NATURAL GATE USER'S MANUAL

NATURAL GATE

OPEN   DECAY   DECAY   OPEN

HIT   CTRL   CTRL   HIT

OUT   IN   IN   OUT

RABID ELEPHANT
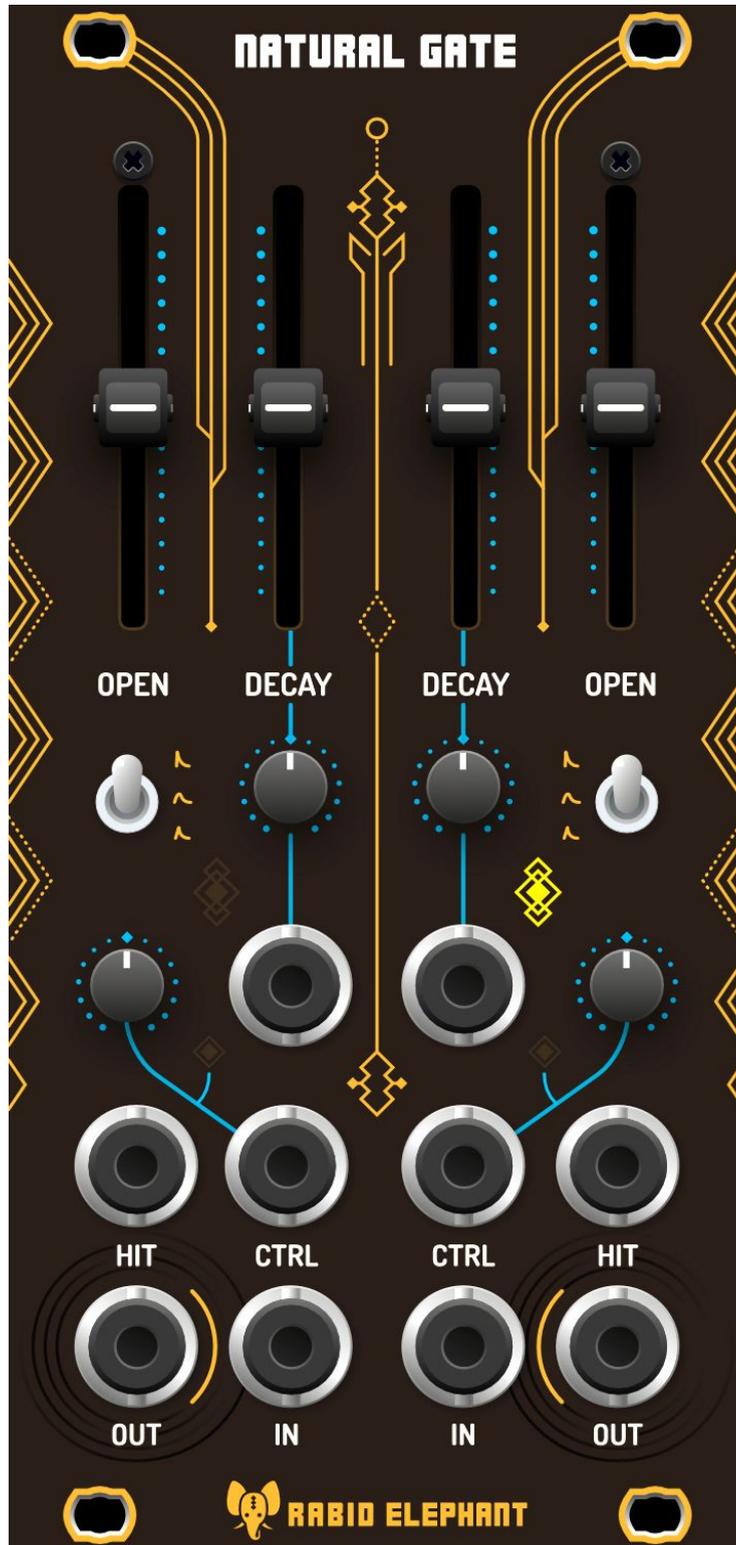
Introduction

Natural Gate has been designed to generate a signature response evocative of the acoustics of the natural world. Think of how the plucking of a string or the beating of a drum head produces organic sounds we are all intimately familiar with, sounds that resonate with us, they feel right.

To obtain these qualities, we started with a blank slate and developed an instrument with its own unique character. A character unhampered by the conventions of traditional circuits and devices.

Natural Gate's fully adjustable (and voltage-controllable) decay alters the level of damping of the object you hit - from very short highly damped events to vibrations that ring out for several seconds. The module's innovative circuitry ensures the perfect decay shape at any decay setting.

W*hat* you hit matters just as importantly; the MATERIAL switch provides a selection of three material characteristics further increasing the flexibility of the instrument.

The HIT input was carefully designed to ensure that any signal you send in will correctly drive Natural Gate's envelopes. The CTRL input allows you to open the gate in any way you see fit and when combined with HIT, natural dynamics are realised.

Natural Gate was painstakingly designed and tuned by many pairs of seasoned ears. Natural Gate defines a new paradigm of how the LPG can be experienced and used, thus opening a portal for dialing in new discoveries.

Features

- Two independent LPG channels
- Zero bleed... Natural Gate fully closes
- Meticulously tuned attack and decay shapes provide extremely natural sounding responses across the full range of decay lengths
- HIT input applies the perfect trigger amplitude, shape, and duration to the internal gate circuitry... regardless of the source's amplitude, shape, or length
- Adjustable and voltage controllable DECAY times up to several seconds
- 3 selectable MATERIAL profiles
- Adjustable and voltage controllable openness
- CTRL and DECAY inputs feature attenuverting trimmers for scaling any incoming signal source properly
- Indicators display gate openness and CTRL zero
- 30mm sliders with 100k cycle life and smooth action
- 100% analogue for utmost fidelity and nuance
- Low loss, high speed active reverse voltage protection
- Overcurrent protection
- Rabid Elephant low loss, long life, high rel power cable with keyed & latching connector

All Rabid Elephant instruments are professionally hand-crafted products built and designed to exceptionally high standards of performance and quality.

Our Warmest Thanks To...

- Absolutely You! We do what we do out of love and the hopes that people create and spread love. You are a patron to this cause and to us... Thank You.
- Hannes Pasqualini. A gifted artist with a very positive and thought-provoking style that is more than welcome here. Thank you Hannes.
- Jesse (exper). Jesse is the ultimate LPG expert and was invaluable while developing our own flavour of LPG. Thank you Jesse.
- Yoni. While we've only met just a short time ago, we have aligned in deep ways and work in harmony. The future looks bright. Thank you Yoni.
- My wife. A sweet, gentle creature and responsible in large for me to stop the passive life and do this instead. Thank you Dre.

Foreword

All of our instruments are designed with clear musical and artistic goals. The goal for Natural Gate was to create a device that produces sounds as if they came from nature.

Natural Gate is not a vactrol emulation or a vactrol LPG variant. Vactrols do not provide responses close enough to the natural events we discovered in our own nature. Natural Gate is designed with this goal first and foremost - to bring nature into the electronic realm and to do so without compromise. Something new, yet already buried deep within ourselves.

Installation

Be sure to 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 BLUE wires**! The blue wires on our cable go to the 'STRIPE' mark of the power header.

Here's a short video showing exactly how to connect power for Rabid Elephant modules (skips ahead to 1:41 to bypass the intro of why we do it this way): https://youtu.be/vDlLA_ZsZ5o?t=1m41s

We do not follow the 'red strip on the ribbon cable is -12V' designation as we don't use ribbon cables and this convention is not consistent with commonly accepted colour codes for voltage polarity.

You may also notice our power cable is a bit different than other Eurorack power cables. In short, it is a big improvement. The end of the cable that is keyed, latched, and fully shrouded is the 'Rabid Elephant' end featuring a superior gold-plated Samtec 'Rugged MiniMate' connector. This end plugs into the module. This side is impossible to plug in incorrectly.

The other end is also a quality Samtec connector with 3-point gold-plated contacts, however, it is unkeyed to allow compatibility to any distribution system. This end is 2x6 pins - we do not use the Gate and CV connections so these pins would be left open. Connect the Eurorack end of the Rabid Elephant power cable to your Eurorack power distribution like so (**BLUE TO STRIPE/-12V**):
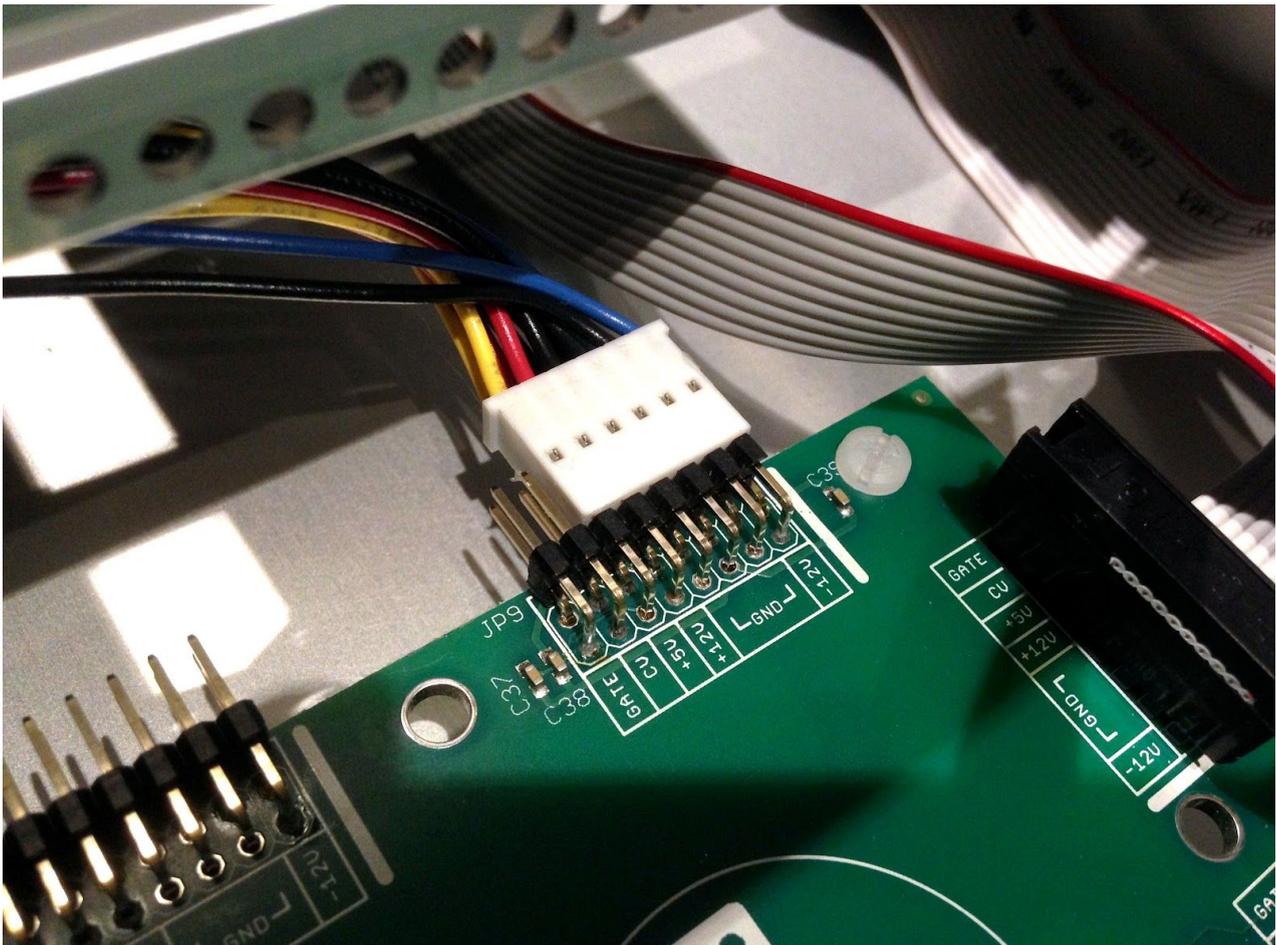
Interfacing with Natural Gate

This is Natural Gate:
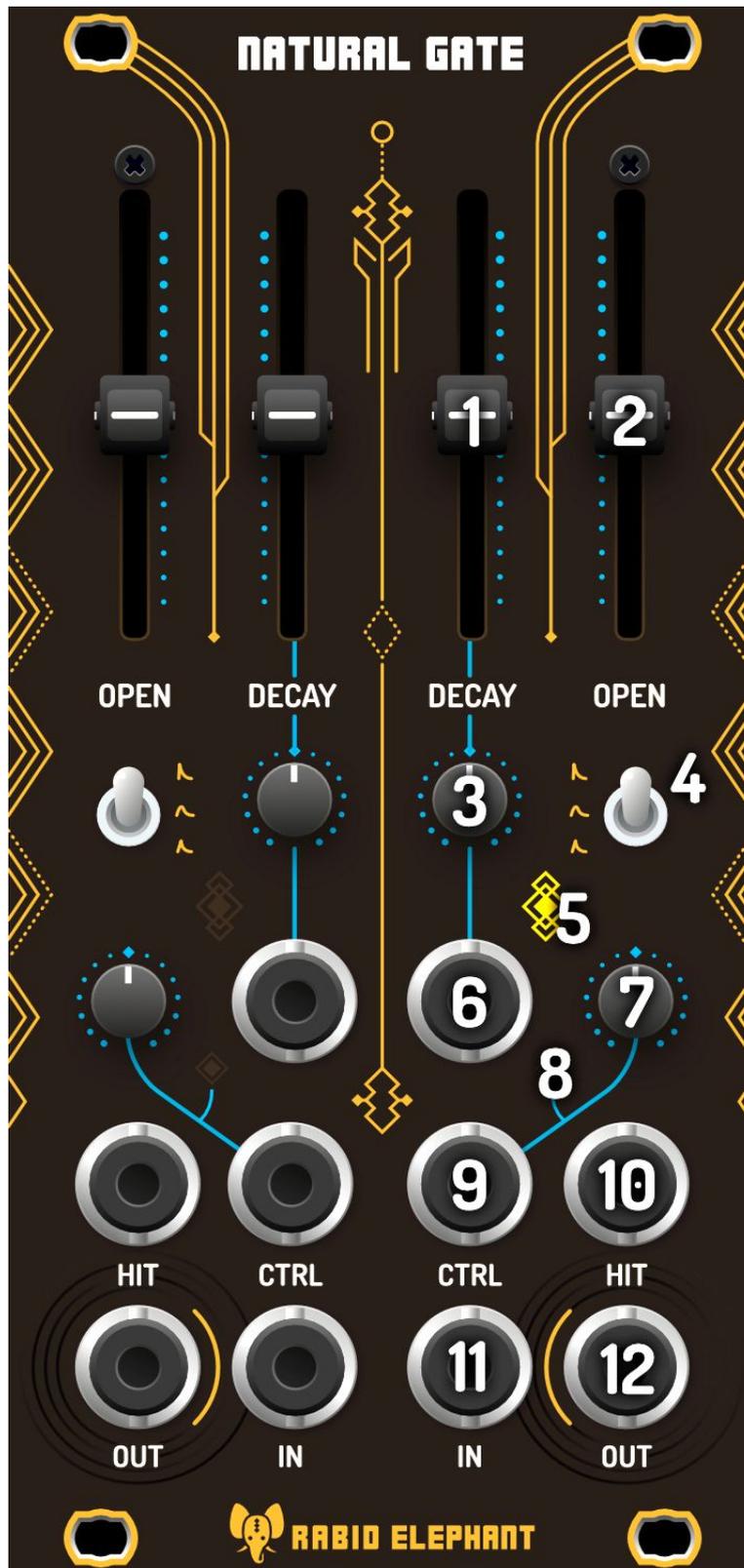
Natural Gate's two channels are mirrored about the centre.

1. DECAY Slider

This adjusts the decay time. From very short, highly damped clicks/taps all the way to events ringing several seconds in duration. Offset control.

2. OPEN Slider

This slider is used to manually open the gate. This offset is post EG. Offset control.

3. DECAY Trimmer

Attenuverter trimmer for the DECAY CV input. 12 o'clock sets gain = 0, full CW sets gain = 1, and full CCW sets gain = -1 (inverted). NOTE: unlike the CTRL input, there is no normalisation to DC at the DECAY jack therefore this trimmer is only used when a signal is applied to the DECAY input jack.

4. MATERIAL Switch

The MATERIAL switch selects one of three material characteristics and controls how the gate responds to a hit or control events. Up responds like the hardest of materials with lots of brightness and very fast attack. Middle is the softest material with the slowest attack, more muffling, and lower volume. Down is a balance between these two materials.

5. Openness Indicator

This indicator displays how open the Gate is.

6. DECAY Input Jack

This input allows for external voltage control over the decay time. It is summed with the DECAY slider setting which means the DECAY control will be the pivot point. Negative levels will subtract from the DECAY slider setting and positive levels will add to the DECAY slider setting.

7. CTRL Trimmer

Attenuverter trimmer for the CTRL input. 12 o'clock sets gain = 0, full CW sets gain = 1, and full CCW sets gain = -1 (inverted).

The CTRL jack has 10VDC normalled to it so it will be a second offset (along with OPEN) but this signal is pre-EG. Besides being pre-EG, it also also allowed to go below the minimum closure set by OPEN. At noon, the voltage added is 0V. You can zero this using the CTRL Zero Indicator, if desired. See the 'OPEN, CTRL, and DECAY Relationships' and 'From Within the Gate' sections for detail on how CTRL and OPEN are related and why we decided on this implementation.

8. CTRL Zero Indicator

This indicates when the voltage is zero of the CTRL input. Since we normalled a voltage to the CTRL jack, we felt it important to be able to zero the CTRL attenuverter trimmer. When nothing is plugged into the CTRL jack, the LED will light up green when the CTRL attenuverter trimmer is set to 0V. When an external signal is patched to the CTRL jack, the LED will illuminate when the signal is 0V.

9. CTRL Input Jack

Provision for feeding in your own envelopes/offsets, etc. CTRL is pre-EG circuitry so any DECAY or OPEN settings will still be applied to the signal sent into the CTRL input. HIT can also be used along with the CTRL input. CTRL and OPEN are similar in that they are both offsets to the filter but they can be exploited differently due the pre-post placement.

The CTRL jack is normalled to 10VDC internally allowing for pre-EG stage offsets via the CTRL Trimmer…

Also note that the CTRL input features a clamp (which is exploited to calibrate optimal closed position) so negative signals may be clipped.

10. HIT Input Jack

This input accepts nearly any signal and will properly 'HIT' the gate with the exact signal the gate likes. The only requirement is that the incoming voltage must exceed +0.25V for a HIT to be triggered.

11. IN Jack

DC-coupled input. Feed in your audio or control voltages here for processing by the Natural Gate.

NOTE: With nothing plugged into this jack, a DC voltage is normalled to the input so that you can extract the envelope profile at the OUT jack.

12. OUT Jack

Output of the gate.

Rabid Acceleration to Use

Use the following state as a launching point when first getting familiarlised with Natural Gate. This Base Gate State will allow the gate to fully close (and fully open) when receiving a HIT event.

Base Gate State

- OPEN slider all the way down.
- DECAY about 25% up.
- MATERIAL switch in the upper position.
- With nothing plugged into the CTRL input, set the CTRL attenuverter to 0V by adjusting the trimmer until you see GREEN illumination.

Plug an audio source into the IN jack. Plug OUT to your audio output module. Send a slow (~1Hz or so), repeating signal into the HIT input. Leave the CTRL and DECAY input jacks unplugged for now. The gate will start firing. Raise the OPEN slider and see how this holds open the gate. Turn it back down. Adjust the DECAY slider to experience the range of decay available.

Pick a decay you like and listen to the changes in the gate as you try different MATERIALs.

Now adjust the CTRL attenuverter trimmer and see how it also opens and closes the gate. NOTE: this is not exactly the same as the OPEN slider but has similar effect (you can exploit this difference when you learn more about it later). The CTRL trimmer goes negative too... put the OPEN slider high and turn this attenuverter CCW from 12 o'clock. See how it subtracts from the OPEN setting and will close the gate.

Now feed in signals to the other jacks and do your thing.

Natural Gate is incredibly simple to jump in and start using, however, there are many of subtle nuances that can be musically exploited.   Read the sections "Interesting Bits" and "From Within the Gate" if you'd like to explore more.

Patch Examples & Tips

Here are some patches that show some of the capabilities of Natural Gate.

Traditional LPG

Patch audio into IN and apply a signal to the HIT input to trigger the gate. Set OPEN fully down. Start with the CTRL trimmer set till the zero LED illuminates, then adjust DECAY to taste. If you want to control the envelope with another source, plug this source into the CTRL input. Adjust controls to taste.

Natural Gate shines when you start to modulate the CTRL and DECAY INputs with external sources. This can add amplitude and spectral dynamics to make the gate sound quite human.

Pitch Scaled Decay

As described in full detail below, Natural Gate shortens the decay of higher pitched information. It turns out this is how many acoustic instruments operate. But in a synthesizer context, this could be undesirable...

If you wish for higher pitched notes to have similar decay lengths as lower notes, patch in your 1V/oct signal into the DECAY jack. Adjust the attenuator and DECAY controls to taste.

Ghost Notes

The particular way the VC decay circuitry was designed led to this rather unique ability: ghost notes!

Patch a channel of Pressure Points (or Knobs or anything with two or more voltage settings you can choose/switch between) to the DECAY CV jack. Set one setting to 0V or a very low value and the other to maximum value (5V or more). Put the DECAY slider about 25% up. Sent the PP gate output to the HIT input. Press the pad with the low setting, then, without lifting your finger from the first pad, press the 2nd pad (with the larger setting) shortly thereafter. You should hear the ringing of the same note when you press the 2nd pad giving a 'hitless' note; a ghost note!

A Nice Sounding 'VCA'

Normal VCAs for audio amplitude control do not always sound right. Using Natural Gate as a VCA will inject a much more natural way of increasing/decreasing loudness and is how many instruments actually operate. Most synthesists already use filters for volume control purposes but Natural Gate will fully close, where many filters may not, requiring a VCA post. Use the CTRL INput to control Natural Gate from external envelopes.

Envelope Generator

Since Natural Gate is DC-coupled and we've normalled a DC voltage to the IN when nothing is plugged in, you will get Natural Gate's envelope at the OUT jack. Send them around as you wish. You can also plug something other than audio to the IN for Natural Gate to process.

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Dueling EGs

You can use the 2nd channel of Natural Gate with different settings or as a control source for CTRL as (when nothing is plugged into a channel's IN jack, a DC voltage is normalised for extraction of an envelope signal at the OUT jack.).

Sending in an external EG into the CTRL input jack while using the HIT input with other sources gives lots of interesting dynamics (try a differently sync'd source than the trigger for the external EG). Keep in mind that the CTRL signal is still affected by the OPEN and DECAY settings so long decays or high OPEN levels may begin to override these external envelope.

Set your other EG with some slower attack. Also try feeding the source trigger signal to both the external EG (again OP to the CTRL input of Natural Gate), and to one input of a logic gate (AND, OR, XOR, etc) with random source as 2nd input. Send the output of the logic gate to Natural Gate's HIT input. And panning these channels R & L emphasises this quite a bit.

Kick

Natural Gate's envelope works extremely well for shaping kick drum sounds. Feed in a low-frequency signal from a VCO and trigger at the HIT input. Adjust the DECAY, OPEN, and MATERIAL to taste. Put them under voltage control, if you like, and save a VCADSR.

Even better (to our ears) is to use a self oscillating LPF. Use one Natural Gate channel for controlling the volume of the LPF output and the other (mult the HIT inputs together) for the FM pitch envelope of the filter. Adjust. Oh my.

Spectral Carver Ducking Compressor

Process the inverted envelope control signal with offset and send into the CTRL input jack. Set the attenuverter trimmer to some setting for the desired ducking amount. This is a nice effect over just using a VCA as the ducks you get are not purely volume ducks and will remove HF content as well. Try it for sidechain use and see what you've been missing!

Looping EG/LPG and Feedback Madness

Because of the way Natural Gate's HIT input is designed, you can create a nifty feedback loop by sending the OUT back to the HIT input (through an offset module) and now use the OPEN and DECAY amounts to control the frequency of the waveform. Use a processing utility, such as Knobs, to modify (offset) where the HIT input will trigger off the output (shift the envelope output signal down with an offset before feeding to the HIT input). And make sure you kick start it with an OR'd HIT signal!

Clicks

The MATERIAL switch can be used to reduce or enhance 'clickiness' at the onset of a hit event. Furthermore, for lower frequency waveforms, you can get seemingly random or 'drifting' click strengths that can make short events sound very human. Keep in mind that the ability to set MATERIAL to the up position and make strong clicks is incredibly useful and makes your notes cut in a mix very well. And just like a plectrum on a string, or a stick hitting a hard object, these little bursts

of energy occur naturally and are a large part of the reason these instruments are identifiably unique sounding.

Elaborating further on the clickies, you may wish to not have them 'wander.' To do this, simply SYNC your VCO with the same gate/trigger edge you feed into the HIT input.

Envelope Output

When nothing is plugged into IN, you will get an envelope at the OUT jack. Of course, you can send this signal any place you want, but this signal will 'match' Natural Gate's native decay length when applied to a CV input with exponential response. We use Natural Gate envelopes almost exclusively. They hit FM, filters, etc very nicely. Try it! We like these envelopes so much, we are working on a dedicated envelope module so stay tuned for that as well!

Two Independent Channels

Keep in mind that Natural Gate's channels are entirely independent from one another. They don't have to be... experiment serialising or parallelising the two channels.

Modulating at Audio Rate & Waveshaping

Natural Gate can also be used as a wave shaper and it sounds really good. The decay profile add their own character to the wave shapes. Try feeding in sync'd and un-sync'd audio rate signals into the CV inputs and attenuating/shifting them around with the Natural Gate trimmers and controls. Also try running the OUT with an audio rate signal feeding CTRL or HIT input of one channel (with IN unplugged) into the CV inputs of the other channel that is processing audio. You can get some very nice wooly, warm analogue sounds in this manner as both waveforms are now via. the decay profiles of Natural Gate.

Interesting Bits

Memory

A very interesting and to us, equally beautiful feature of Natural Gate is that it has 'memory'. Natural Gate will start to open more if you keep on hitting it fast enough. And this indeed makes sense... it is common for the human body to apply more force the faster it has to do something. Try this for yourself - as a human first: tap slowly on a surface in front of you and gradually increase speed more and more - really push yourself to go faster than you think you can till you finally reach the point you absolutely cannot go faster... It is likely the volume of your taps increased when you approached your absolute top speed. Now try this with the Natural Gate. It is most noticeable for longer decays so set the decay around 80% and send in a very slow LFO or manual trigger to the HIT input. Now increase the rate at which you HIT the gate... listen to the output. You may notice that for this to be apparent, there has to be some overlap in the ringing out of the previous note when the new note arrives. For shorter decay settings, the rate of repetition would have to be faster as well to hear this effect. And since you now can reduce the maximum closure of the gate (using the CTRL input or attenuverter), you can actually hear HF increase as HITs 'build up.' This subtle feature makes Natural Gate all that much more natural and organic sounding.

Frequency Dependent Decay

You may also notice Natural Gate's decay scales inversely proportional with the pitch of the incoming signal. Just like on an acoustic piano or guitar, higher pitched notes will decay faster while lower notes will sound longer. Nature! Since Natural Gate features voltage-controllable decay, this effect can be removed or even emphasised, if desired (see the **Patch Examples** section).

OPEN, CTRL, DECAY Relationships

Increasing the openness of Natural Gate can drastically change the perceived decay time and it is probably already apparent that several controls/inputs affect the gate openness. If you want longer decays you can surely increase the DECAY slider but you can also increase the CTRL trimmer or OPEN slider to extend the decay times. Setting the CTRL trimmer a little past the 'zero' point or OPENing the gate just a little bit can be a very nice place to be.

Note that the 'closed' level of any LPG or VCA or even on/off switch is always measured in some non-infinite attenuation. Natural Gate in its 'base state' is calibrated to be very closed to the extent that the noise floor of your modular is higher than this! This simply means you have a fair amount of room to open the gate while it still sounds like it is fully closing. And raising the minimum gate closure a bit with CTRL or OPEN as mentioned above affords a wider decay range, which may be useful to you.

You can also choose not to have the gate open all the way by reducing the CTRL trimmer CCW from noon. This has the opposite effect for decay time and will actually start to change the decay shape making it more abrupt as it is is clipping off some of the ringing out. You can exploit this for either shorter plucks/pings or more abrupt decay profiles. Please note that the CTRL input has an internal clamp so it is limited in how closed it can go below zero. And also remember that OPEN is post-EG stages, whereas this clamp and CTRL circuitry is pre-EG. So you can only reduce a raised OPEN so

much. If you need this level of control, process the CTRL signal with external processing utility capable of offset/inversion, etc.

There are lots of options with all of these controls. Do not think CTRL always has to be zeroed to use the gate properly. This bias will give lots of different variations to the sound.   Ultimately your ears should guide you through these interweaved spaces.

Trimmers

The 4 attenuverter trimmers on Natural Gate are just that... We find these are incredibly useful to have onboard and will save from needing external attenuation modules. These, coupled with the playable controls (the sliders), give all required CV processing capabilities: attenuation, inversion, and offset. But do keep in mind, these are not at all considered 'live playable' controls. If you find you do want to play them, a more ergonomic solution is to use an external processing module (such as our Knobs precision processing utility).

From Within the Gate

Knowing a bit more about why we created Natural Gate and some inner workings may help you to explore the instrument deeper.

Every module we make starts with a purely musical goal. For Natural Gate, it was to make a module that created sounds as if they came from our natural world and not the artificial one. Initially turning to the typical LPG for this, we were not satisfied. They didn't sound natural enough to us.

So we began by taking a field recorder and various striking objects - sticks, felt mallets, rocks, etc. - and we began hitting all sorts of things from skinned drums, to sheets of metal, tubes, strings, and all sorts of things in my woods (I love nature and the outdoors!) - things like trees, the earth (hard packed clay, grass covered soil, sand), fallen branches, stones, and so forth. Having a library of envelope shapes to study, we found that short things have different profiles than things that ring long. Hard on hard, hard on soft, soft on hard all have different responses. And additional dimensions of how the harmonic content was damped. And not just the objects themselves, but the environments they were struck in - leaves of trees, grass, etc all damn the resulting sound we hear as well. How fast you would hit something also affected the resulting shapes and sounds. We studied all of these parameters and determined the key components of what was making these events sound natural.

Before continuing on to some of the implementation details, we'll first discuss the traditional LPG in order to highlight the differences in our lovely Natural Gate.

As you may know, the common LPG is some hybrid of a filter and VCA simultaneously. 'Opening the gate' means are you increasing both the high-frequency information that will pass and increasing the volume at the same time. A coarse analogy is like having a LPF feeding a VCA with the same control signals. A majority of Natural Gate's loudness, however, is indeed due to the filtering action as Natural Gate is much more filter than VCA in the hybrid. This balance was carefully adjusted till our ears were happy.

The signal that opens and closes Natural Gate is generated by some rather elaborate envelope generator stages.   The HIT and CTRL signals are both fed through these EG stages. The HIT input is crafted specially by us and the CTRL input allows you to feed whatever you like. But both always go through the EG stages.

The OPEN fader is post EG and will shift the entire envelope up or down. So while the CTRL signal may sound like it is doing the same thing, they are at different locations in the signal path.

The amplitude of the envelope signal will control both the spectral content and the volume of the signal at the IN jack. The higher in amplitude the envelope signal, the brighter and louder the input signal that passes through the gate. As the envelope signal decays, HF information and loudness are reduced more and more until you can no longer hear the signal.

Humans cannot hear fundamentals past 16-20kHz so opening a filter beyond these frequencies will naturally have less impact on the sound. By default, with the CTRL attenuator set to zero (green LED will light) and OPEN slider all the way down, and MATERIAL set to up position, the HIT input will fully open the gate allowing all frequency content to pass (at least initially, before it begins to quickly, then gradually, decay). Raising OPEN or adding CTRL will increase both the minimum closure setting of the gate and the maximum opening (remember, it is an offset). If you raise OPEN (or add CTRL), you can increase the filter cutoff past the frequencies you can hear... the peak of the envelope

applied to the gate is effectively clipped by the bandwidth of your ear as you listen to the output signal.

We wanted to ensure musicians could quickly get to a nominal setting, with no clipping of the all-important EG profile as well as ensuring no bleed. This means the gate will both fully close and fully open. This is provided by turning the OPEN slider fully down and the CTRL attenuverter set to the ZERO setting (zero indicator will illuminate) with MATERIAL in the uppermost position.

Natural Gate also allows the musician to control how far it will open - an upper limit. By normalling a DC voltage to the CTRL input jack, the CTRL attenuverter allows the CTRL signal to sweep both negative and positive. If you set the CTRL attenuverter CCW of 12 o'clock, you can reduce the minimum closure level of the gate. This also limits how far the gate will open. You can use CTRL to great effect adding frequency-dependent dynamics to your events or to simply roll-off some high-end for a quieter, smoother, less aggressive sound. It is very handy to use both HIT and CTRL simultaneously. Now you can apply CTRL, along with HIT to vary how open the gate is under CV control and not be 'stuck' always fully opening the gate when a HIT comes in. And because reducing the closure (shifting the envelope down) also affects the apparent decay length, you now have a secondary method to adjust the decay profile. Negative CTRL values reduce the apparent minimum decay length of the gate even shorter and removes/clips some of the long ringing tail of the envelope for a more abrupt sort of damping.

How a hit event sounds is largely due to the material you are striking. Stick to wood, hand to skin, felt mallet to head... they all sound different. This is realised with the MATERIAL switch. The MATERIAL settings alter two parameters: the attack and amplitude of the envelope signal feeding the gate, which by nature of how Natural Gate works, also affects the frequency content of the resulting signal.

Natural Gate's envelopes are very interesting. They have lots of energy up front with a sharp initial decay - much sharper than the simple exponential RC discharge profiles found in nearly all other EGs, then the envelope starts to level off, decaying *very* gradually. The ringing gets soft and quiet as it slowly fades away. This is what gives the gate its more natural plucky sort of decay but with the ability to have it ring nicely like a finely-made drum. You may extract this envelope at the OUTput jack(s) by leaving the INput(s) unplugged for use around the rest of your modular system. These envelopes are unique to only the Natural Gate and are 1:1 in time with Natural Gate's internal gate stages when applied to other *exponential* CV inputs.

Voltage controllable decay took lots of crafting to get right. Natural Gate simply doesn't stretch or shrink a common envelope shape. That doesn't work for our musical goal. As stated earlier, short things have different shapes than long ones after normalising them. We have addressed this directly by having separate shapes for long decays and short decays with each carefully crafted to sound perfect. This means any decay setting still sounds natural. This may not be obvious at first but Natural Gate has a lot going on behind the panel to make this and all of the other features work towards our goal.

Finally we'd like to reiterate that Natural Gate is not a 'vactrol emulation' module. Natural Gate has no vactrols whatsoever nor does it try to recreate this devices. Why? To us, a vactrol doesn't really represent closely enough what we think nature sounds like. So they were immediately thrown out; as we do not design as slaves to components, we design to accomplish a musical goal, *then* find which components and designs will get us there. Vactrols are silly, sloppy components that should only be used in the most particular applications (or, really, never at all - they are bad for the environment, have lots of drift and temperature dependence, have poor matching, and their performance degrades over time). Natural Gate's intent is not to model any other LPG's characteristics... and it doesn't.

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Thanks for using Natural Gate and we hope it gives you a link to the world we naturally fit into!

Specifications

- HIT trigger threshold: +0.25 V

- Envelope output amplitude: +10 Vpp, unipolar (0 to +10 V)

- 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 outputs current limited to 35 mA

- Protection (Power)

    - Active high-speed reverse voltage

    - Overcurrent (fused)

- Power Requirements: +/-12 V (+/-5%) @ 80 mA (average)

- Size: 12HP W x 128.5 mm H x 25 mm D**, 38mm 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 minimum power cable bend radius clearance

* Shorting any output is not recommended, of course, 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/distribution scheme. Therefore we cannot guarantee full assurance in regards to IO safety and damage. See our Warranty section for responsibilities. Patch carefully!

Tested PSUs (this does not guarantee compatibility and makes no statement on noise, reliability, or safety - see **Warranty** section below): Doepfer PSU2, Bel Power 150W linear, Intellijel TPS80W MAX, Intellijel TPS30W MINI, Tiptop Audio Studio Bus, Tiptop Audio uZeus, and several others.

Any specifications are subject to change without notice.

Calibration, Warranty, and Repair

Calibration

Some Rabid Elephant products 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 (dropped module, someone got curious and turned a trimmer (don't do this, please), etc.), we will recalibrate any Rabid Elephant instrument at no cost for the duration of the warranty period (user covers shipping 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 aging 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 maximize 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.

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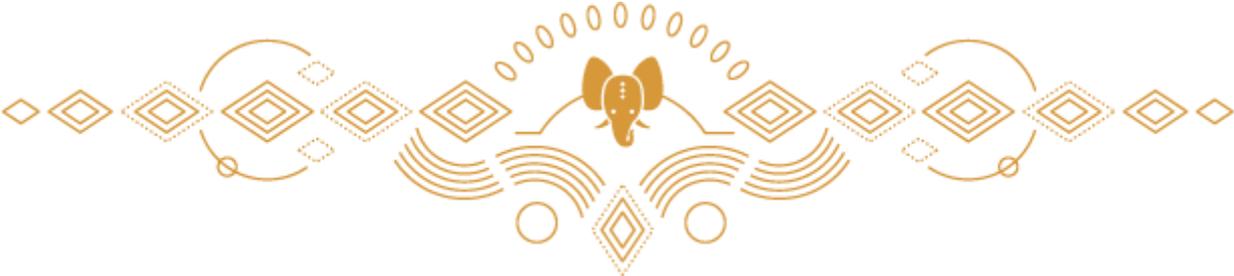
~ *With love*, Rabid Elephant