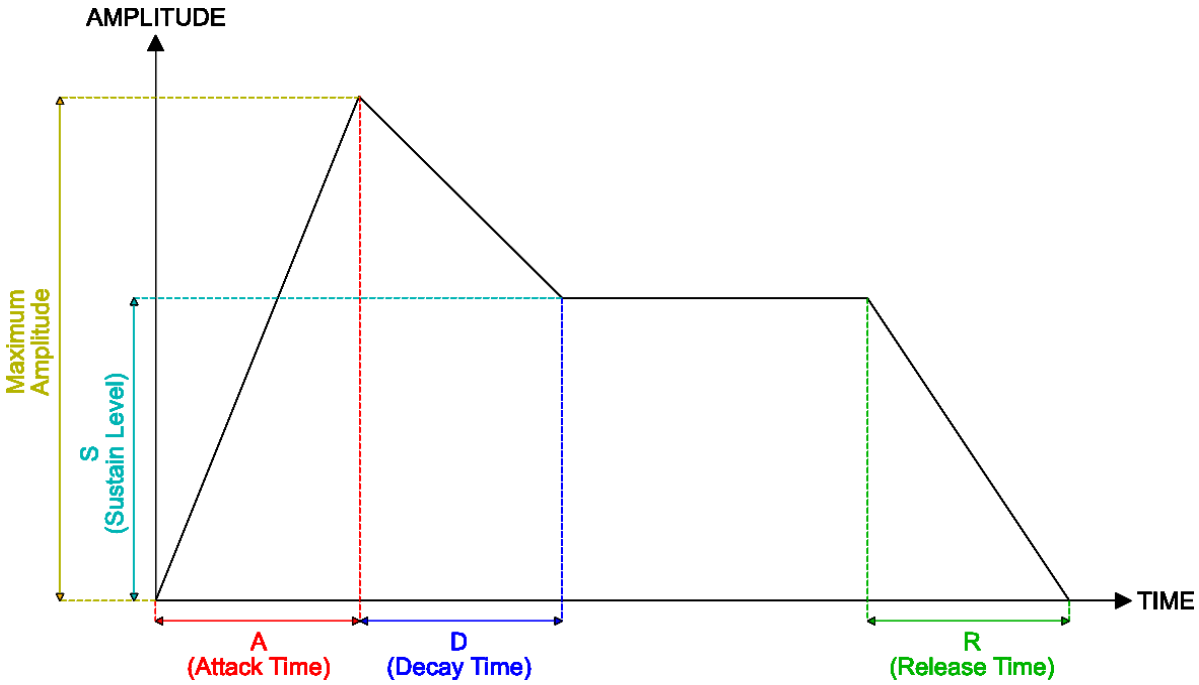
VCA Overview

After exiting the filter, audio passes through the VCA (voltage controlled amplifier) where its volume level is shaped by the ENVELOPE (discussed below) when the ENV/GATE switch is set to ENV. When that switch is set to GATE, then the VCA operates more like an organ — switching the sound on to full volume when a signal appears at the GATE jack atop the module, or when you press the little red button beneath the GATE switch. In GATE mode the sound stays at maximum volume until the Gate signal is removed (or the button is released). Additionally, there is a 3-position DRIVE circuit built into the VCA, which can saturate Atlantis' output, giving it a grittier, more aggressive sound.

ENVELOPE Overview

Sounds are rarely static. For example, a plucked string sound is brighter and louder at the beginning, then grows duller and quieter over time. A bowed string takes longer to reach its maximum volume (and brightness) as the bow digs deeper into the string.

To synthesize these time-based changes, Atlantis contains an **ENVELOPE**, which lets you set the sound's Attack time, Decay time, Sustain level and Release time. Using the **ADSR** sliders, you can create many different contours. For example, you would create a short, snappy sound by using a fast **A**, short **D**, no **S**, and short **R**. Or you can create a more languid contour that slowly fades in (slow **A**), stays at maximum volume (full **S**), then fades away slowly when you stop playing the note (long **R**).



In order to maximize the envelope's usability, Atlantis gives you two ADSR scalings: **x1** and **x10**. Use the **x1** setting when you need to create shorter, snappier envelopes with great precision. Use the **x10** setting to create longer, more lethargic envelopes.

Without needing to employ patch cables, Atlantis lets you route the envelope to numerous destinations, including the VCA (volume contour of a note); VCO (pulse width contour of a note); and VCF (timbral contour of a note). Additionally, Atlantis gives you the option of inverting the envelope when sending it to the VCF. You can, of course, use Atlantis' patch points to route the envelope to any number of other internal (or external) destinations.

MOD Overview

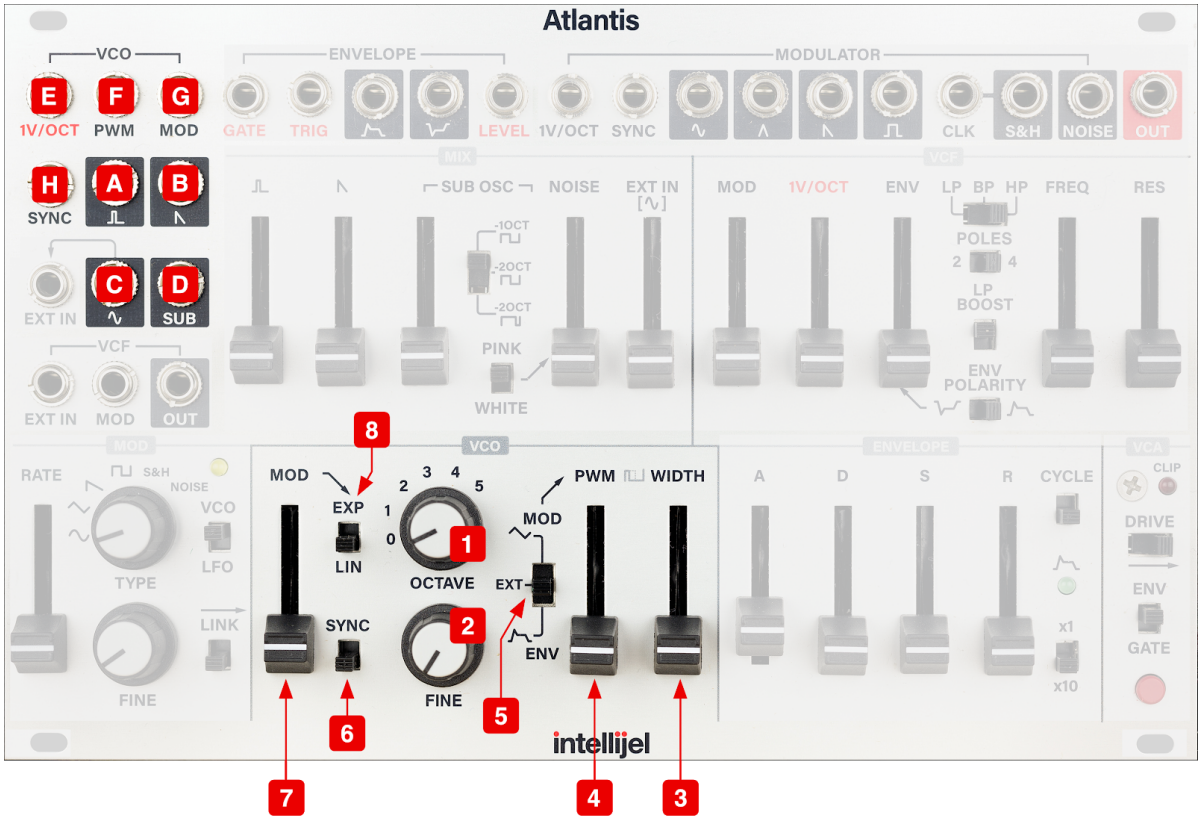
The **MOD** section is a fully featured second VCO, and you can access its various waveshapes using patch cables. In Atlantis' default configuration, this oscillator serves as a modulator — which means it's used to dynamically alter ("modulate") one or more other parameters. The MOD oscillator operates at either audio rates or as a low frequency oscillator (LFO), depending on the position of the VCO/LFO switch. Numerous modulation shapes are available, including Sample & Hold (S&H) and noise.

Atlantis' normalized architecture supports direct modulation of several parameters, including: the frequency of the main VCO (FM); the pulse width (PWM) of both the main VCO and the SUB OSC; and the VCF FREQ. More modulation options become available when the patch points are used.

PANEL REFERENCE

This section discusses, section-by-section, every element on Atlantis' front panel.

VCO



Controls

[1] OCTAVE Select Knob

This 6-position knob sets the coarse tuning of the oscillator. Each position shifts the tuning by one octave. Fine adjustment can be made using the FINE knob.

[2] FINE Tune Knob

This knob finely adjusts the tuning frequency. The range is approximately +/- 6 semitones from the centre position.

[3] PULSE WIDTH Slider

Sets the pulse width of the oscillator's PULSE output. Different pulse widths produce different timbres. With the slider at the bottom, the output produces a narrow 10% duty cycle. With the

slider at the top, the resulting pulse has a 90% duty cycle. A square wave is produced with the slider exactly half-way up.

[4] PWM Amount Slider

You can modulate the PULSE WIDTH over time using the PWM (pulse width modulation) slider. This gives the waveform a sense of “movement.” Use the corresponding PWM SOURCE switch to select a modulation source.

[5] PWM SOURCE Switch

Selects a Pulse Width Modulation source. There are three options:

- MOD: When switched to the top position, the output of Atlantis’ MOD oscillator varies the pulse width over time. The input from the MOD oscillator is summed with the PULSE WIDTH slider and, together, they set the width of the PULSE output.
- EXT: When switched to the middle position, Atlantis uses a signal patched into the PWM Input to vary the pulse width. The PWM input is summed with the PULSE WIDTH slider and, together, they set the width of the PULSE output.
- ENV: When switched to the bottom position, Atlantis uses the ENVELOPE to vary the pulse width over time. The input from the ENVELOPE is summed with the PULSE WIDTH slider and, together, they set the width of the PULSE output.

[6] SYNC Switch

Switches the primary VCO into HARD SYNC mode. This forces the frequency of the VCO to become a “child” oscillator — synchronizing its periodicity (pitch) to an external parent oscillator’s. Every time the parent oscillator restarts its wave cycle, it forces the child oscillator (the VCO) to restart its cycle. Richly harmonic waveforms result from setting the parent and child oscillators to different frequencies.

By default, Atlantis uses a square wave from the MOD oscillator as the parent oscillator. So, when VCO is set to SYNC mode, the VCO’s pitch is actually controlled by the MOD oscillator. If desired, you can patch a different oscillator into the VCO SYNC input jack and synchronize to that instead.

To achieve classic analog sync sounds, patch your keyboard into the MOD’s 1V/OCT jack and tune it using the MOD oscillator’s RATE and FINE control. To get that classic “dive bombing” sync sound, patch the ENVELOPE output into the VCO’s 1V/OCT jack and adjust the envelope to taste. *TIP: For a more subdued “dive bomb”, route the envelope through an external attenuator, such as an Intellijel Triatt or Quadratt 1U before sending it to the VCO’s 1V/OCT input jack.*

[7] MOD Amount Slider

This sets the depth of the FM effect. When the slider is at the bottom, no frequency modulation occurs. Maximum modulation occurs at the top.

[8] EXP/LIN Switch

Switches between two types of frequency modulation: EXP[ONENTIAL] and LIN[EAR]. Its effect is most clearly heard (and understood) when the VCO/LFO switch in Atlantis' MOD oscillator is set to VCO.

See the FM synthesis discussion to learn about these two types of frequency modulations, including their sonic characteristics, fundamental differences and sound design uses.

Inputs and Outputs

[A] PULSE Wave Output

Pulse wave output from the VCO. The width of the pulse is controlled by a combination of the PULSE WIDTH knob and PWM input. Although Atlantis routes the VCO pulse wave to the MIX by default, this jack lets you tap into that output directly — sending it to alternate destinations either within Atlantis or within a larger eurorack system.

[B] SAW Wave Output

Sawtooth wave output from the VCO. Although Atlantis routes the VCO SAW wave to the MIX by default, this jack lets you tap into that output directly — sending it to alternate destinations either within Atlantis or within a larger eurorack system.

[C] SINE Wave Output

Sine wave output from the VCO. Atlantis routes the VCO SINE wave to the mixer's EXTERNAL INPUT by default. If you choose to send external audio into the Mixer instead of the sine wave, this jack enables you to still access that SINE wave — sending it to alternate destinations either within Atlantis or within a larger eurorack system.

[D] SUB Osc Output

SUB Osc output from the VCO. Although Atlantis routes the Sub Osc to the MIX by default, this jack lets you tap into that output directly — sending it to alternate destinations either within Atlantis or within a larger eurorack system.

[E] 1V/OCT Input

This input controls the pitch of the VCO, and is typically fed from the Pitch CV output of a standard 1V/Oct keyboard or sequencer.

[F] PWM Input

This input has a range of +/- 5 V, and is used to modulate the pulse width when the PWM SOURCE switch is set to EXT. The input is summed with the PULSE WIDTH slider and, together, they set the width of the PULSE output. Note that external PWM allows for pulse widths that extend down to 0% and up to 100%. At these two extremes, the PULSE output is silent, further increasing the timbral complexity available.

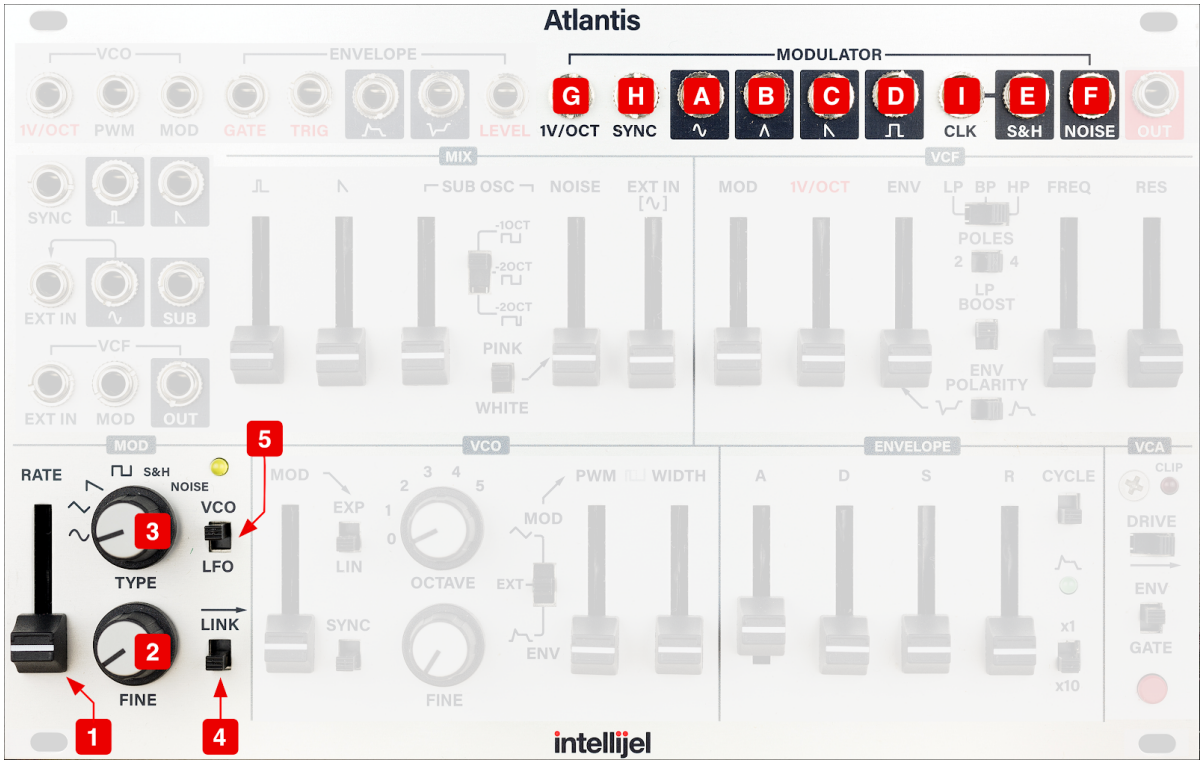
[G] MOD Input

Linear or exponential frequency modulation input. The behaviour is set by the EXP/LIN switch. Patching into this input disables the the input from the MOD oscillator.

[H] SYNC Input

With the SYNC switch turned ON, the VCO synchronizes its pitch/periodicity to the waveform received at this input. With no signal connected, the VCO synchronizes to the MOD oscillator’s square wave output.

MOD



Controls

[1] RATE Slider

This slider coarsely adjusts the MOD Oscillator rate, and when used in conjunction with the FINE knob, provides a 10 octave range. With the VCO/LFO switch set to **VCO**, this slider affect the pitch. With the VCO/LFO switch set to **LFO**, this slider affects the rate the the LFO, which can range from several minutes to low audio rates.

[2] FINE Tune Knob

This knob finely adjusts the MOD Oscillator rate. With the VCO/LFO switch set to **VCO**, this knob fine tunes the oscillator's pitch to a range approximately +/- 6 semitones from the centre position.

[3] Waveform TYPE Knob

Selects the shape of the MOD oscillator's waveform, which Atlantis sends (in its default normal mode) to the MOD inputs for VCO frequency, VCO pulse width and VCF frequency. There are six shapes available: Sine; Triangle; Sawtooth; Square; S&H (Sample & Hold) and Noise. Note that the the position of the PINK/WHITE switch in the MIX section determines the color of the

noise, and that the output range of the S&H is also affected by the noise color (as described in the Noise section discussion later in this manual).

[4] LINK Switch

In the up position this switch turns on LINK mode, which synchronizes the frequency of the MOD oscillator to a multiple of the VCO frequency. This is useful, for example, if you tune the MOD oscillator to some interval of the VCO and want this pitch ratio maintained as you play a keyboard (or sequencer) plugged into the 1V/OCT input of the VCO. Conversely, turning off LINK mode is useful, for example, if you want a slow LFO to sweep the VCF filter and you want to keep that rate steady, regardless of the note being played.

[5] VCO/LFO Switch

Switches the MOD oscillator between LFO and VCO mode. When in VCO mode the oscillator operates at audio rates over a 10 octave range. When in LFO mode, the range is reduced to 1/100th the frequency of VCO mode, allowing wave cycles from several minutes in length up to low audio rates.

Inputs and Outputs

[A] SINE Wave Output

Sine wave output from the MOD Oscillator. This 10V peak-to-peak output is always available, regardless of the position of the MOD Oscillator's Waveform TYPE knob. If you patch this output into Atlantis' EXT IN jack and turn up the EXT IN slider in the MIX section, you will hear a sine wave from the MOD oscillator. This enables the MOD oscillator to function as a second audible oscillator — fattening the sound if you tune the MOD to the same frequency as the VCO, or enabling pitched intervals from a single 1V/Oct input.

[B] TRIANGLE Wave Output

Triangle wave output from the MOD Oscillator. This 10V peak-to-peak output is independent of the setting of the MOD oscillator's Waveform TYPE Knob. If you patch this output into Atlantis' EXT IN jack and turn up the EXT IN slider in the MIX section, you will hear a triangle wave from the MOD oscillator. This enables the MOD oscillator to function as a second audible oscillator — fattening the sound if you tune the MOD to the same frequency as the VCO, or enabling pitched intervals from a single 1V/Oct input.

[C] SAWTOOTH Wave Output

Sawtooth wave output from the MOD oscillator. This 10V peak-to-peak output is always available, regardless of the position of the MOD Oscillator's Waveform TYPE knob. If you patch this output into Atlantis' EXT IN jack and turn up the EXT IN slider in the MIX section, you will hear a sawtooth wave from the MOD oscillator. This enables the MOD oscillator to function as a

second audible oscillator — fattening the sound if you tune the MOD to the same frequency as the VCO, or enabling pitched intervals from a single 1V/Oct input.

[D] SQUARE Wave Output

Square wave output from the MOD Oscillator. This 10V peak-to-peak output is always available, regardless of the position of the MOD Oscillator's Waveform TYPE knob. If you patch this output into Atlantis' EXT IN jack and turn up the EXT IN slider in the MIX section, you will hear a square wave from the MOD oscillator. This enables the MOD oscillator to function as a second audible oscillator — fattening the sound if you tune the MOD to the same frequency as the VCO, or enabling pitched intervals from a single 1V/Oct input.

[E] S&H Output

Sample & Hold output signal from the MOD Oscillator. This output is always available, regardless of the position of the MOD Oscillator's Waveform TYPE knob. You can completely decouple the S&H circuit from the MOD oscillator by simply plugging an external clock into the CLK input atop the unit and patching the S&H output into whichever parameter you wish to modulate. Doing this allows the MOD oscillator to run at a rate different than the S&H circuit, while outputting a waveform other than the S&H signal.

This has many benefits. For example, assume you want to modulate the VCO's pulse width at audio rates while simultaneously sending a low frequency S&H signal to the filter frequency. To achieve this, you would simply set the MOD oscillator to VCO mode and its WAVEFORM Type Knob to SINE. In the VCO, you'd turn up the PWM slider and you'd make sure to turn up the PULSE Wave Level Slider in the MIX section. Without patch points, there would be no way to send a separately clocks S&H signal to the filter frequency. But if you send an external clock into the CLK input; patch a cable between the S&H Output Jack and the VCF's MOD In jack; and turn up the MOD slider in the VCF, you now have two totally independent modulation sources controlling different parameters in Atlantis.

[F] NOISE Output

Noise output from the MOD Oscillator. Set the noise color using the PINK/WHITE switch in the MIX section. This output is always available, regardless of the position of the MOD Oscillator's Waveform TYPE knob.

[G] 1V/OCT Input

This input controls the pitch of the MOD oscillator, and is typically fed from the Pitch CV output of a standard 1V/Oct keyboard or sequencer. When this input isn't used, the MOD oscillator's pitch instead depends on the setting of its LINK switch — either following the pitch changes sent to the VCO (LINK = ON) or droning at the pitch set by the MOD oscillator's own RATE and FINE controls (LINK = OFF).

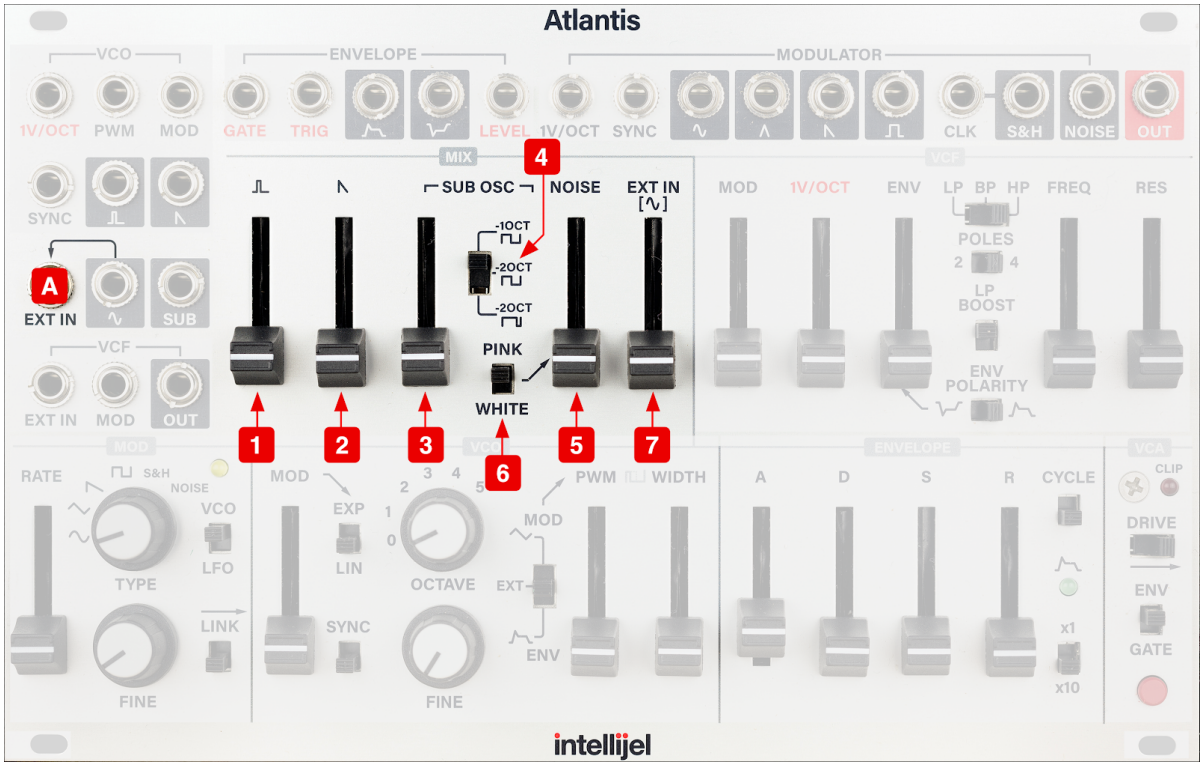
[H] SYNC Input

The MOD oscillator will hard synchronize its pitch/periodicity to any waveform patched into this jack. Every time the waveform appearing at this input restarts its wave cycle, it forces the MOD oscillator to restart its cycle (meaning the SYNC input dictates the perceived pitch of the MOD oscillator).

[I] CLK (Clock) Input

A clock patched into this input sets the rate at which the S&H circuit samples the MOD oscillator's Noise generator. When this input isn't used, the S&H clock is fed by the MOD oscillator's square wave, and its rate is determined by the MOD oscillator's own RATE & FINE controls, coupled with the position of the VCO/LFO switch. This input, when used in conjunction with the S&H Output jack, allows the S&H circuit to operate independently of the MOD Oscillator, as outlined earlier in the S&H Output jack discussion.

MIX



Controls

[1] PULSE Wave Level Slider

Controls the mix level of the Pulse wave from the VCO.

[2] SAWTOOTH Wave Level Slider

Controls the mix level of the Sawtooth wave from the VCO.

[3] SUB OSC LEVEL Slider

Controls the mix level of the Sub Oscillator. The SUB OSC is an additional waveform derived from the VCO pulse output, and depending on the position of the SUB OSC TYPE Switch, is pitched either one or two octaves below the VCO.

[4] SUB OSC TYPE Switch

Sets both the waveshape and octave of the Sub Oscillator. In the top position, the Sub Oscillator outputs a square wave exactly 1 octave below the pitch of the VCO. In the middle position, the Sub Osc outputs a square wave exactly 2 octaves below the pitch of the VCO. In the bottom position, the Sub Osc is the sum of the -1 and -2 octave square waves, resulting in an oscillator 2 octaves below the pitch of the VCO, but with a wider pulse width.

[5] NOISE Level Slider

Controls the mix level of Atlantis' built-in noise generator.

[6] PINK/WHITE Noise Color Switch

Switches between one of two colors of Noise: PINK and WHITE. Pink noise is the darker of the two. It contains equal power per octave, which gives more energy to the lower frequencies. White noise is brighter sounding, since it contains equal energy at every frequency. This gives more energy to the higher frequencies. The noise color also affects the output of the S&H circuit (found in the MOD oscillator). White noise produces a greater range of random S&H values than Pink noise, and is the type traditionally used to create sample & hold effects. If you want a more subdued S&H effect that's skewed toward the lower part of the scale, use Pink noise.

[7] EXT IN / SINE Wave Level Slider

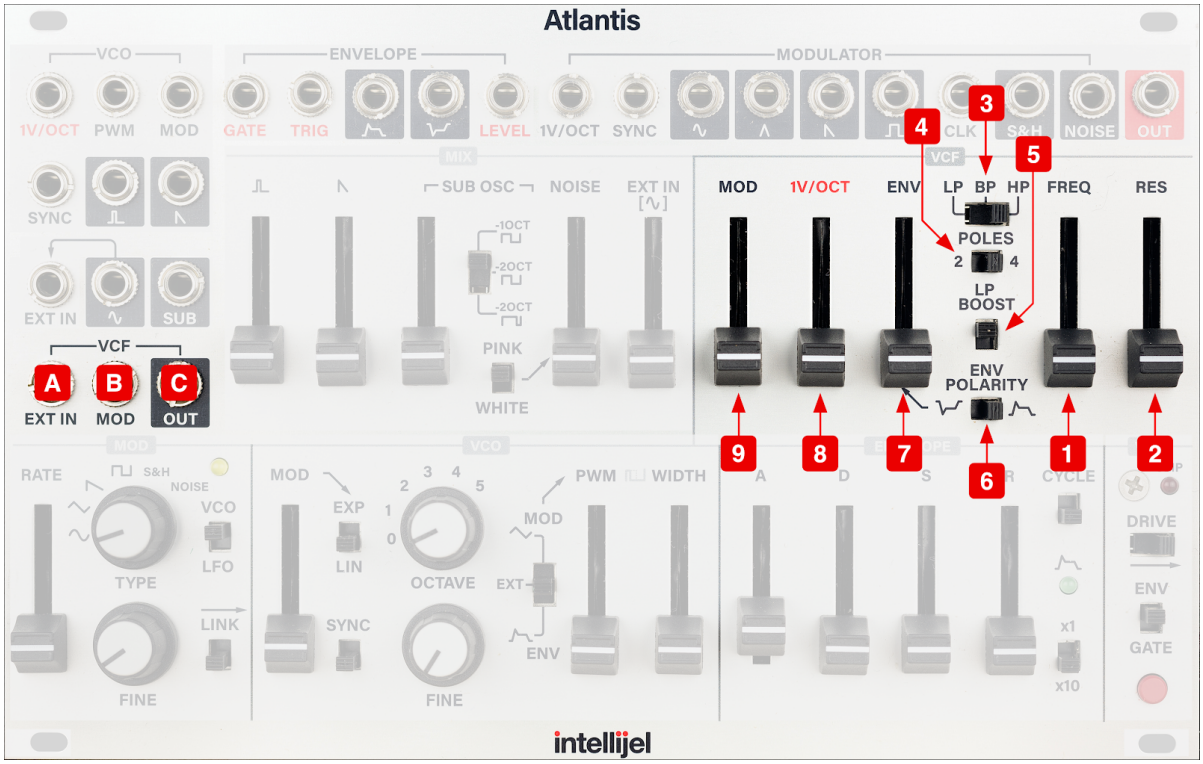
Controls, by default, the mix level of the Sine wave from the VCO. If a signal is inserted into Atlantis' EXT IN jack, the Sine wave input is disabled and this slider controls the mix level of the external signal.

Inputs and Outputs

[A] EXT IN (External Input)

A Signal patched into this input feeds into the mixer's EXT IN slider, which automatically disconnects the normalled sine wave input. This lets you mix external audio (or audio from the MOD oscillator) with Atlantis' VCO waveforms — all of which you can further process through Atlantis' VCF and VCA.

VCF



Controls

[1] FREQ Slider

Sets the cutoff frequency of the filter. The slider position is combined with the ENV, 1V/OCT and MOD controls.

[2] RES Slider

Sets the resonance of the filter. At its maximum, the filter self resonates — generating a sine wave at the frequency set by the FREQ slider. If you set the 1V/OCT slider to max, the filter will track the pitch of a connected keyboard or sequencer.

[3] LP/BP/HP Switch

Selects between three different filter types:

- LP: Lowpass filter mode. Lowpass filters allow low frequencies to pass through the filter, eliminating higher frequencies and resulting in a deeper, thicker sound.
- HP: Highpass filter mode. Highpass filters allow high frequencies to pass through the filter, eliminating lower frequencies and resulting in a brighter, thinner sound.

- BP: Bandpass filter mode. Bandpass filters allow only a certain band of frequencies to pass through the filter, removing frequencies that are both above and below the desired frequency.

[4] POLES Switch

Selects between either a 2-pole and 4-pole cutoff slope. The number of poles a filter has determines how aggressively the filtered frequencies are attenuated. A 2-pole filter reduces frequencies by 12 dB per octave. So if you used the FREQ slider to cut all frequencies above middle C (C3), then you would still hear frequencies corresponding to C4 — but they would be attenuated by 12 dB. A 4-pole filter reduces frequencies by 24 dB per octave. So in this case, if you set the filter to cut all frequencies above C3, then the frequencies corresponding to C4 would be 24 dB quieter.

[5] LP BOOST Switch

Switches on LP Boost mode. This mode “fattens” the sound of a lowpass filter when resonance is used. With LP Boost off, high resonances can drown out the bass frequencies. With LP Boost on, the bass frequencies remain prominent.

[6] ENV POLARITY Switch

This switch, used in conjunction with the ENV AMOUNT slider, selects whether the envelope has a positive or a negative effect on the filter frequency. When switched to the right, the envelope is positive, which means the envelope adds to the value set by the FREQ slider. When switched to the left, the envelope is negative, meaning the envelope subtracts from the value of the FREQ slider.

[7] ENV Amount Slider

Sets how much Atlantis’ ENVELOPE affects the filter frequency. At the bottom position, the envelope has no effect on the filter frequency. At the top position, the envelope modulates the filter frequency using the full 0 - 8V range of the envelope (applied either positively or negatively, depending on the ENV POLARITY switch).

[8] 1V/OCT Amount Slider

Sets the extent to which filter frequency tracks the pitch of a connected keyboard or sequencer. At the top position, the filter frequency fully tracks the input pitch; at the bottom position, no tracking occurs. Values in the middle give scaled tracking. In general, tracking allows higher notes to sound “brighter” than lower notes — much like an acoustic instrument behaves.

[9] MOD Amount Slider

This sets the depth of an additional filter frequency modulation source (which is summed with the 1V/OCT and ENV modulation sources). By default, this controls the amount of modulation from Atlantis’ built-in MOD oscillator. If you connect a different modulation source to the VCF’s

MOD INPUT jack, then the MOD Amount slider controls the depth of that external modulator instead.

Inputs and Outputs

[A] EXT IN Input

A signal patched into this input feeds the VCF and automatically disconnects the normalled input from Atlantis' MIX section. This lets you use Atlantis as a stand-alone filter for processing external signals.

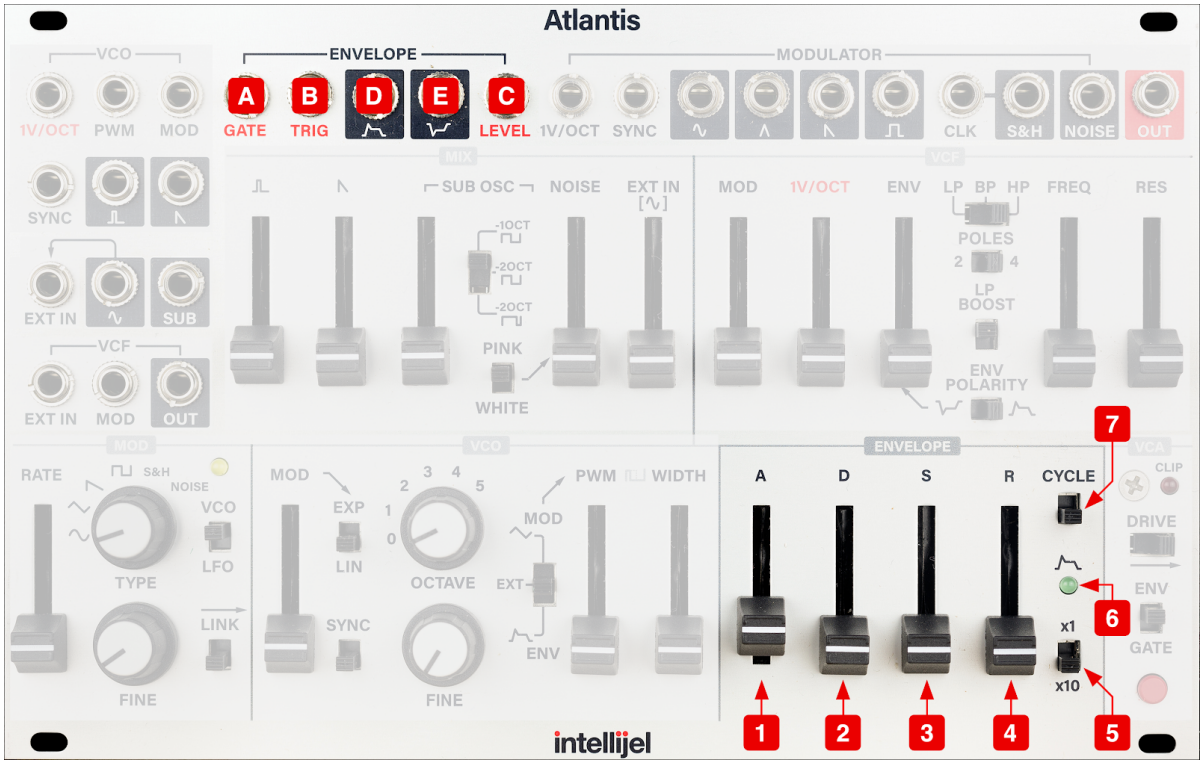
[B] MOD Input

A signal patched into this input modulates the VCF FREQ by an amount set by the VCF's MOD Amount Slider. When this jack is used, Atlantis' MOD oscillator is no longer routed to the filter.

[C] VCF OUT

The output of the VCF feeds this output. An output taken from this jack bypasses Atlantis' VCA. This is particularly useful when Atlantis' envelope is modulating the filter, and you want to use an external envelope with a different shape to control an external VCA.

ENV



Controls

[1] A[TTACK] Time Slider

Sets the time required for the envelope to rise from zero (0V) to its maximum level (5V). The higher the slider, the slower the attack time. The slider's overall time range depends on the setting of the RATE switch.

[2] D[ECAY] Time Slider

Sets the time required for the envelope to decrease from its maximum value (5V) to a level set by the S[USTAIN] slider. The higher the D[ECAY] slider, the slower the decay time. The slider's time range depends on the setting of the RATE switch.

[3] S[USTAIN] Level Slider

Sets the sustain level of the envelope, which is the level at which the envelope sustains while the gate voltage remains high (or a note is held). The higher the slider, the higher the sustain level. At the bottom, there is no sustain (0V), and at the top the sustain level is at maximum (5V).

[4] R[ELEASE] Time Slider

Sets how quickly a sound fades out to zero (0V) when the gate voltage goes low (or a note is released). The higher the slider, the slower the release time. The slider's overall range depends on the setting of the RATE switch.

[5] RATE Switch

Selects between two different ranges for the attack, decay, and release times. In x1 mode the maximum time for each stage is approximately 1 second. In x10 mode, the maximum time for each stage is approximately 10 seconds. Use x1 to create short, snappy envelopes ideal for percussive sounds. Use x10 to create slower, more evolving envelopes for pads and drones.

[6] LEVEL Indicator

The brightness of this LED indicates the level of the envelope.

[7] CYCLE Switch

When in the ON position, the end of the decay phase will start the attack phase again, creating an effect similar to an LFO, but with a unipolar voltage range.

Inputs and Outputs

[A] GATE Input

When the gate goes high, the envelope moves through its A and D stages, then sits at the S level. When the gate goes low, the envelope enters the R stage.

[B] TRIGGER Input

When a trigger is received at this input while the gate is high, it resets the envelope back to the beginning, and starts the attack phase again.

[C] LEVEL Input

This input expects a 0 to 5 V signal and controls the overall level of the envelope via a built-in linear VCA. It is normalled to a 5 V source so when nothing is connected the envelope uses its maximum range.

[D] ENVELOPE Out

This is the primary envelope output. The level ranges from 0 to 5 V.

[E] INVERSE ENVELOPE Out

This output provides the inverted version of the envelope, from 0 to -5 V.

VCA

Controls

[1] GATE Button

Press to manually trigger a note. The gate button is normalled to the Envelope's GATE input. Pressing and holding the button will activate the envelope in the same way as an incoming gate signal from a keyboard or sequencer. It provides a useful way to test out the envelope settings or to manually to trigger the envelope during performance.

[2] ENV/GATE Switch

Selects whether the VCA (loudness) is controlled by the ENVELOPE or if it's simply gated. Specifically:

- ENV Mode: In this position, the VCA uses the Envelope settings to control the loudness of a note.
- GATE Mode: In this position, the VCA ignores the ENVELOPE settings, and uses a simple on/off, organ-like envelope instead. In this mode, when the GATE Input goes high (or the GATE button is pressed), the VCA instantly rises to full volume, where it remains for as long as the GATE voltage is high (or the GATE button is held). When the GATE input goes low (or the GATE button is released), the VCA instantly falls to no volume.

[3] Amplifier DRIVE level

Increases the amount of gain applied to the output clipping circuit, escalating the “grittiness” of the output, and boosting the signal. In the left position, amplifier drive is off. The middle position produces soft clipping, while hard clipping occurs with the switch set to the right.

[4] Amplifier CLIP LED

This LED lights when the output signal clips. Atlantis’ clipping circuit is designed to be pleasingly aggressive, and is more easily triggered when the DRIVE level is set to either the middle or right position.

Inputs and Outputs

[A] Audio OUT

Mono audio output (10V peak-to-peak).

TIPS, TERMS & TECHNIQUES

Atlantis features some classic but powerful techniques that go beyond introductory subtractive synthesis. If you're new to analog synthesis, or just want to get a better handle on how Atlantis employs these techniques, read on.

Noise

In the world of audio, noise is usually considered to be a bad thing, and developers expend great effort to design circuits that minimize noise. So why does Atlantis contain circuits designed specifically to *create* noise?

Indeed, *unwanted* noise is undesirable. But not all noise is unwanted. Synthesizing the sound of wind or waves are a couple of the more obvious uses for a noise generator, but the possibilities go far beyond. The crack of a snare hit; the breathiness of a flute sound; an added sizzle to a resonant pad — all are within the sonic domain of noise.

But noise has many other benefits beyond simply being heard. For example, when it's used to modulate a filter's cutoff frequency, an oscillator's pitch or its pulse width, then all sorts of raspy, buzzy, gritty timbres are obtained. Not coincidentally, Atlantis' normalled routing enables you to modulate these very same destinations with the built-in noise source.

Noise is also a key ingredient in Sample & Hold (S&H) circuits. Because noise is essentially random, feeding it into a S&H circuit produces the sort of clocked, randomly stepped voltages that are a common sonic characteristic of classic sample & hold techniques.

It might surprise you to learn that not all noise is the same, and that different circuits exist to produce different types, or "colors," of noise. The two most common colors of noise are pink and white, and both are offered within Atlantis.

Pink noise has less high frequency energy than white noise, and thus sounds darker. Pink noise contains equal power per *octave*, which means the 55Hz wide range of frequencies in the octave between A1 and A2 contains the same amount of energy as the 880Hz range of frequencies in the octave between A5 and A6. This has the effect of giving more sonic weight to lower frequencies, resulting in a deeper, thicker sounding noise.

White noise contains equal power per *frequency*, which means every frequency, whether it's 70Hz or 7,000Hz is equally present in the noise signal, and the energy curve is no longer skewed toward the lower frequencies favored by pink noise. This give white noise more brightness and sizzle than pink noise.

The noise color also affects the output of Atlantis' S&H circuit. White noise produces a wider range of random values than Pink noise, and is the type traditionally used to create sample & hold effects. If you want a more subdued S&H effect that's skewed toward the lower part of the scale, use Pink noise.

Sample & Hold

Sample & Hold (S&H) is a technique most commonly used to generate stepped, random voltages. The circuit works by (you guessed it) sampling an input signal's voltage each time you send it a clock pulse, and holding that voltage until the next clock pulse. Two of the most common destinations for the S&H output are a filter's cutoff frequency (creating stepped, clocked timbral changes), and the VCO frequency (which produces random notes at clocked intervals).

In Atlantis' default configuration, the input signal is either pink or white noise (as set by the PINK/WHITE switch in the MIX section), and the clock rate is set by the MOD oscillator's RATE and FINE controls. In general (and as described in the Noise section), if you use white noise, every output voltage is equally likely to occur — resulting in a wide voltage swings from clock to clock. If you use pink noise, the output voltages are biased toward lower values, creating a more subdued set of random voltages.

You can decouple Atlantis' S&H circuit from the MOD oscillator by plugging an external clock into the CLK input atop the unit and patching the S&H output into the parameter you wish to modulate. Refer to the discussion of the **S&H Output** jack in the Inputs and Outputs description of Atlantis' MOD Section.

FM

Having learned that noise can be a good thing, and that sample & hold does not imply Atlantis can function as a sampler, it probably won't surprise you to learn that Atlantis' FM circuitry doesn't enable you to listen to your favorite radio station. Instead, it lets you create some very complex waveforms — ranging from tuneful to downright clangorous.

At its most basic, frequency modulation (FM) does exactly what it says — it modulates the frequency of one waveform with the frequency of another. It's easiest to understand this effect if you think about the "slow motion" variant first: Assume you have an oscillator tuned to middle-C, and that you want to frequency modulate it with a slow LFO. The result, obviously, is tremolo — where the pitched oscillator now wavers up and down around the pitch at a rate set by the LFO.

So what happens if you speed up the modulating waveform to audio rates? The ear is no longer capable of perceiving a wavering pitch, and instead perceives a single, fixed-pitch, harmonically rich waveform.

Atlantis supports two types of FM: Exponential and Linear.

- *EXPONENTIAL FM* is the type found on vintage analog mono synths of the 1970's. If the VCO's MOD slider is turned up, then any change to the modulating frequency (normalled to the RATE slider in Atlantis' MOD section) changes the perceived pitch of the fundamental. Furthermore, because the harmonic ratio of modulator to fundamental changes from note-to-note, neither the resulting pitch nor the timbre track chromatically. This makes Exponential FM ideal for

clangorous, atonal sound effects. It's a great source for experimental sounds, particularly when the modulating pitch is, itself, modulated.

- *LINEAR FM* is the type more commonly associated with digital synths in the 1980's, although the linear FM circuitry in Atlantis is purely analog. If the VCO's MOD slider is turned up, then any change to the modulating frequency (normalled to the RATE slider in Atlantis' MOD section) alters a note's timbre without affecting its perceived pitch. Furthermore, because the harmonic ratio of modulator to fundamental remains consistent from note-to-note, both the resulting pitch and timbre track chromatically. This makes Linear FM more "musical" than exponential FM, and it's ideal for creating harmonically complex waveforms that track across a range of notes.

Sub Osc

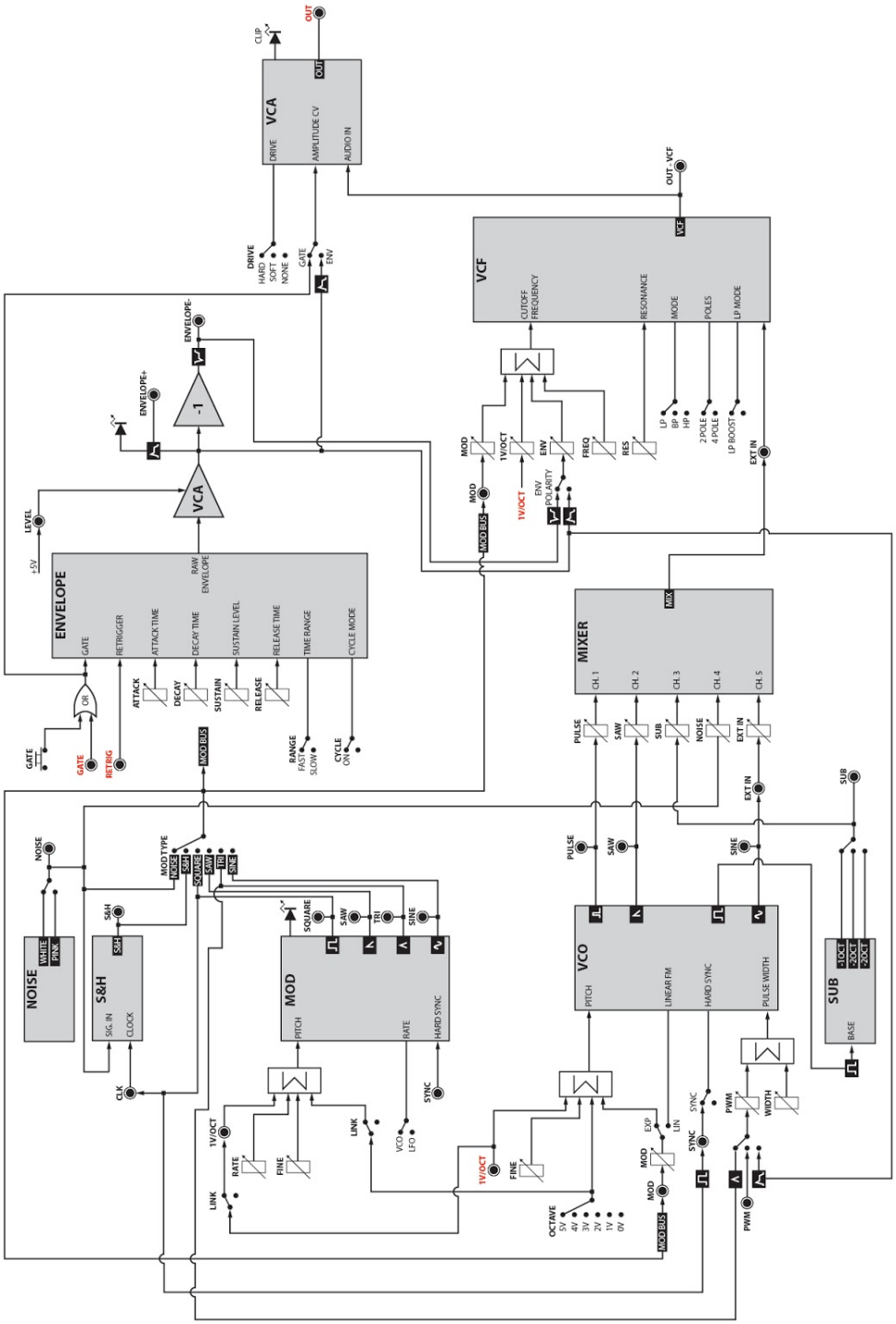
Sub oscillators are synchronized to the pitch of some parent oscillator, but produce a waveform either one or two octaves lower, which can give your sound a beefier bottom end. Atlantis's sub oscillator is tied to the pitch of the VCO, and gives you three different options:

- A square wave 1-octave below the pitch of the VCO
- A square wave 2-octaves below the pitch of the VCO
- A pulse wave that sums the -1 and -2 octave square waves, resulting in a waveform 2-octaves below the pitch of the VCO, but with a wider pulse width than a square wave.

Atlantis' sub-oscillator level (and mode switch) are found in its MIX section.

Signal Flow

Although we strongly advise that you read this manual, we do empathize with the desire to nerd out over a really good block diagram. So, without further ado:



TECHNICAL SPECIFICATIONS

Width	40 hp
Maximum Depth	38 mm
Current Draw	214 mA @ +12V 196 mA @ -12V