PORTAL DRUM USER'S MANUAL

PORTAL DRUM

HIT   DYNACTRL   TUNE   AMP DECAY   DRIVE   EQ SPAN   OUT

pitch dcy amt   trnst amt

FINE   TIME

TUNE   PITCH DECAY

COARSE   MEOW   AMOUNT

DRIVE

AMP DECAY

TONE   track   SPAN

TRANSIENTS   EQUALIZER

AMOUNT   HPF   POSITION

RABID ELEPHANT

Introduction

Portal Drum is an analogue powerhouse for creating novel tuned-drum sounds. Portal Drum is particularly well suited to create kick drums but it will also create many great sounding toms, percussion instruments, and synth/bass lines. With Portal Drum, we wanted to make a new canonical drum sound with just a hint of nostalgia. Through this portal you will undoubtedly discover new territories!

Portal Drum utilises an underlying philosophy that an instrument should sound right with minimal or even no additional processing. You will immediately find Portal Drum fits much better in a mix without compression, post-EQ, layering, resampling, etc. This keeps the music making process more immediate and fun.

Portal Drum features a total of 3 painstakingly designed envelopes for PITCH DECAY (FM), TRANSIENT, and AMP DECAY. These novel envelopes are a big part of Portal Drum's characteristic sound and not found in any other synthesiser.

The Portal fold circuit adds focused and more interesting nonlinearities from subtle warmth and saturation to near-extraterrestrial reaches that cut a tunnel through the spectra.

The equalisation section of Portal Drum contains a HPF for keeping your tunes lite while the GAP EQUALIZER drastically contours and pushes frequency content to the edges providing a huge array of mixed drum tones.

The Portal Drum is the first instrument of ours to feature the DynaControl system. This gives the user a way to macroise a particular drum design and be able to play it easily and musically with minimal external patching. In fact, only one wire is needed to fire the drum and modulate up to 6 parameters which gives the user a realistic 'how hard' input as found on a real drum.

Portal Drum features no less than 18 knobs and 16 switches for tuning to your heart's content, all in an ergonomic 20HP. Addition of fully featured attenuverters, each with their own range/polarity switches and S&H circuits on each of the parameters means this module is a truly all-in-on solution. Because of the use of dual-concentric controls, we create a highly dense module without sacrificing ergonomics. Portal Drum requires no external EQs, S&H modules, compressors, distortions, or utilities to create complete drum sounds. For it's size, cost, and of course novel sound, it is unrivalled.

Portal Drum is capable of a ton of different drum sounds - everything from minimal 'pillow kicks' and toms to esoteric perc sounds, rimshots, woodblocks, claves, and ticks n clicks. Just listen and twiddle and you will find your own special spots!

Features

- PORTAL and SATURATION wave distortion modes (CVable)
- PITCH modulation with custom envelopes provide fully adjustable FM sweeps (CVable)
- Selectable pitch envelope shapes: 'Rabid Elephant' and 'Classic'
- AMP DECAY for adjusting the duration of the kick (CVable)

- TRANSIENT generator for adding all sorts of colours of cliks, tiks, cluks, etc. (CVable)
- HPF gives other bass frequencies room and controls liteness
- Powerful EQ sculpting with the GAP EQUALIZER (CVable)
- MEOW displaces the bloom of harmonic energy instead of placing it all up front
- Three meticulously crafted custom envelopes for FM, AMP, and TRANSIENT
- DynaControl system for applying musical dynamics to any or all CVable parameters with just a single input - with one cable it is possible to expressively run the entire drum
- Six switchable analogue high speed S&H circuits on all CV inputs
- Fully-featured 3 mode attenuverters on all CV inputs for biploar, unipolar positive, or unipolar negative knob operation, which eliminates wasted knob range
- Dual concentric conductive plastic pots with high cycle life and smooth action to increase feature density with no compromises to ergonomics
- Low loss, high speed active reverse voltage protection, overcurrent protection, ESD protection

All Rabid Elephant instruments are professionally hand-crafted products built and designed to exceptionally high standards of performance, quality, and most importantly: musical sound. **Click here** for more details about this commitment.

Our Warmest Thanks To…

- Absolutely You! We do what we do out of love and the hopes that people create and spread their own liteness with the world. You are a patron to this cause and to us… Thank You!
- Yoni. While we've only met just a short time ago, we have aligned in deep ways and work in harmony - keeping each other lite. Meowww!
- Hannes Pasqualini. A gifted artist with a very positive and thought-provoking style that is more than welcome here.
- Thuy. For providing her (+) energy during unstable times <3
- Vuk, thanks for your help. Godspeed young emperor 🙌

Installation

Install the power cable to your power distribution with the correct polarity. Also ensure the connector on the non-Rabid Elephant side is not shifted/offset incorrectly. **-12V is the side of the connector with the RED STRIPE**! The red side of the cable go to the 'STRIPE' mark of the power header.

NOTE: We have included an Appendix located at the end of the manual which includes a Quick Terminology section defining terms used throughout the document.

Interfacing with Portal Drum

This is Portal Drum:

NOTE: All CV inputs nominal -5 to +5V range, with some inputs able to go farther with increased voltage!

1. HIT Input Jack

This input is designed such that it will accept nearly any type of signal while still properly hitting the kick drum. The only requirement is that the voltage exceeds +1V. This jack also has a little trick when you leave the DynaControl input unplugged. Because we have S&H circuits (and attenuverters) on every input, you can create a single cable HIT + dynamics input if you vary the gate amplitude of your HIT signal. VeloGate! Because of this normalisation, be certain to zero out any attenuverters or plug a dummy cable into the DynaControl jack if you do not want to apply the HIT signal to the CV inputs.

2. DynaControl Input Jack

This is the macro dynamics input for the module. We think of this as the 'how hard the drummer hits' input. Start here for CV modulation! By default, all parameters that have attenuverters are normalled to this jack (meaning they call get this signal if their corresponding CV input jacks are left unplugged). Then you now can 'program' the dynamics response using the attenuverters. See the Musical Dynamics and DynaControl section for more details how to fully exploit this system.

3. TUNE Input Jack

1V/oct control over the VCO base pitch. The VCO in Portal Drum will track many octaves so be sure call Portal Drum up for pitched instrumentation too!

4. AMP DECAY CV Input Jack

This input allows for external voltage control over the AMP DECAY time. It is summed with the AMP DECAY knob setting.

5. DRIVE CV Input Jack

CV control over the drive of the wave distortion circuits.

6. SPAN CV Input Jack

CV control over the span of the GAP EQUALIZER.

7. OUT Jack

Final output of the drum.

8. S&H ENABLE Switches

When set to the right, a S&H circuit is enabled. Nice, eh? The allows drum CV modulations to be locked in with every HIT signal. Turn these off if you want to hear modulation movement between HIT pulses. Special Note: The first two switches do not have dedicated CV input jacks - the corresponding circuit written in blue under the switches indicate which circuit to apply S&H. 'pitch dcy amt' = PITCH DECAY AMOUNT and 'trnst amt' = TRANSIENT AMOUNT.

9. FINE TUNE Knob (Inner)

Base tuning of the oscillator with fine resolution. Offset control.

10. COARSE TUNE Knob (Outer)

Base tuning of the oscillator with coarse resolution. Offset control.

11. TUNE Attenuverter

Fully featured attenuverter with 3-way polarity selection switch: bipolar, unipolar positive, or unipolar negative with gain ranges -1 to +1, 0 to +1, or 0 to -1, respectively.

Note the blue arrow markings above all attenuverter switches. The left-most 'up and down' arrows mark -1 to +1 range of the knob with the 12 o'clock position being 0. The center 'up' arrow marks 0 to +1 positive unipolar range. The right 'down' arrow marks 0 to -1 negative unipolar range.

An attenuverter is a circuit that adjusts how much (the gain) of the incoming CV signal is applied to the target parameter. The polarity switches above the knobs control the gain range of the knob. When the switch is fully left, the knob will adjust the gain of the incoming CV from -1 to +1 with 0 gain when the knob is at noon. When the switch is in the centre, the knob adjusts the gain from 0 to +1 and when the switch is fully right, the knob adjusts the gain from 0 to -1. Keep in mind that in the bipolar position a human will be unable to perfectly zero out the control entirely - for achieving perfect zero, use one of the unipolar options (centre or right switch position) and turn the knob fully CCW.

TIP! There is a panel hint to tell which attenuverter corresponds to which parameter. If the attenuverter has a small gold arc underneath, it corresponds to the outer knob of the dual-concentric stack. No arc means it corresponds to the inner knob of the dual concentric stack.

12. PITCH DECAY LENGTH Knob (Inner)

Adjust the length of the pitch decay envelope. Offset control.

13. PITCH DECAY AMOUNT Knob (Outer)

Adjust the amount of the pitch decay envelope that affects pitch of the oscillator. Offset control.

14. PITCH DECAY AMOUNT Attenuverter

15. PITCH DECAY ENVELOPE SHAPE Switch

This switch chooses the shape of the pitch decay envelope. Left = Rabid Elephant, Right = Classic. Note: the graphic is not representative of the nuances that differ the shapes :p. The classic shape is *not* linear and what you will find in any other drum machine. The Rabid Elephant shape is novel and has been fine tuned 100s of times over the course of 4 years! It is like an exponential decay but more knee'd. This shape was actually derived, then tweaked from Natural Gate's custom envelopes.

16. MEOW Knob

Meow uses the pitch decay envelope to set the placement of energy from fully in front to later in the waveform. See the Tips section for more details how this control can be used.

17. DRIVE Knob (Inner)

This adjusts the amount of drive into either the portal or saturation circuit. It also is used for adjusting the volume without any clipping/folding as an overall 'one knob dynamics' control. Offset control.

18. DRIVE Attenuverter

19. PORTAL/SATURATION Switch

This switch chooses the type of waveform distortion: Portal (folding) or Saturation (clipping). Offset control.

20. AMP DECAY Knob (Outer)

This adjusts the decay time of the drum's amplitude. Offset control.

21. PILLOW/PUNCH Switch

This switch chooses the type of drum: pillow or punch. In Punch mode, the hold time allows at least a full cycle of typical LF signal to push air; especially useful for more powerful LF drum sounds. In general, the pillow drum has less power than the punch drum and will also allow for the shortest decay times.

22. AMP DECAY Attenuverter

23. TRANSIENT TONE Knob (Inner)

Adjusts the tone of the transient. This transient isn't a layer but rather adds harmonic content to the initial part of the signal itself so phase issues are never a problem. Offset control.

24. TRANSIENT AMOUNT Knob (Outer)

Amount of transient. Offset control.

25. TRANSIENT AMOUNT Attenuverter

26. HPF TRACK DISABLE Switch

When disabled (right), the HPF cutoff is fixed by the HPF CUTOFF FREQUENCY knob. When tracking on (left), the HPF will track the TUNE input jack post-attenuverter.

27. HPF CUTOFF FREQUENCY Knob

2nd order HPF. The HPF range is to ~1kHz. Offset control.

28. EQUALIZER (GAP EQUALIZER) SPAN Knob (Inner)

The GAP EQUALIZER is our answer to mid sculpting. Think of it as a gap or canyon in the mid frequencies. It is a LPF feeding a HPF, circuit-wise, with SPAN adjusting the cutoff of a HPF and POSITION adjusting the cutoff of the LPF. Both SPAN *and* POSITION control how wide the gap is as these are not linked controls. You can see the frequency plots of the GAP EQ at various positions in the Appendix here. Offset control.

29. EQUALIZER (GAP EQUALIZER) POSITION Knob (Outer)

The Position control adjusts the LPF side of the GAP EQUALIZER. Offset control.

30. EQUALIZER (GAP EQUALIZER) SPAN Attenuverter

Rabid Acceleration to Use

Because the module has such huge range, tons of features, and many controls, we'd recommend starting with the following settings the first time you use the module:

1. Turn all attenuverter polarity switches to the centre position and turn all attenuveter knobs fully CCW. You find out later why we do this in the Musical Dynamics & DynaControl section.
2. Enable S&H on all inputs by moving all S&H switches to the rightmost position.
3. Set SPAN fully CCW and POSITION fully CW.
4. Set PITCH DECAY AMOUNT fully CCW.
5. Set AMP DECAY about half way and DRIVE about 10 o'clock.
6. Set TRANSIENTS AMOUNT fully CCW
7. Now send in a velocity control signal into the DynaControl jack (velocity output from sequencer, LFO, whatever you want to adjust velocity). Turn up various attenuverter knobs. Note the changes are heard only at HIT triggers.
8. Turn off any S&H switches for parameters you want to hear CV movement *between* the HIT pulses.
9. Most of the controls on Portal Drum will interact with each other. Try finding a nice transient using the TRANSIENTS TONE and AMOUNT controls (start with DRIVE set pretty low - 25% or so). Now adjust the SPAN, POSITION, and DRIVE controls to see how this transient sound can be transformed. Most controls are like this. By having this kind of interaction, the amount of nooks and crannies opens up to a near-infinite amount of possibilities.

Musical Dynamics & DynaControl

Portal Drum features a very simple system we call DynaControl. It is comprised of a programmable macroisation concept as well as a bussing scheme that makes even a minimally patched module perform similarly to a real instrument. So we have a single macro and via bussing, we program how much this macro is applied to each target parameter.

Take a kick drum, for example. It it operated only by a foot. The only variable other than the rhythm the human gets to choose is force. But force doesn't only affect one parameter - it affects many. And so we think of force as a macro. We use this DynaControl input as our 'force' input.

When you hit a drum at varying forces, a several things happen:

- The harder you hit it, the more nonlinear and louder the sound becomes
- The harder you hit it, the longer it rings out

- The harder you hit it, the more the head deflects resulting in more pitch decay (FM)
- The harder you hit it, the more transients you hear

DynaControl is automatically bussed (via jack normalisation) to all of the CV inputs and we use the attenuverters to control how much of the DynaControl signal goes to each parameter. This is the programming of your instrument to this macro input. This programming is continuously adjustable for each parameter using the attenuverter knobs. In the above example, we can program this response using the attenuverter knobs (first, enable all of the S&H circuits by switching them to the right and put all attenuverter switches to the middle (unipolar +) position):

- The harder you hit it, the more nonlinear and louder the sound becomes
  - Set the DRIVE attenuverter knob to some positive value
- The harder you hit it, the longer it rings out
  - Set the AMP DECAY attenuverter knob to some positive value
- The harder you hit it, the more FM'd the signal becomes
  - Set the PITCH DECAY AMOUNT attenuverter knob to some positive value
- The harder you hit it, the more transients you hear
  - Set the TRANSIENT AMOUNT attenuverter knob to some positive value

We have just programmed a drum that has very musical dynamics over four parameters - all from just one signal at the DynaControl jack. Send an external 'force' signal here and tweak your programmings. For the most direct understanding of your programming, just send in a knob DC offset to this input and play the 'force knob' as the drum fires.

But wait, there's more! The DynaControl system actually utilises 2 input jacks for a percussion module: HIT and DynaControl. The HIT jack is normalled to the DynaControl jack and DynaControl is normalled to each of the CV inputs. The reasons we've done this is as follows: If you use a variable amplitude HIT signal, you can run the entire module with just one cable and still get the same powerful, macroised dynamics control. Just remember that you may want to enable the S&H for the parameters to ignore the gate lengths/falling edges of the incoming HIT signal. We would recommend leaving the S&H circuits on until you have a need for them to be off, which would only be in those cases where you want to hear changes in modulation between the HIT pulses. Cool eh?!

To remove parameters from the DynaControl bus, you can zero out all attenuverters corresponding to unused/unplugged CV inputs.

Also note that the DynaControl input is the only way to access CV control over PITCH DECAY AMOUNT and TRANSIENT AMOUNT. These two targets do not have their own input jacks. They do, however, have their own S&H circuits!

IMPORTANT DYNACONTROL REMINDER!

Remember that when the DynaControl input is unplugged it will receive it's signal directly from the HIT jack. This means that if any attenuverter is not zero'd out, this hit pulse itself will be applied as modulation to those target parameters. Attenuverters are zero'd out if the knob is fully CCW in either the middle or right switch positions. If the S&H switch is enabled for that non-zero'd attenuator target, only the voltage level (the height of the HIT pulse) will be applied and you will not hear the falling edge (resulting in a simple offset). If the S&H switch is off, then the target parameter will modulate high and low based on the HIT signal's high and low voltage.

This can be exploited with some targets but for others, like tune, you may not want a pulse 'blip' very quickly tuning the VCO differently when the HIT is high than when it is low. And for short HIT pulses,

which most probably are, you may not notice you've left an attenuverter set at a non-zero value which may be confusing until you memorise this feature's functionality.

Tips

Always Account for the Loudness Heuristic

This is listed first because it's probably the most impactful in getting results from Portal Drum. Most people already know that louder things are perceived as sounding better, even if the signal is exactly the same. On Portal Drum, we strongly encourage getting in the habit of having one hand on make-up volume/gain somewhere else in the post Portal Drum signal chain. Especially when adjusting Drive amounts. We'd estimate that 95% of all drum sounds you probably like (or at least what the world seems to like) have lower drive settings - below noon - for cleaner drum sounds. And even below noon, you will still get large variations in volume that need to be normalised later in the chain. Do this. You will start to find lots of awesome, useable drum sounds at lower drive settings once you make them louder again.

Dynamics

We have given Portal Drum a decent amount of dynamic range. Always normalise your drum volume by having your mixer fader handy along with make-up range. This allows exposure of the very nice sounds available with low drive settings. In fact, most kicks you probably hear are with lower drive settings. Audible clipping starts around 10 o'clock on the DRIVE control. Watch your hearing and watch clipping at the mixing board/interface front end!

Portal Drum did not result in an entirely pristine, clean drum voice. In fact, it did indeed start with 'hifi' origins but the drum sounds were missing life. If you need very low noise, try using the Saturation setting and setting Drive to very low levels.

We have given the DRIVE control a fair amount of range as increasing it didn't remove any settability. That being said, the DRIVE control is used for many things, including some volume adjustment. As you approach 10 o'clock and beyond, more distortion of the waveform will occur. You may note that well beyond noon, transients may be lost - this is because the waveform already contains lots of higher order harmonics and are effectively masking the addition of more transients.

Context, Context, Context

It's important to understand the role of your drum in context. When creating Portal Drum, we always placed the kick sounds in a particular song. Be very careful with any 'heft bias' where the cool super powerful sounding kick gets in your head to the point it kills your song. We have found that even heavy kicks are quite a bit different when you mix them to fit a song hence the HPF and EQ. Be careful with power, low end, etc. It adds considerable heft to your song and you may not want that weight for your listeners.

Devilish Details

Portal Drum has tremendous range and while we have spent years ranging things so they work well together, please note that this instrument can do very subtle changes to tone that can have a big impact on the feel and mix of your drums in a song. After having your fun going ape shits, also try using it more subtly. You'll probably find a lot of use and much better fitment without lots of post-processing work later. And ofc, if you're punk, ignore at will.

DynaControl

Another friendly reminder the DynaControl input is normalled to the HIT input. If you have a pulse at your HIT input, it will be fed into the DynaControl input and if any attenuverters are set to non-zero, this pulse will also modulate those non-zero'd target parameters. This could end you up with some unusual behaviour if you do not remember this. Read here again for more details.

EQ'n

The EQ sections of the instrument are extremely powerful and composed of a 2nd order HPF and a GAP EQUALIZER, which contains a 2nd order LPF into a HPF to create a variable width gap in the spectrum of the audio. It's important to note that the POSITION (or SPAN) controls will not affect the other. They are independent and not-linked. Look here to see the frequency response of the GAP EQ.

You will find many fruitful interactions between the EQ section and the other controls of the module. Because we liked and built-in some codependence, you have to remember that the EQ is capable of completely removing certain transient frequencies and enhancing others. Keep this in mind when adding transients or harmonics.

The GAP EQUALIZER is a highly efficient way to EQ the drum signal with minimal controls. We designed the GAP EQUALIZER with two controls: POSITION and SPAN. The 'bypassed' settings are with the POSITION fully CW and SPAN fully CCW. The HPF is bypassed when it is fully CCW. So when setting things that add harmonic content, you may want to have the EQ in the bypassed setting. Other than that, just adjust em by ear. We start initial tuning of the module from the knobs in the upper left to the lower right.

MEOW

What the heck is MEOW? The name came from the way it sounds with high levels of pitch decay and portal drive… more clearly speaking, MEOW controls how much of the inverted pitch decay envelope is fed into the drive circuitry. The more MEOW, the more the sound will increase in volume and harmonics over time (the bloom time controlled by the PITCH DECAY time). This ended up being quite a bit more useful than we'd originally thought because it allowed the beginnings of the drum sound to be more subdued and the drums started to slip into a mix a bit more effortlessly but without removing the punch and attack the pitch sweep provides. We find MEOW makes most sense to adjust in context with the rest of your music as it's easier to hear em slip on in.

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Ticks, Clicks, and Transients

A key point in the design of Portal Drum was to create a phase correct instrument over the sweeps of all controls. Everything happens in only serial fashion; no additional signals are mixed in the drum. By design, this completely avoids any issues you may be aware of when layering or mixing sounds which may phase cancel. Keep in mind that transients are affected by the decay time (when the decay of the previous hit is still ringing out), the GAP EQUALIZER, pitch decay, and the DRIVE amount. When DRIVE is very high or the the signal is filtered in certain ways, you may not hear transients or they may be 'maxed out' by the other parameters (like DRIVE).

Portal Drum is a sync'd VCO type voice. This means everytime a new HIT pulse is received, the VCO will reset back to zero. Portal Drum features a special sync circuit that makes certain the waveform always starts off moving in a positive direction (EQ or other settings may alter this) but because 'science,' if your decay is very long and rings into the next hit pulse, the ending level of the waveform will immediately be set back to zero. This may introduce additional clicks.

Also remember in PUNCH mode and very short decay times, you will hear the falling edge click too, as the hold time is longer in PUNCH mode..

Specifications

- VCO tuning range: 20 Hz to 2 kHz
- HIT trigger threshold: +1 V
- Output amplitude: +10 Vpp, bipolar (-5 to +5 V) nominal
- All IO DC-coupled
- Input Impedance: 25 kΩ to 50 kΩ
- Headroom (max passable signal before clipping): >= +/-11.9 V for +/-12.0 V power, 50 kΩ load
- Protection (IO)
  - All IO will handle shorts to any voltage from +12.0 V to -12.0 V *
  - All output currents limited to 35 mA
- Protection (Power)
  - Active high-speed reverse voltage
  - Overcurrent (fused)
- Power Requirements: 12.00VDC (nominal), (+11.95V, -11.95V (min)) @ 160mA + and 110mA - (average)
- Size: 20HP W x 128.5 mm H x xx mm D**, xx mm D***
  - W, width is nominal HP. Actual width is 12HP = 5.08 * 12 = 60.96 mm minus standard fitment tolerances.
  - **D, depth measured from back of front panel to back or rear panel)
  - ***D, depth measured from back of front panel to back with power cable

* Shorting any output is not recommended and should be avoided. We test for duration of at least 5min for each test scenario. That being said, it is impossible to test our instruments with every other Eurorack module and power supply. Therefore we cannot guarantee full assurance in regards to IO safety and damage. See our Warranty section for responsibilities. Patch carefully!

Any specifications are subject to change without notice.

Calibration, Warranty, and Repair

Calibration

Rabid Elephant products typically feature calibration adjustments. All of these adjustments are designed in such a way where continual calibration is not required. If the module calibration is upset we can recalibrate any Rabid Elephant instrument at no cost for the duration of the warranty period (user covers shipping & handling costs). If you feel the instrument needs calibration, email us at: support@rabidelephant.com

Warranty

Rabid Elephant, LLC. warrants the product and accessories contained in the original packaging against defects in materials and workmanship for normal use for a period of 3 years after the original purchase date.

The warranty does not include normal ageing or wear, cosmetic damage, including but not limited to scratches, dents, etc. It does not include damage caused by accident, misuse, abuse, fire, liquids, or other atypical external sources. It does not include damage imparted on the product due to incompatibilities with non Rabid Elephant products. It also does not include coverage of damages caused by modification, tampering, or repair of Rabid Elephant products by non Rabid Elephant

employees (*properly executed* adjustments, if covered in the User's Manual are allowed and will not void this warranty).

We do not and cannot guarantee full compatibility with all other non-Rabid Elephant products due to the lack of standardisation in this format and the lack of specifications for many of the modules currently available. Therefore, we are not accountable for damage imparted unto other modules or systems caused by Rabid Elephant products nor damage to Rabid Elephant products by other modules or systems.

Repair

We will make every attempt to repair any of our products and make a considerable effort to ensure our products do not end up in a landfill. We will not in-discretionarily discard/replace the instrument or subassemblies of the module. If your instrument is damaged, please contact us at: support@rabidelephant.com. If covered under warranty, your instrument repairs will be covered free of charge.

Environmental

Our instruments, we hope, will never end up in a landfill and we design in such a fashion to maximise life. However, we realise everything has a finite lifetime so we would prefer any Rabid Elephant item that would otherwise be disposed be sent back to us. Do NOT dispose of any of our products in the trash! Send it back to us and rest assured it will be disposed of in a safe manner. You may also arrange safe disposal at your nearest e-waste handling facility. All current and future Rabid Elephant products are RoHS compliant.

Appendix

Quick Terminology

Attenuverter: A control that adjusts how much (the gain) of the incoming signal is applied to the target circuit. Depending on the settings of the attenuverter range switches located above each attenuverter knob, gain may be in the range of -1 to +1, 0 to +1, or 0 to -1.

CW: Clockwise. Turning the knob to the right.

CCW: Counter-clockwise. Turning the knob to the left.

DC: Direct Current but don't focus on that. It just means the signal is some constant voltage. Usually DC levels of a signal can be adjusted. In fact, offset knobs (which most parameters on your synth are!) are actually DC signals added to the CV signal to shift the parameter level up and down. Once you stop turning the knob, the signal stays at that shifted level.

Gain: This is constant that multiplies the signal. In other words, it scales the incoming signal by some constant. Gain values less than 1 attenuate or shrink the signal in the up and down dimension. Gains above 1 boost the signal and stretch out the signal. $y = Gx + C$ where y is the output, x is the input signal, G is the amount of gain, C is the amount of offset.

Invert/Inversion: Flipping a signal, typically about the horizontal axis. This is equivalent to applying a gain of -1 to the signal. The 'version' part of attenuversion comes from this term.

Macro: A control that controls 2 or more other parameters.

Offset: This is a constant level or DC shift in the signal. Unlike gain, this is added, not multiplied with the signal. Instead the whole signal moves up and down. $y = Gx + C$ where y is the output, x is the input signal, G is the amount of gain, C is the amount of offset.

Gain vs Offset
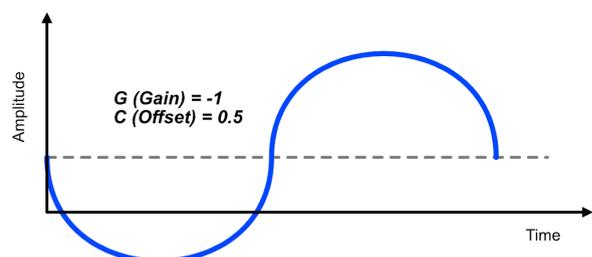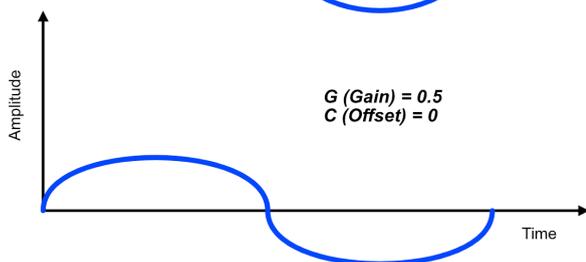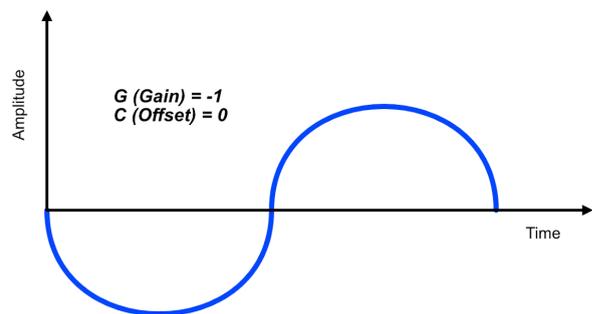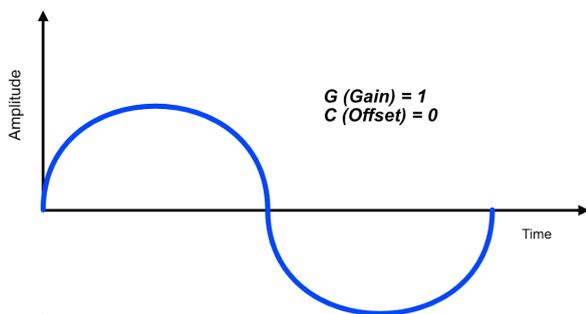
GAP EQUALIZER Frequency Response Plots

Note: 1% is with the control fully CCW, 100% is fully CW. The green plot is the final output of the GAP EQ, the other two plots are the internal outputs of just the LP or HP sections.

Position 1%, Span 1%:	Position 50%, Span 1%:	Position 100%, Span 1%:

Position 1%, Span 50%:	Position 50%, Span 50%:	Position 100%, Span 50%:

| Position 1%, Span 100%:	Position 50%, Span 100%:	Position 100%, Span 100%:
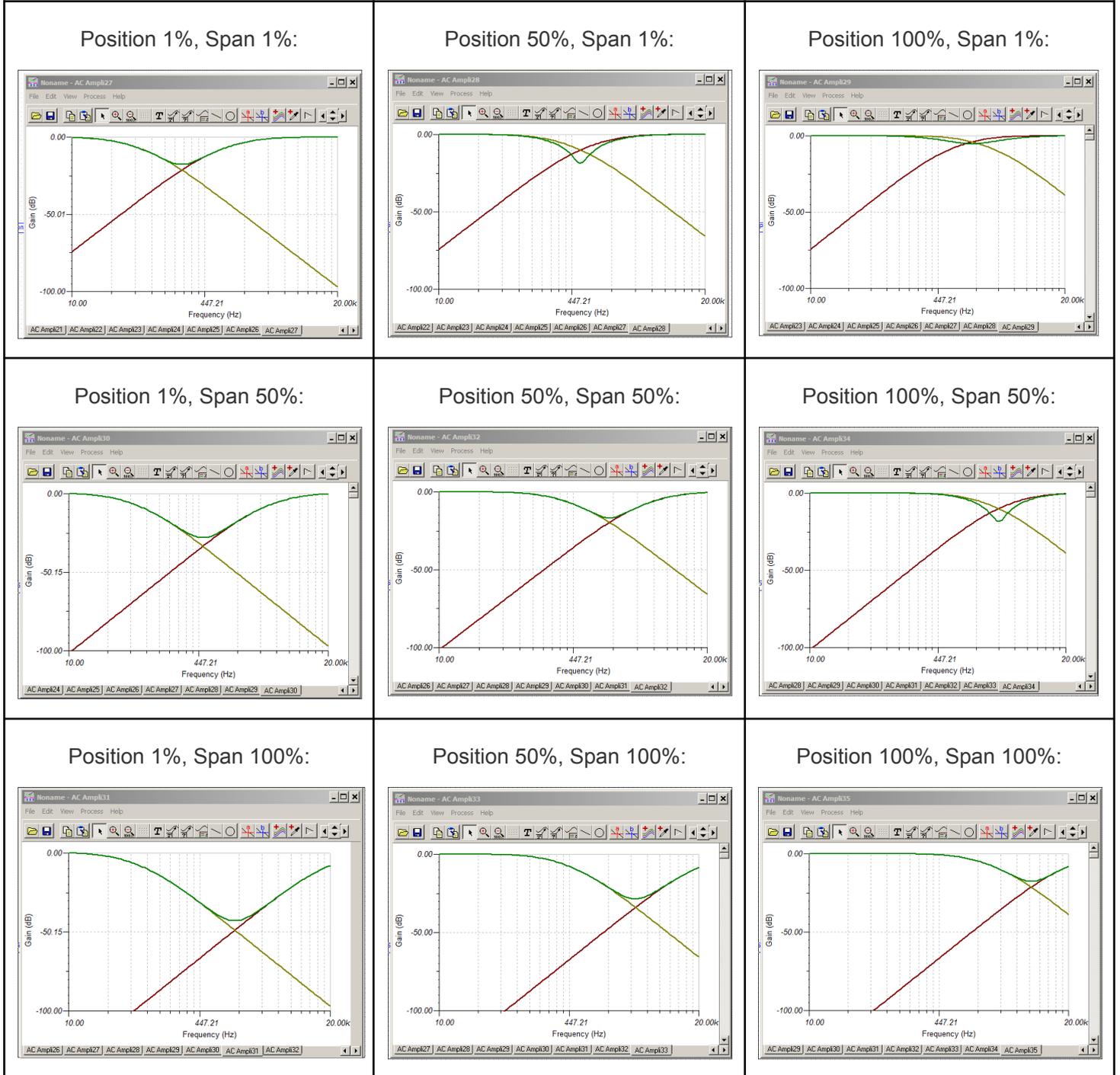
Expander (preliminary)

Portal Drum contains provisions for potential expansion of the following parameters:

- HIT Button In
- Meow Amount CV In
- 1V/oct In
- FM Decay CV In
- Transient Amount CV In
- Transient Tone CV In
- HPF 1V/oct In
- GAP Position CV In

- Direct Sin VCO Out
- Direct Tri VCO Out
- VCO Sync disable
- Pitch EG Out
- Amp EG Out
- DynaControl Out
- S&H Pulse Out
- Portal In

It is important to leave the expansion header plug installed for proper operation of the unit. Do not remove this plug. If we release an expander or make it open source, this is where you plug into the expander.

Spread your creativity, kindness, and positive energy with the world...
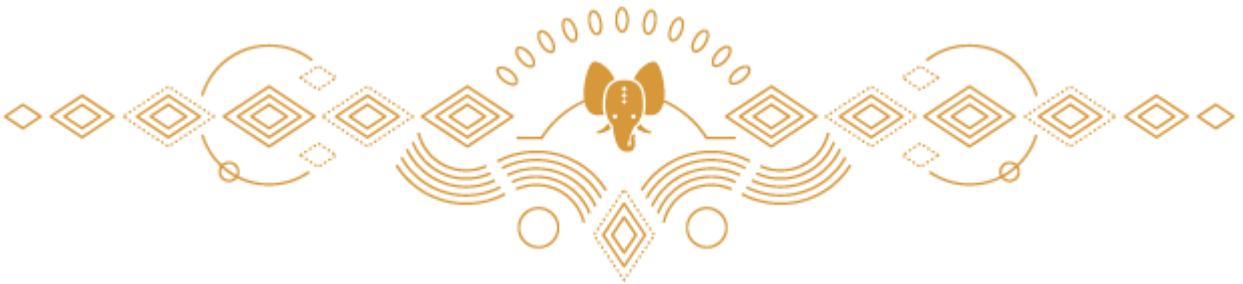
~ With love, Rabid Elephant