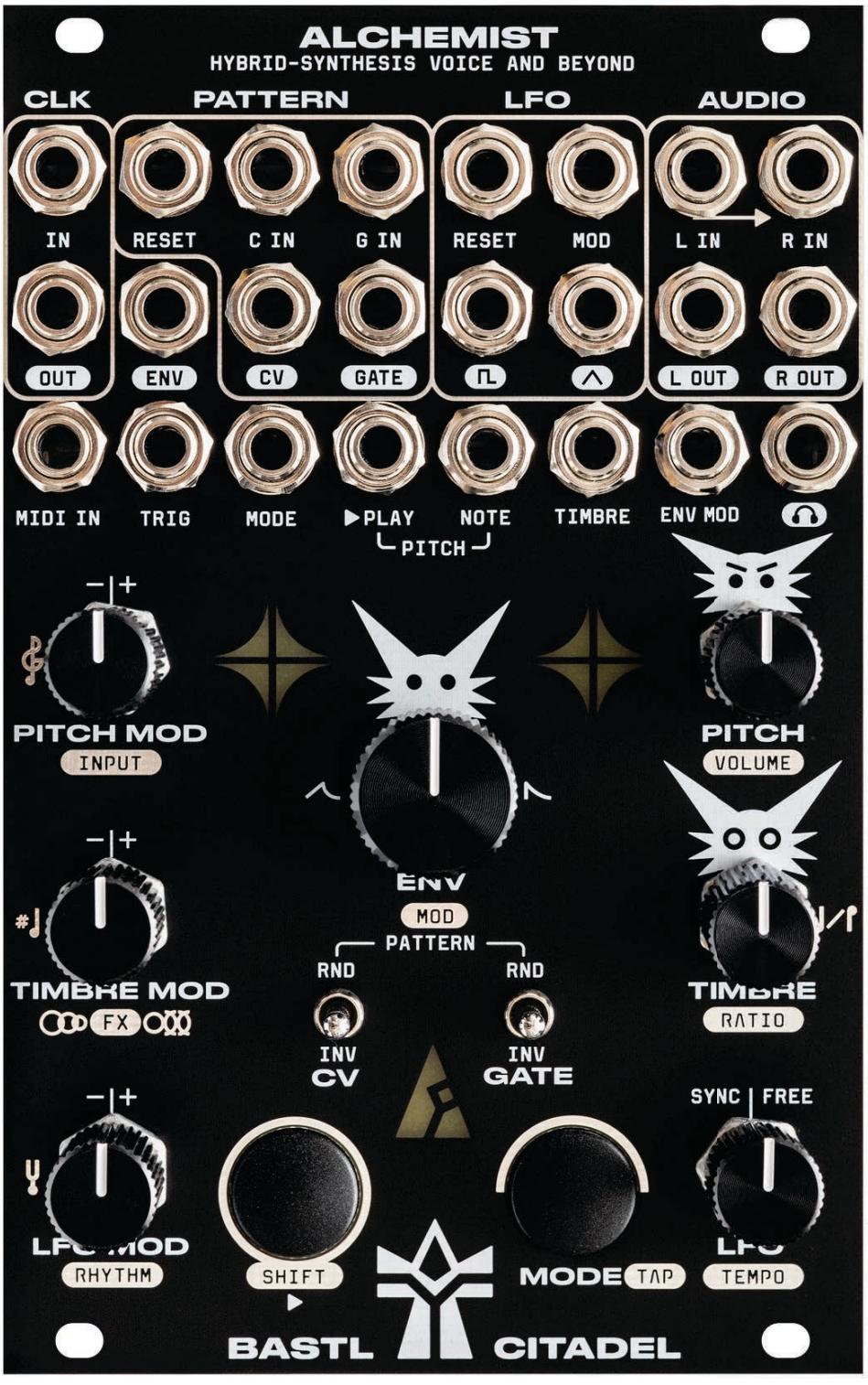
BASTL INSTRUMENTS

ALCHEMIST CITADEL



CITADEL ALCHEMIST

Citadel Alchemist is a patchable hybrid-synthesis based eurorack module that empowers you in discovering melodies and even harmonies despite being monophonic.
Patch programmable sequencing via the control signals into the two PITCH MOD inputs opens up a world of melodic inspiration beyond classic arpeggios while staying in your preferred SCALE.

It has a carefully tuned wide timbral range across 5 synthesis modes (FILTER, FM, SUPERSAW, HYPERSINE and GLITCHNOISE) accessed by main TIMBRE sweep that is refined by the RATIO control.

The ENV macro knob affects different parts of the synth and sequencing engine to maximize musicality and it even lets you continually morph between the synthesis modes and access truly unique sounds.

The timbral palette is further extended by the dual FX section which offers either a wide delay that will smear the arpeggios into echoed harmonies or a chorus-flanger-distortion-combfilter macro custom tuned for each synth mode.

You can also access gliding rubber textures with the PITCH SLIDE macro that applies pitch envelope and portamento.

You can customize its rhythms and scales with the **web-based editor**.

The Citadel Alchemist is a eurorack module version of the compact Kastle 2, portable instrument. This makes it fit perfectly in the modular synth environment while providing all the necessities for a beginner eurorack setup such as headphone output (line level compatible) and MIDI input/sync, while being complex and fun within larger setups.

All main parameters can be modulated and tightly sequenced by the surprisingly powerful CV and GATE pattern generator. Create groovy

off-grid beats using the built-in LFO, which can be synced, reset, or left to run freely.

The Alchemist is a semi-autonomous companion that keeps surprising you with fresh ideas. Alchemist is not just a sound box—it's a powerful MIDI controller and sequencer. Send finely curated USB MIDI data to your DAW or USB MIDI instrument, and discover new ways of playing and interacting through a modular interface.

Alchemist receives TRS MIDI via front panel and both sends and receives USB MIDI via the connector on the back of the module.

Do not write melodies! Let them emerge from the behaviour you set-up by the patch interaction of various modulation sources.

Features

- 5 synth modes
  - FILTER
  - FM
  - SUPERSAW
  - HYPERSINE
  - GLITCHNOISE
- Hybrid synthesis
  - 4 oscillators
  - FM with feedback
  - Raw Waveform mixing
  - Ring mod
  - Track and hold
  - Stereo noise with track and hold
  - Stereo Filter
  - Transient shaper
- Dual FX section
  - Delay to the left
  - Chorus/Flanger/Distortion to the right

- stereo audio processing at 44kHz/16-bits
- PITCH knob with range of 6 octaves
- PITCH MOD attenuverter knob for modulating pitch
  - NOTE input: quantized pitch with selectable scales (updates on trigger)
  - ▶PLAY input: 3rd, 5th and octave above NOTE – triggers envelope on change, time quantized to PLAY GRID – great for arpeggios!
  - user-defined scales (**via web app**)
  - MODE+PITCH MOD to change quantizer scale
  - MODE+TIMBRE MOD for root note adjustment
  - MODE+LFO MOD for fine tuning
  - MODE+PITCH to change and preview octave
- TIMBRE knob for main timbral sweep
  - refine TIMBRE sweep with RATIO (oscillator detune ratios and wave mixing ratios)
  - hit the SHIFT button to trigger the sound
  - TRIGGER input to trigger sound
  - TIMBRE MOD input with attenuvertion
- MODE input with attenuation to change synth MODE with CV
- ENV knob
  - turn right to set decay and focus TIMBRE on transients
  - turn left to add attack and decay and focus TIMBRE on BODY
  - fully left or fully right enters DRONE mode
  - slows down arpeggio at long envelopes
  - MODE MORPHING to the left
  - ENV MOD input with attenuverter
  - ENV MOD updates only at trigger
  - patchable ENV output of the envelope
- LFO with triangle and pulse output, reset input, attenuverting modulation, synced or free
- Tempo generator with tap tempo, divider, and external clock input
- Pattern generator (tempo synced) with GATE and CV output, patch-programmable
- GATE generator contains user-programmable RHYTHM patterns (**via web app**)

- stereo eurorack-level DC coupled input with input gain (up to +6db), accepts up to -10V to + 10V
- input can be mixed at the output or run thru the built in effects
- DC coupled stereo eurorack-level output, -5V to +5V
- stereo headphone output capable of driving headphones up to 250 Ohm
- analog sync input
- analog sync output

- TRS MIDI Input (clock, notes, CCs, pitch bend)
- USB-C on the back of the module (firmware updates, USB MIDI in/out, editing scales and rhythms)

TECHNICAL DETAILS

- 16 HP
- PTC fuse and diode protected 10 pin power connector
- 24 mm deep
- current consumption: +12 V: <60 mA (w/o headphones), <90 mA (w/headphones to max); -12 V: <20 mA
- Input Ranges:
  - PITCH: PLAY IN and NOTE IN: **-0.2V to 7V**
  - CLK IN, RESET IN, C IN, G IN: **0V to 5V**
  - LFO MOD, MODE IN, TIMBRE IN, ENV MOD IN, LFO RESET, TRIG IN: **-5V to +5V**
  - L/R IN: **-10V to +10V**
- Output Ranges:
  - CLK OUT, ENV OUT, CV OUT, LFO TRI OUT, LFO PULSE OUT: **0V to +5V**
  - L/R OUT **-5V to +5V**
  - Headphone output: 2Vpp (line level compatible)

Introduction

For starters, let me tell you: **Follow the white cats!**
The knobs with the white cats control the main parameters for your sound: PITCH, TIMBRE and ENV. All other knobs come alive once you start patching.
Short press the SHIFT button to preview your sound.
The Citadel ALCHEMIST can be experienced in various ways. It is absolutely legit to just explore and let your ears guide you. If that's your game, you might appreciate the Quick Start guide.

The Quick Start guide is linked here.

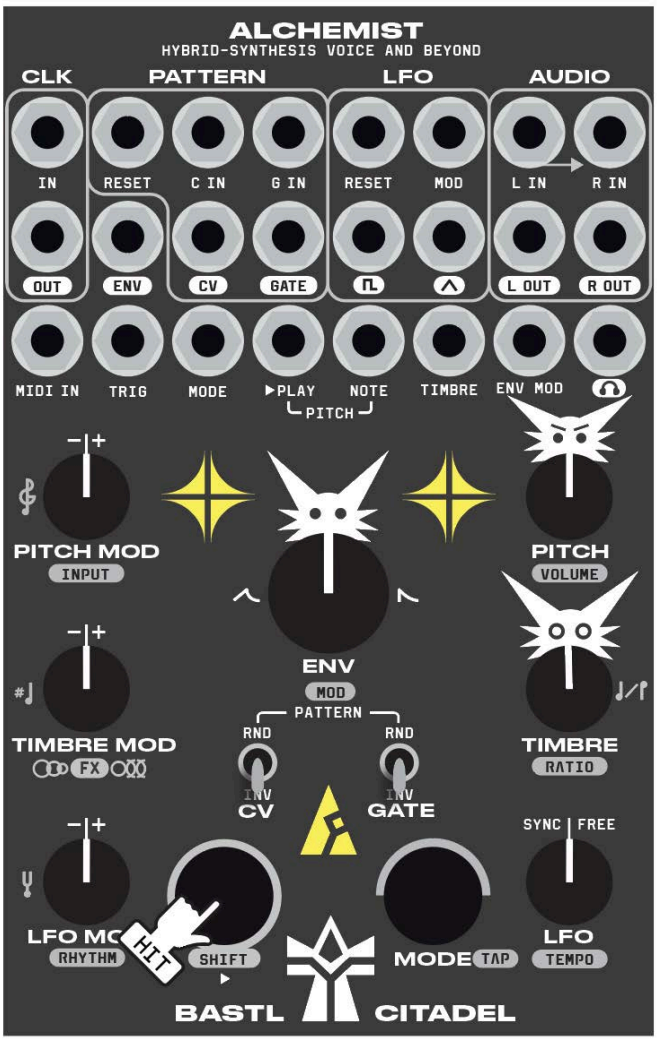
MANUAL

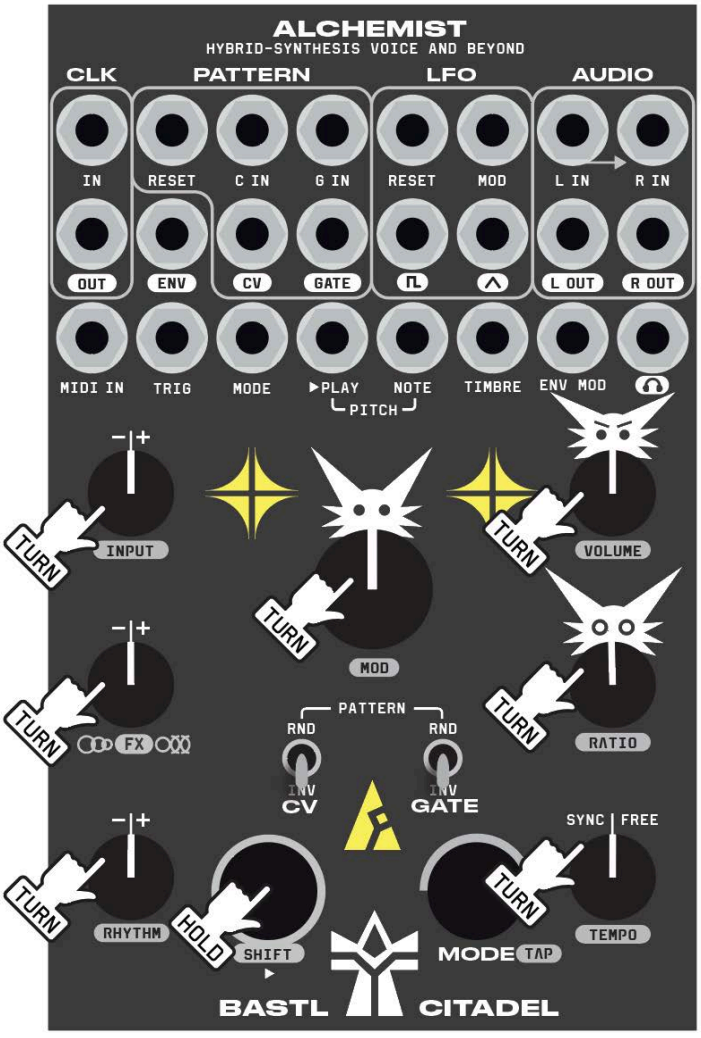
This full manual will give you a better understanding of the Alchemist's inner workings and help you achieve the results you desire. It provides plenty of tips and shows you just how deep the cat's hideout goes—get ready for an adventure!

Shift

Hit or tap the SHIFT button to **trigger the envelope**.
NOTE: The trigger signal happens at the button release.

Hold the SHIFT button to access the **silver-labeled functions**. For example, hold SHIFT and turn the PITCH knob to adjust the VOLUME.





Button Combos

Short SHIFT press = trigger synth (on button release)

SHIFT + KNOB = secondary function in silver
SHIFT + MODE = Tap tempo
MODE (short press) = next synth mode
MODE + SHIFT = previous synth mode
SHIFT + MODE >2s = enter/leave ADVANCED SETTINGS (input behavior etc.)
SHIFT + MODE >10s = MEMORY RESET

Connecting Citadel

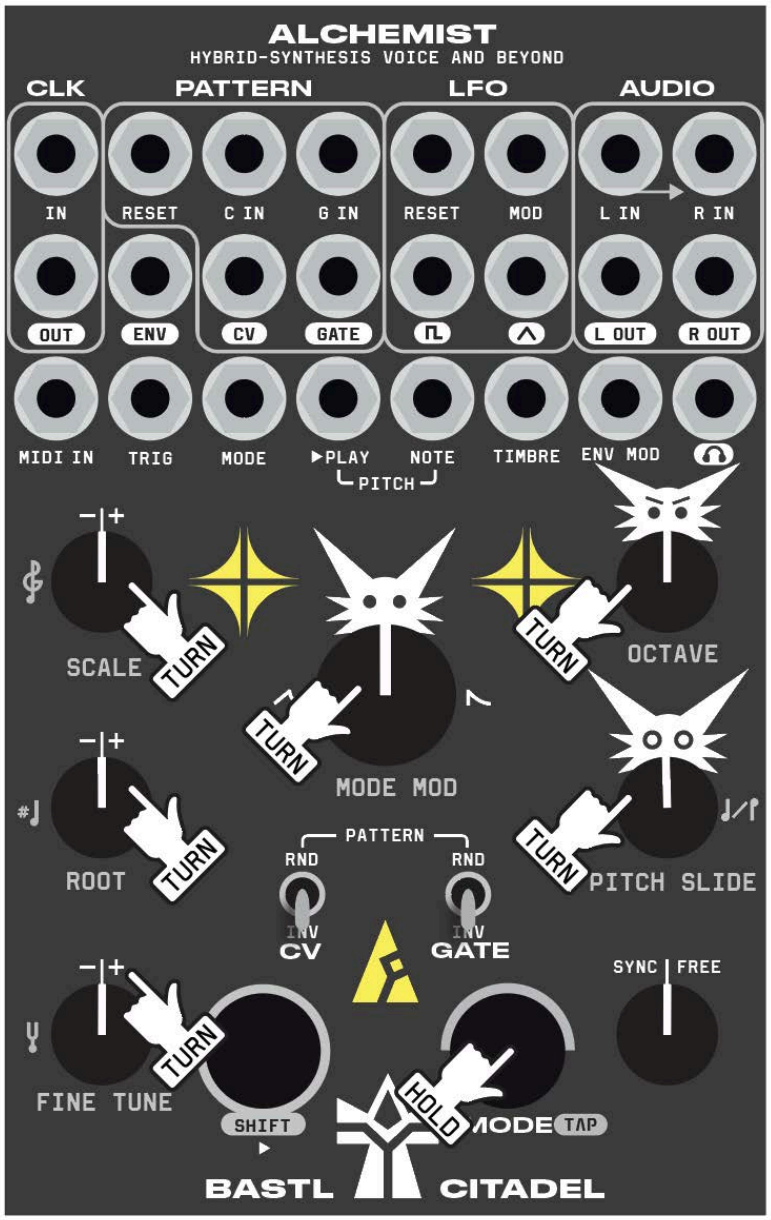
SHIFT + PITCH MOD knob = set input gain
SHIFT + PITCH knob = set output volume
SHIFT + MODE >2s = ADVANCED SETTINGS (input behavior etc.)

SHIFT + Knob Combos

SHIFT + TIMBRE MOD = adjust FX - delay or chorus distortion
SHIFT + LFO = adjust tempo
SHIFT + LFO MOD = load preset rhythm on the GATE pattern generator
SHIFT + ENV = attenuvertion of the ENV input
SHIFT + TIMBRE = adjust RATIO

MODE + Knob Combos

MODE + PITCH MOD = change quantizer scale
MODE + PITCH = change octave
MODE + TIMBRE MOD = adjust root note
MODE + LFO MOD = fine tune pitch after quantizer
MODE + ENV = modulation attenuation for MODE input
MODE + TIMBRE = adjust pitch slide settings


ALCHEMIST
HYBRID-SYNTHESIS VOICE AND BEYOND
CLK
PATTERN
LFO
AUDIO
IN
RESET
C IN
G IN
RESET
MOD
L IN
R IN
OUT
ENV
CV
GATE
L OUT
R OUT
MIDI IN
TRIG
MODE
▶PLAY
PITCH
NOTE
TIMBRE
ENV MOD
SCALE
TURN
OCTAVE
MODE MOD
ROOT
PITCH SLIDE
PATTERN
RND
RND
INV
CV
INV
GATE
SYNC | FREE
FINE TUNE
SHIFT
HOLD
MODE
TAP
BASTL
CITADEL

POWER

Before connecting the ribbon cable to this module, disconnect your system from power! Double-check the polarity of the ribbon cable and that it is not misaligned in any direction.
The red wire should match the -12V rail both on the module and the bus board.

! please make sure of the following:

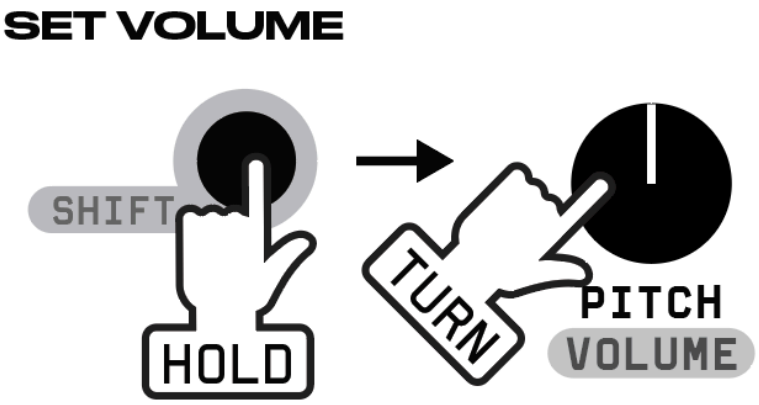
- you have a standard pinout eurorack bus board
- you have +12V and -12V rails on your bus board
- the power rails are not overloaded by current

Although there are protection circuits on this device, we do not accept any responsibility for damages caused by the wrong power supply connection. After you've connected everything, double-checked it, and closed your system (so no power lines can be touched by hand), turn on your system and test the module.

AUDIO OUT

Connect the **HP** jack of the Citadel Alchemist either to headphones or further devices that receive line level audio. Use the L and R OUT for patching inside of eurorack.

👆🎛️To set the output **VOLUME**, hold **SHIFT** and turn the **PITCH** knob. The volume affects both the L/R OUT and the Headphones output.



AUDIO IN

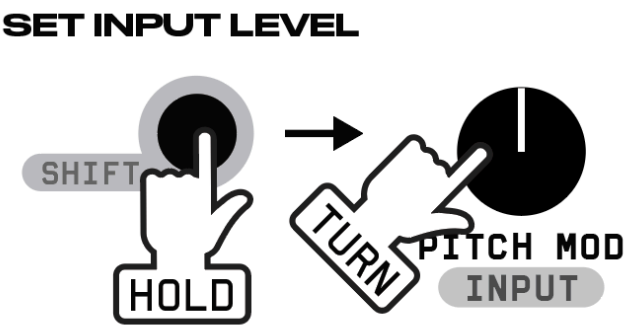
Connect your eurorack level sound source to the **L IN and R IN** jacks. L IN is normalized to R IN so if your source is mono you can plug it to L IN and it will get copied to R IN.

The signal at Audio input will get mixed with the sounds coming from the ALCHEMIST at the output.

You can easily dial in the output volume up if it gets too quiet.

You can also route the input to go through the effects of the ALCHEMIST – delay, chorus/flanger. See the **Advanced settings** section for the **Input Routing** setting.

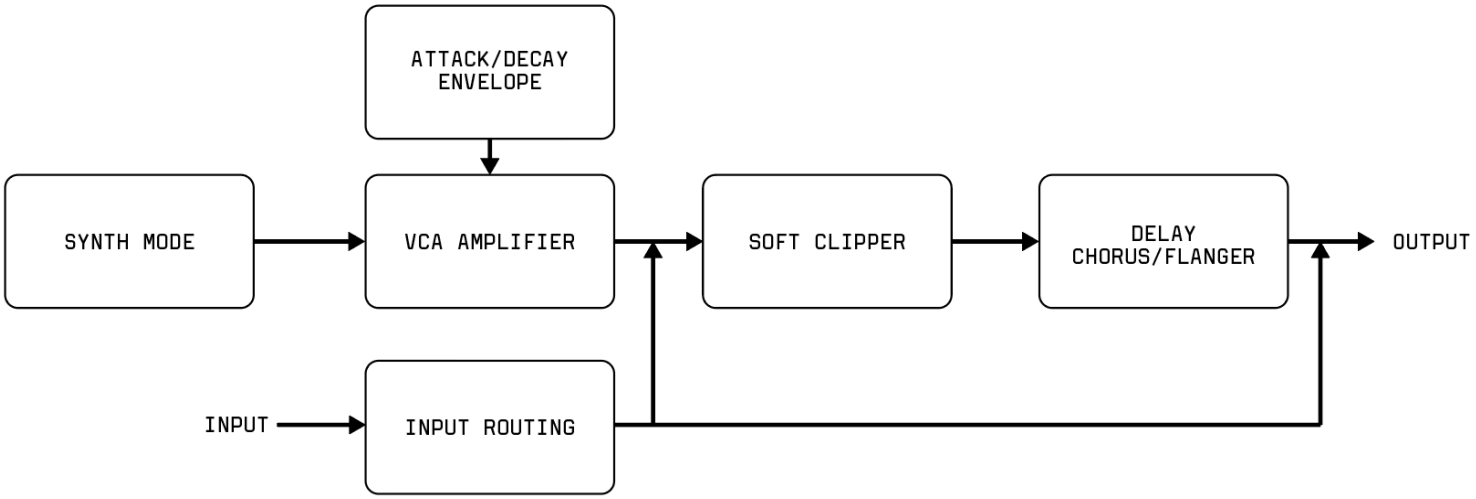
👆🎛️ To set the **INPUT gain** hold **SHIFT** and turn the **PITCH MOD** knob. **Input gain** is the amount of amplification of your input signal.



While holding the SHIFT button, the signal strength is indicated by the left light and when it reaches RED, it is clipping at the input, and you should lower your input gain (unless you want to go for that distortion🤘). Keep the input gain so the signal is peaking into orange.

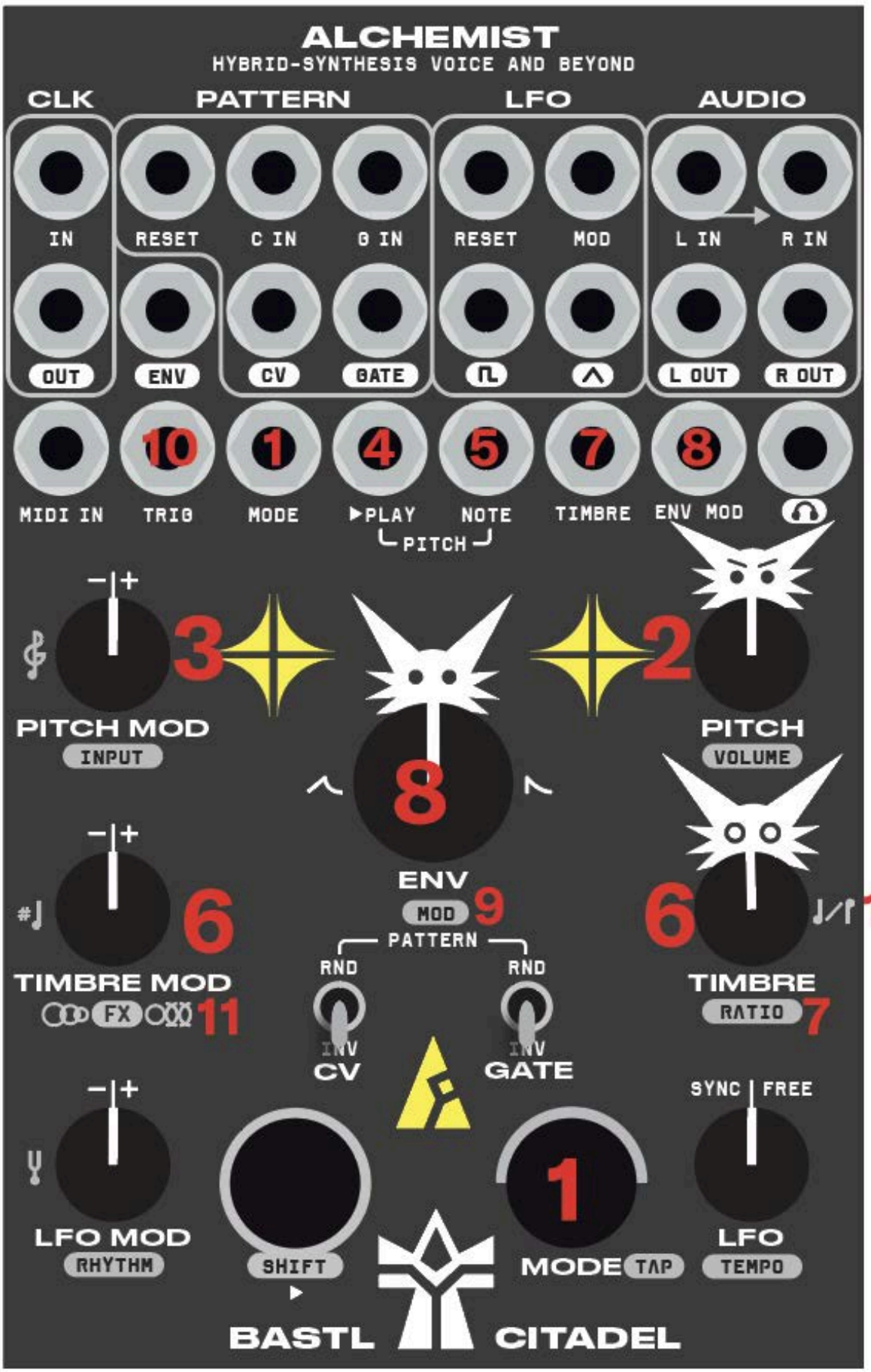
SIGNAL FLOW

Here is the block diagram of the signal flow of Citadel ALCHEMIST.



MAIN SOUND CONTROLS

These are the main controls that affect the sound:



1. MODE

The **MODE** button cycles between different synthesis modes:

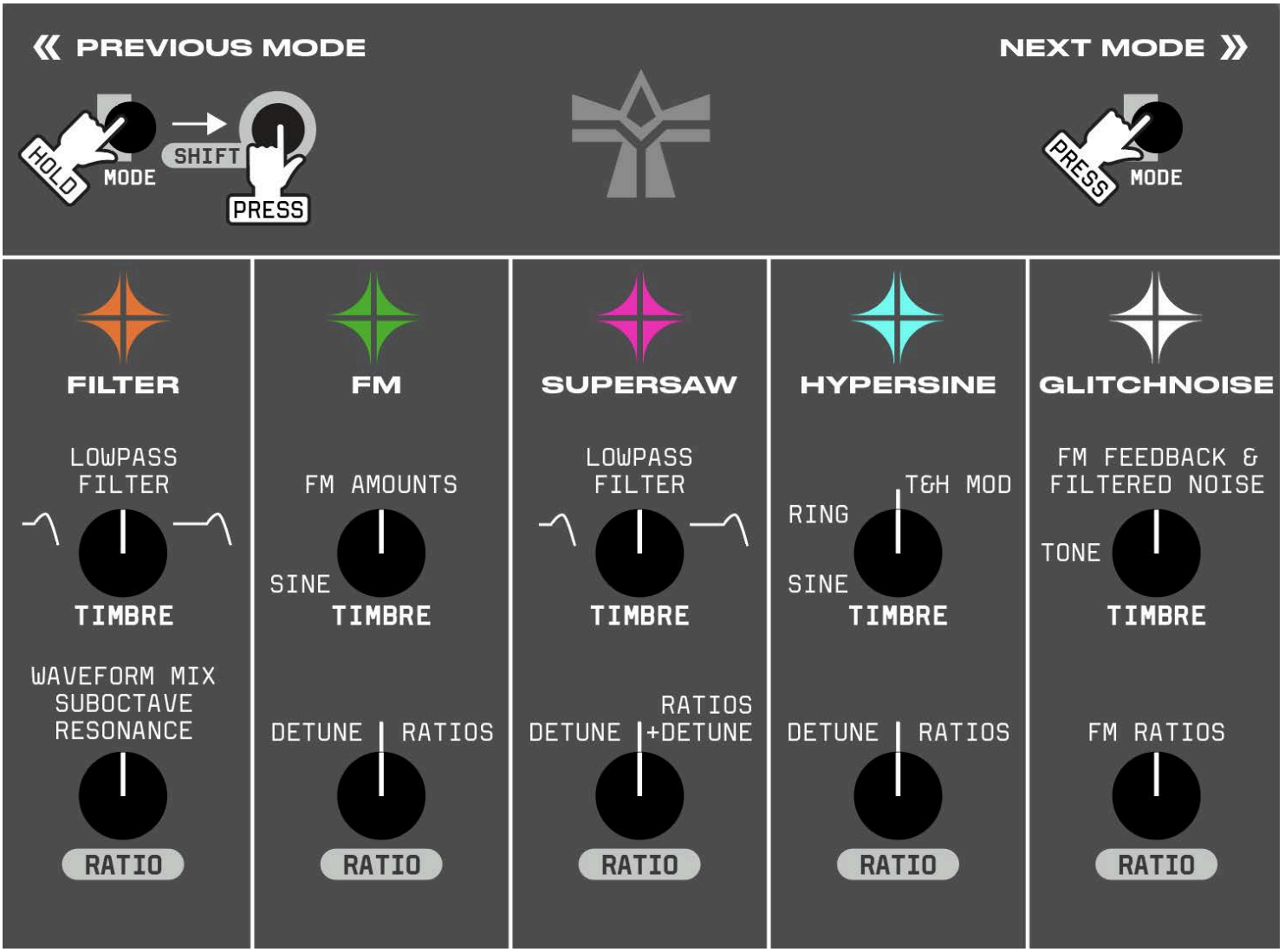
- short press MODE = next synth mode
- hold MODE and press SHIFT = previous synth mode

The synthesis mode can be modulated on MODE input.
👆🎛️ Hold MODE and turn ENV is the amount of modulation.
Fully left is no modulation and fully right is positive modulation.

Each mode has two main timbre parameters

- **TIMBRE** tweakable and modulatable
- **RATIO** refines the main TIMBRE sweep.

👆🎛️ Hold SHIFT and turn TIMBRE to set Ratio.



Filter (Orange)

Subtractive synthesis staple. 3 oscillators with harmonically rich waveforms (saw and square) are detuned and mixed (RATIO) and then they hit resonant lowpass filter (TIMBRE).

FM (Green)

The FM is a classic phase modulation inspired by the likes of DX7. The main Carrier oscillator has two modulators. It produces bell-like sounds with distinct transients or detuned atonal timbres. Set oscillator ratios/detune with RATIO and depth of phase modulation with TIMBRE.

Supersaw (Magenta)

Classic trance music staple with a twist. Detune three saw wave oscillators (RATIO) and filter them with plain lowpass filter (TIMBRE)

Hypersine (Cyan)

Unique sounding digital mode inspired by the original Kastle Synth. Two oscillators ringmodulate each other while the third adds track and hold modulation in higher TIMBRE settings. Detune the oscillators with Ratio.

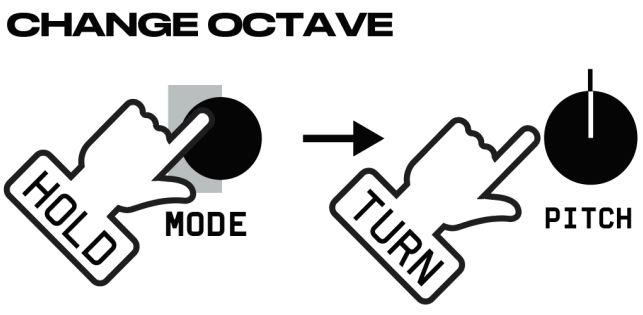
Glitchnoise (White)

Noisy and unpredictable with a lot of strange and unique sweetspots to hunt for. Honestly, I do not even know what is really happening... but I love it!

2. PITCH knob

The PITCH knob sets the base NOTE over 6 octaves. It starts with the selected ROOT note and the knob sweep is quantized to the selected SCALE.

👆🎛️ Hold MODE and turn PITCH knob to change the octave. The current melody will be transposed by the octave if you do so.



3. PITCH MOD

The PITCH MOD knob sets how much the PLAY and NOTE inputs affect the pitch. To the right the pitch will go higher, in the middle it will not affect the pitch and to the left the pitch will go lower.

The interplay of the two pitch modulation inputs is where intricate sequences and arpeggios unfold.

4. NOTE (0V to 7V)

The NOTE input is updated only when a trigger is detected at the TRIG input.

The **base NOTE** is established by the position of the PITCH knob and the voltage at the NOTE input (attenuated by the PITCH MOD knob).

The base NOTE will always be aligned to the selected SCALE (see the **Quantizer** section for more information).

When PITCH MOD knob is fully clockwise NOTE input tracks V/Oct. To enable all semitones – choose the chromatic SCALE.

Note: Because the Note input updates only with TRIG it might result in a hanging remembered voltage. If the input is detected as unpatched for a while it will reset back to 0V.

5. ►PLAY (0V to 7V)

The ►PLAY input generates 3rds, 5ths and octaves above the **base NOTE**. These intervals will always be quantized to the selected SCALE.

When voltage at the PLAY input (attenuverted by the PITCH MOD knob) changes it will trigger the envelopes.
The envelope triggers will be time aligned to a PLAY GRID. The PLAY GRID is typically a faster version of the clock and the exact division/multiplication is affected by the ENV knob and the TEMPO. It is tuned to be always in a musical time scale.

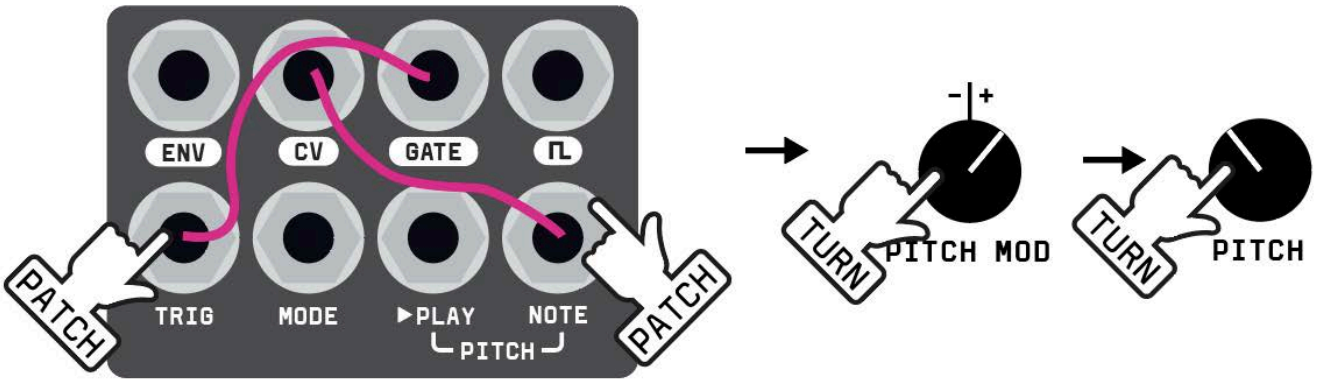
Understanding the ►PLAY and NOTE interaction

The ►PLAY input can give you great arpeggios. Patch in the triangle LFO while feeding the NOTE input with CV and the TRIG input with GATE.

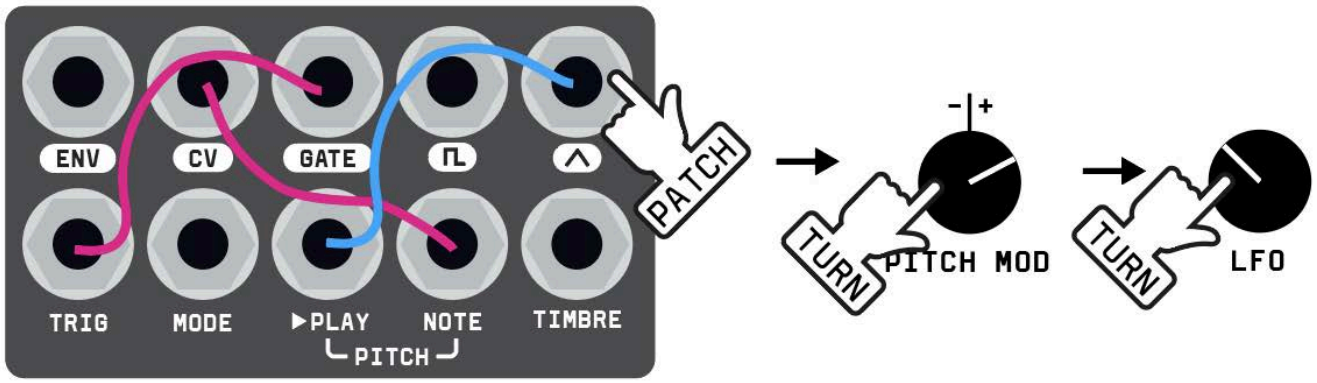
In musical theory terms the CV would be the root note of your arpeggio chord. The LFO would be the arpeggio shape and the GATE would be the harmonic rhythm at which you progress the chord progression.

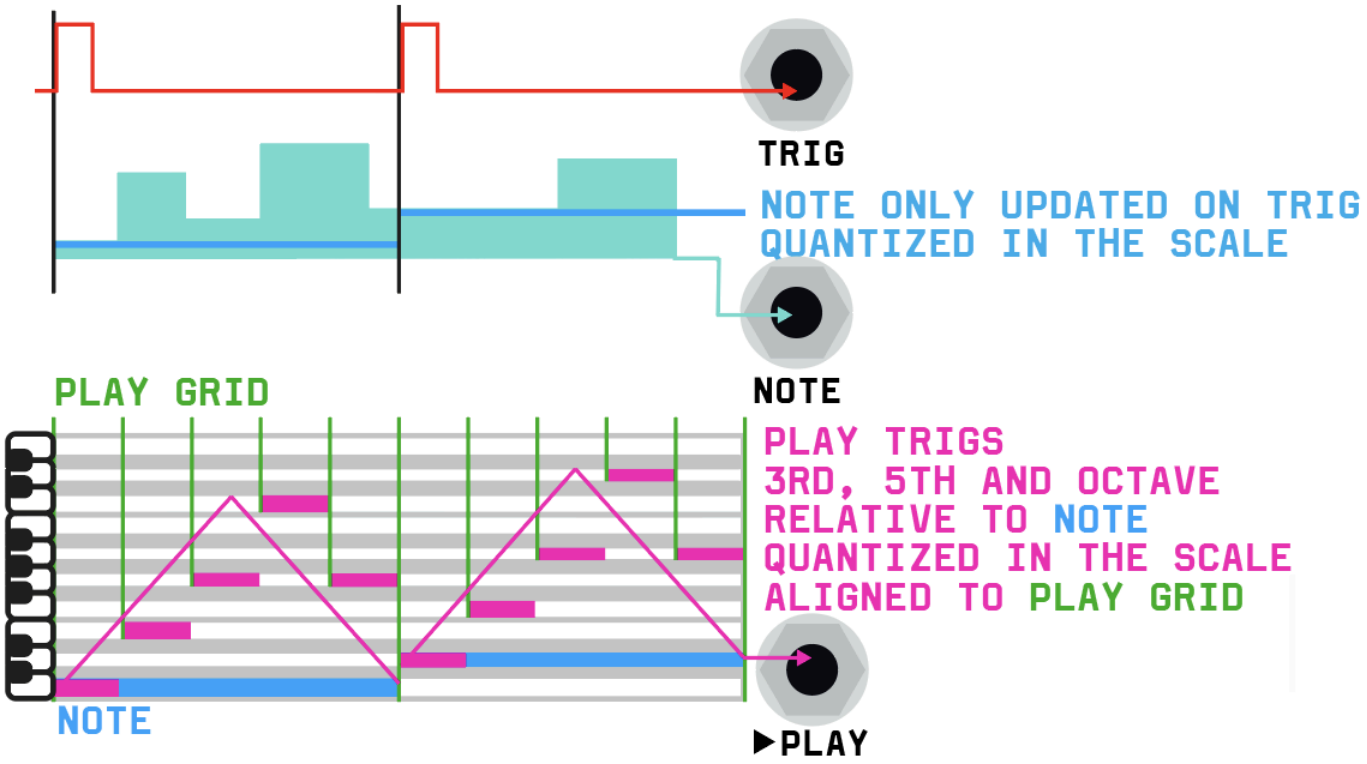
This builds understanding regarding the mechanics of the PITCH MOD inputs.
Experiment! There are no rules - only your imagination.

DISCOVER A MELODY

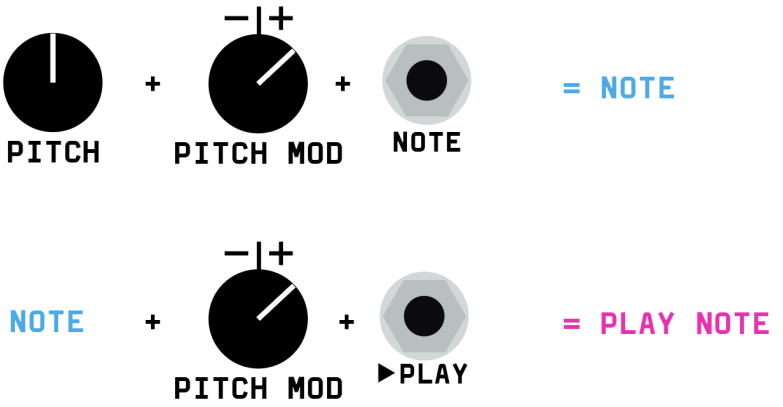


ARPEGGIATE IT





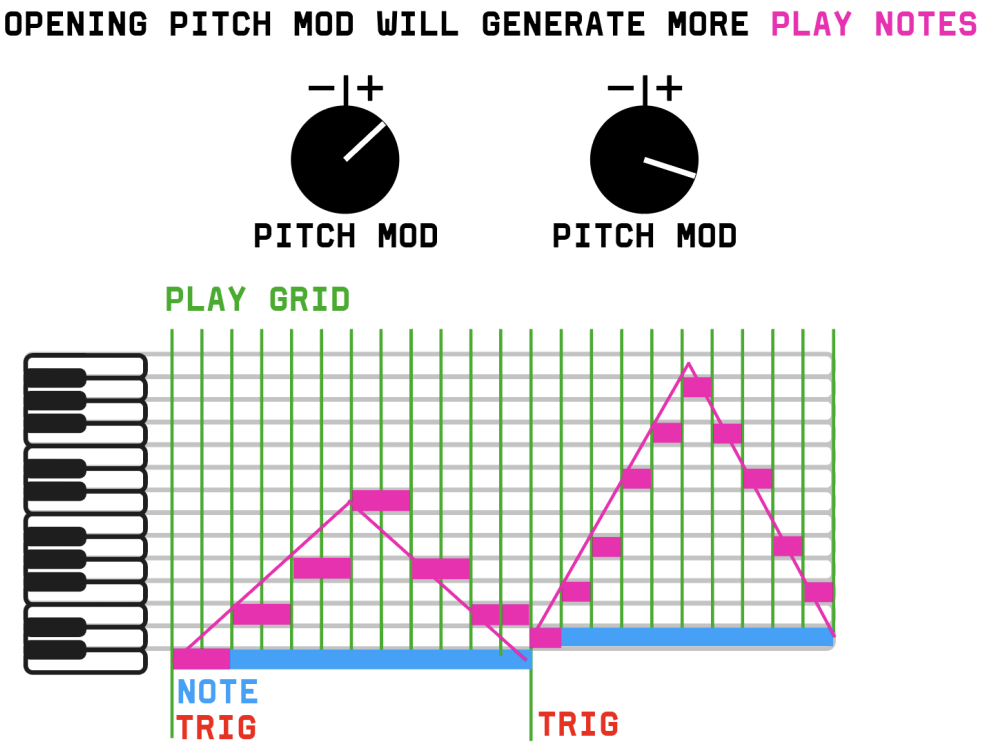
TIP: Speed up unsynced LFO to be faster than the PLAY GRID to generate semirandom arpeggio shapes.
Below is a simplified diagram of how the NOTE and ▶PLAY inputs combine. The resulting note will always be quantized to the selected SCALE.



Opening the PITCH MOD knob will generate more PLAY NOTES. This is a great way to make faster arpeggios that span a bigger pitch range.

Note: Turning ENV further to the left or right will result in sparser PLAY GRID and therefore sparser arpeggio which goes well with longer attack/decay envelopes.

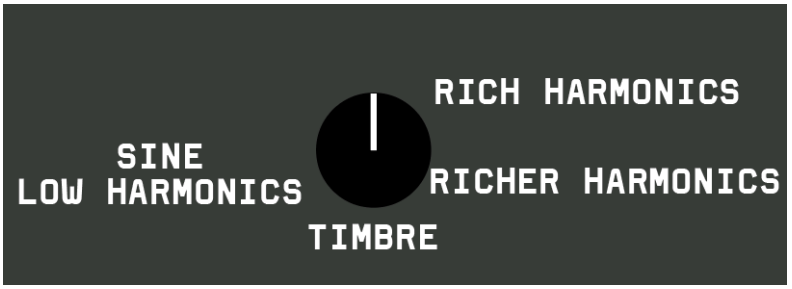
Play with LFO, ENV, PITCH MOD and PITCH knobs to find the perfect arpeggio!



TIP: If using GATE to feed the TRIG input also patch it to the RESET of unsynced LFO. This results in interesting musical arpeggio shapes.

6. TIMBRE & TIMBRE MOD (-5V to +5V)

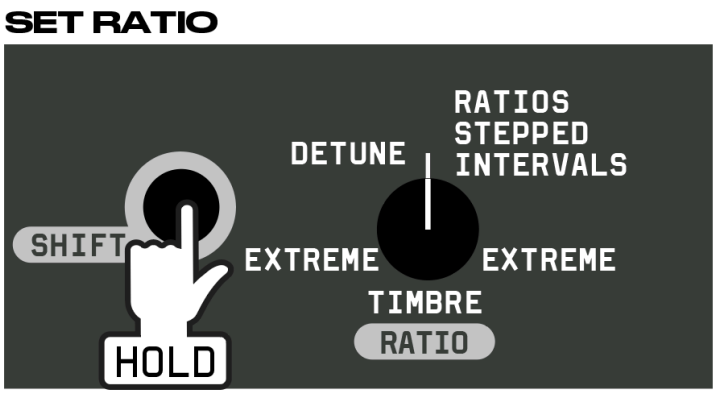
The TIMBRE knob is the main control to go from low harmonic sine waves to full spectrum timbres. It changes the mechanics of adding the waveform complexity from synth mode to synth mode.
The TIMBRE MOD knob sets how much the TIMBRE knob is modulated via the TIMBRE MOD input. In the middle there will be no modulation, to the right it will increase positive modulation and to the left it will increase negative modulation.



7. RATIO

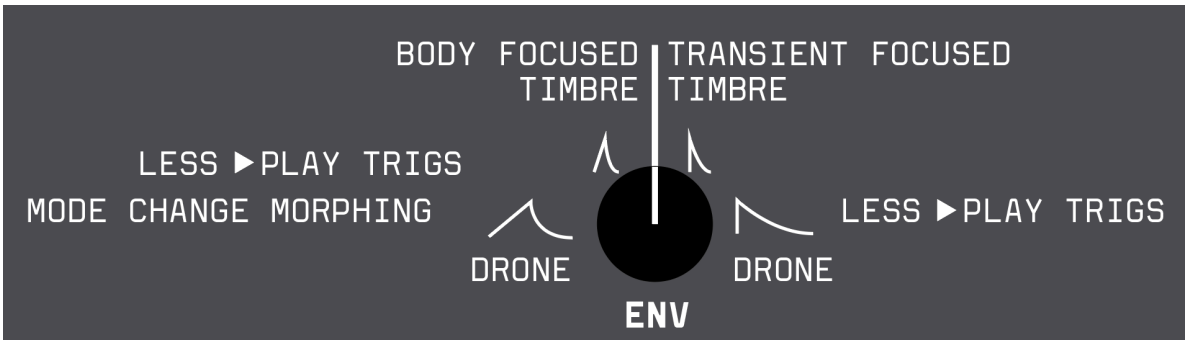
👆🎛️Hold SHIFT and turn TIMBRE knob to adjust RATIO.

RATIO refines the main TIMBRE sweep and defines character for each synth mode. In most cases it sets the detuning/ratio of the different oscillators as well as the ratios of their different waveform mixing. The exact function depends on the synth MODE.
RATIO is remembered and autosaved for each synth mode separately.



8. ENV

The ENV knob is literally the center piece of the ALCHEMIST; it does influence other parameters in a musical way and it becomes sort of a PAD/REVERSE/PLUCK/DRONE macro knob.



ENV knob to the **right**

- increases the DECAY time
- the TIMBRE control will focus more on transients
- above 3 o'clock it makes sparser PLAY GRID (slower arpeggios)
- fully right it activities drone mode

ENV knob to the **left**

- increases both ATTACK and DECAY
- focuses TIMBRE more towards the body of the sound
- the main volume envelope does not re-trigger in the ATTACK phase
- bellow 9 o'clock it makes the PLAY GRID sparser
- below 9 o'clock it introduces MODE MORPHING for continuous transition between synth modes – perfect when MODE is modulated
- fully left it activities morphing drone mode

9. ENV MOD (-5V to +5V)

👆🎛️Hold SHIFT and turn ENV knob to adjust the amount of ENV modulation.

The envelope and the macros it adjusts can be modulated via the ENV MOD input. ENV MOD in the middle of the knob will mean no modulation and will increase positive modulation to the right and increase negative modulation to the left.

Note: for empirically tested reasons we decided it is better to not enter/leave drone mode via modulation. The drone mode can be only set by the knob position.

ENV OUT (0V to +5V)

The ENV output mirrors the main amplitude envelope with the exception of the drone mode at both extremes of the ENV knob. In those positions it will simply render a long envelope that can still be triggered and can still be used for modulation.

ENV MOD is only updated when envelopes are triggered. It does not require a trigger from the TRIG input. It updates also on triggers caused by the ►PLAY input.

TIP: You can enter drone mode with the ENV knob position and because you cannot modulate out of a drone mode you can still modulate the ENV MOD input and get various envelopes from the ENV output that can be used for timbral modulation.

10. TRIG (-5V to +5V)

The TRIG input is the main out of the 5 different ways to trigger envelopes and sound on the Alchemist. Detecting the rising edge on the TRIG input will trigger all internal envelopes and also will update the NOTE input.
That means you can use various different signals to trigger stuff.

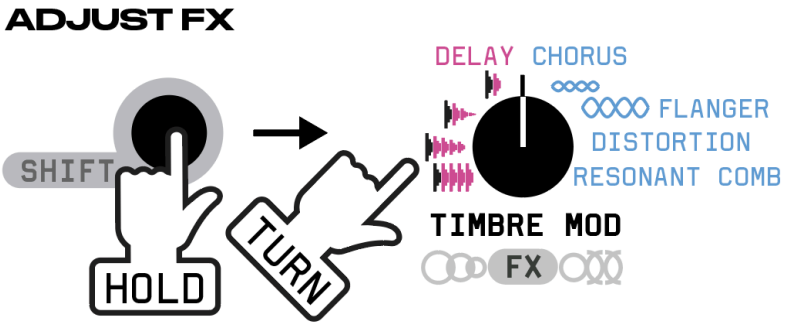
5 ways to trigger the sound on the Alchemist:

- Rising edge on the TRIG input
- Short press of the SHIFT button
- Modulation the ►PLAY input
- Entering drone mode with the ENV knob
- Sending MIDI notes via USB MIDI

11. FX

👆🎛️Hold SHIFT and turn TIMBRE MOD knob to set the FX.

The timbral palette of the Alchemist extended by the dual FX section which offers either a wide delay that will smear the arpeggios into echoed harmonies or chorus-flanger-distortion-combfilter macro custom tuned for each synth mode.



The Delay is always synced to TEMPO and set to 3/8th of a note. Increase tempo for shorter delays and vice versa.

TIP: to modulate the delay time you can use LFO PULSE patch it to SYNC IN and then modulate the LFO.

The right side of the FX knob is custom tailored to each synth mode. It usually starts by widening the stereo field with a chorus that becomes more resonant as you increase the FX knob. Some modes also introduce various types of distortion that have exciting interplay with the TIMBRE and RATIO settings.

TIP: The right-most FX setting in both FM and GLITCHNOISE modes creates a resonant delay line aka comb filter aka Karplus-Strong resonator with its frequency aligned to the PITCH. Set the ENV knob slightly to the right of the centre for short impulses to excite the FX resonator. Make pitch go really low with negative PITCH MOD to explore extreme sound design.

12. PITCH SLIDE

👆🎛️Hold MODE and turn TIMBRE knob to set the PITCH SLIDE.

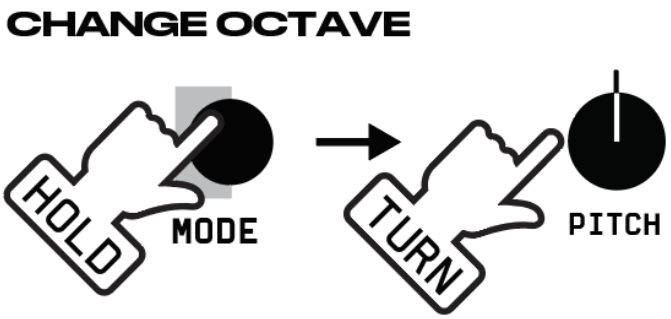
Pitch Slide is a great way to change the expression of your patch by applying pitch envelope and portamento.

- to the right applies positive envelope to pitch
- early to the left it applies inverse envelope to the pitch
- further to the left increases portamento (all pitch change is slowed down)

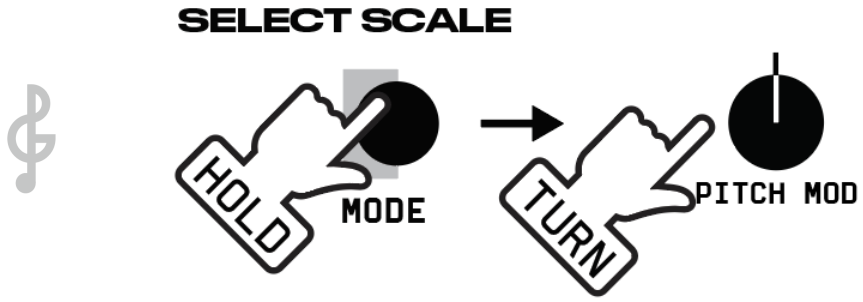
QUANTIZER

You can play the synth quantized to pitch in a musical scale.

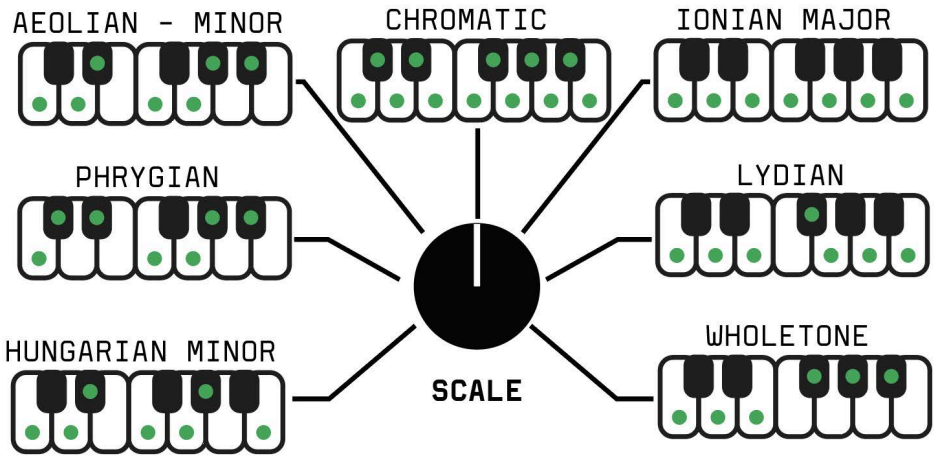
The NOTE PITCH MOD patch point modulates the pitch in a quantized manner, based on the selected scale. It updates the pitch only when the TRIG is triggered.



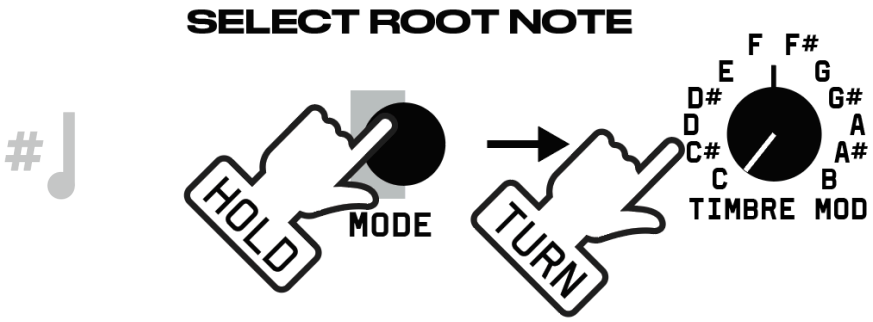
👆🎛️ Hold **MODE** and turn the **PITCH knob** to select the octave.



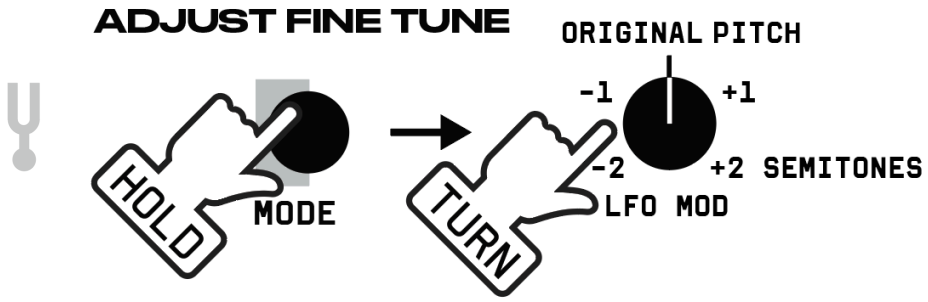
👆🎛️ Hold **MODE** and turn the **PITCH MOD knob** to select the quantizer scale. When the scale changes, the lights will briefly dim. The following picture illustrates this with the **ROOT** set to **C**.



You can edit all scales via the **WEB APP** Refer to the [WEB APP] section for more details.



👆🎛️ Hold **MODE** and turn the **TIMBRE MOD knob** to select the root note of the quantized scale. When the root note changes, the lights will briefly dim.



👆🎛️ Hold **MODE** and turn the **LFO MOD knob** to adjust the fine-tuning by ±2 semitones. This adjustment is applied after the quantizer.

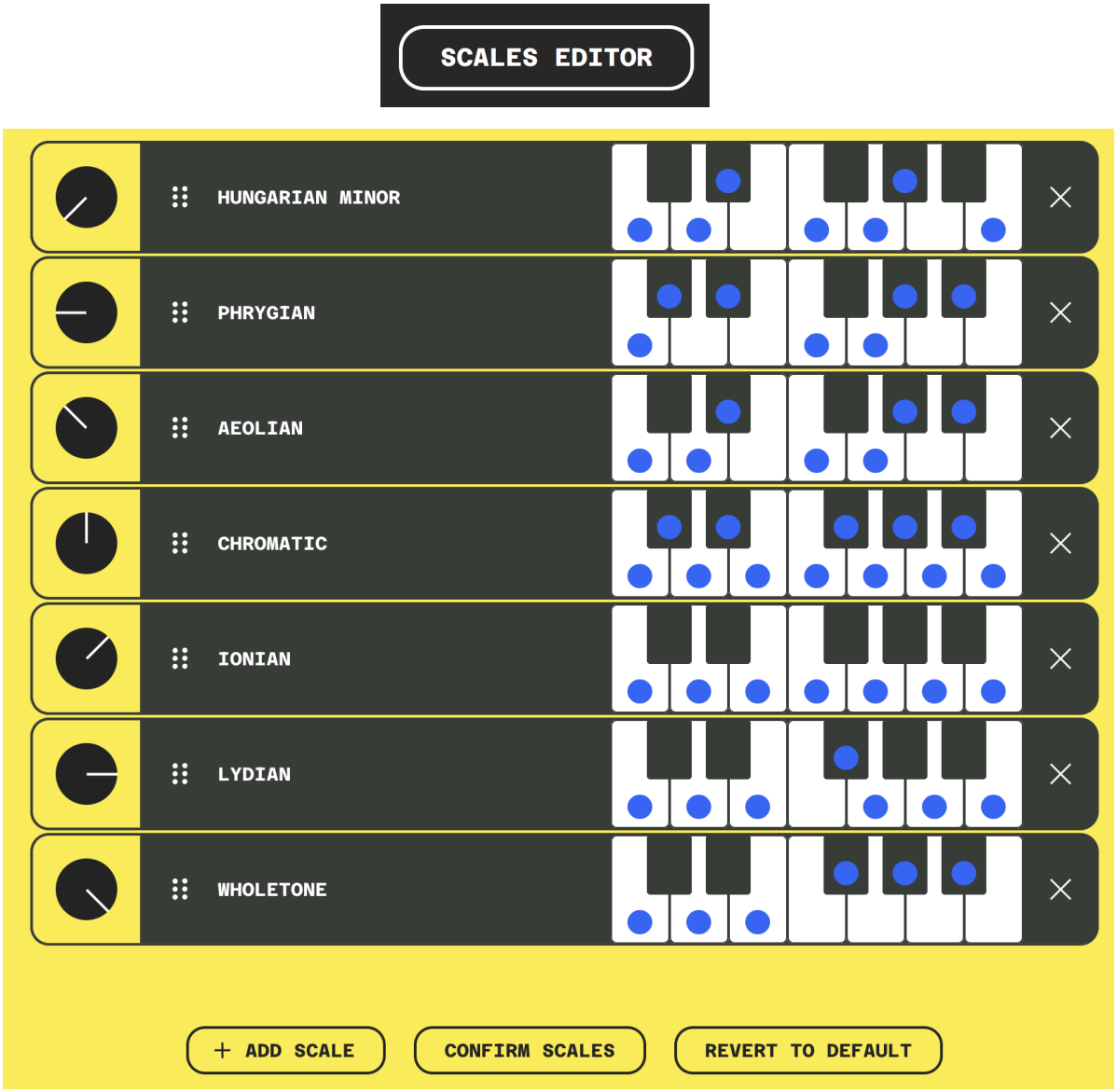
EDITOR

The online editor app allows you to edit RHYTHMS and SCALES.

https://apps.bastl-instruments.com/alchemist-laboratory/

Scales Editor

Click on the SCALES EDITOR button to access the editor.



Edit Scales

Click on the piano keys to edit your scales.

NOTE: Scales remain accurate if the **ROOT note** is set to **C**, and the **FINE tune** knob is centered. Refer to the **Quantizer section** for additional details.

Preview and Manage Scales

- Preview the entire scale by clicking on its name.
- Rearrange scales by dragging the dots on the left side of each scale.
- Delete scales by clicking the **X** icon.
- Add new scales using the **+ADD SCALE** button.

Scale Limits

- Minimum number of scales: **3;** Maximum number of scales: **32**

Finalize Edits

- Use the **CONFIRM SCALES button** to save your changes.
- Undo edits with the **REVERT TO DEFAULT button**.

Rhythms Editor

Access the editor by clicking on the **RHYTHMS EDITOR** button.

On the **ALCHEMIST**, rhythms can be loaded by holding **SHIFT** and turning the **LFO MOD knob**. These rhythms will be sent as triggers through the **GATE output**.

Edit Your Rhythms

- Click on the steps to edit your rhythms.
- Preview the rhythm by clicking the **PLAY** button and stop it using the **STOP** button.
- Add new rhythms by clicking the **+ADD RHYTHM** button.

Manage Rhythms

- Rearrange the order of rhythms by dragging the dots on the left side of each rhythm.
- Delete rhythms by clicking the **X** icon.

Rhythm Limits

- Minimum number of rhythms: **3;** Maximum number of rhythms: **32**

Finalize Edits

- Save changes by clicking the **CONFIRM CHANGES** button.
- Undo edits with the **REVERT TO DEFAULT** button.

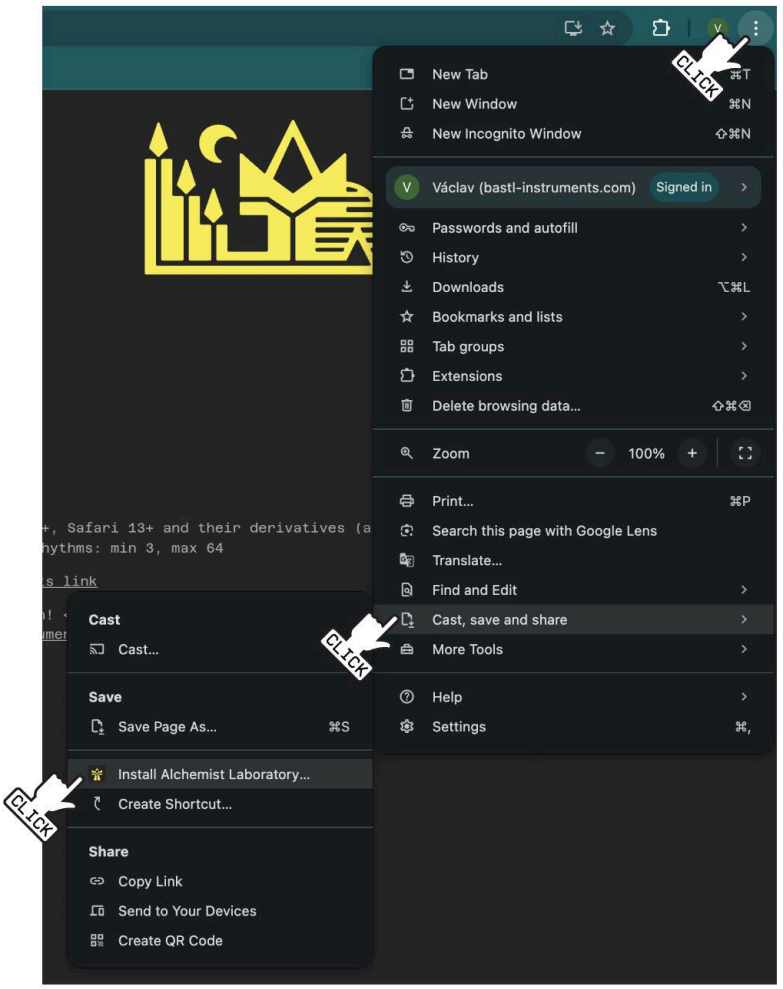
Supported Browsers

Chrome 76+, Edge 79+, Firefox 76+, Safari 13+, and their desktop derivatives.

App Offline Mode

Even though the **ALCHEMIST Laboratory** is a web app, you can install it as a local application using **Chrome** (or its derivatives) and access it even without an internet connection.

NOTE: Safari and Firefox are not supported due to their lack of PWA (Progressive Web App) technologies.

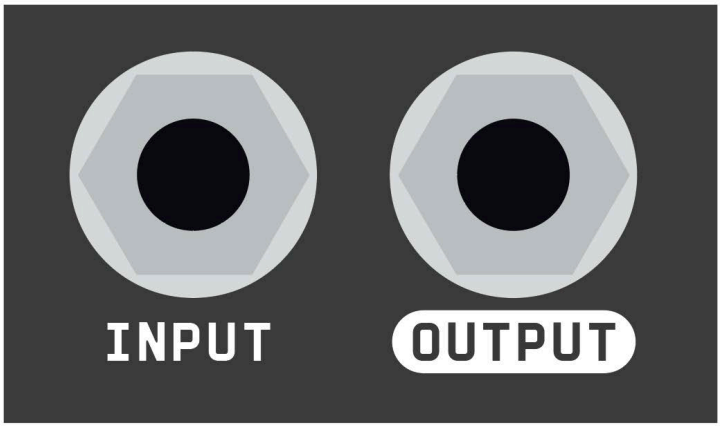


PATCHBAY

The **Patchbay** on the **Citadel** consists of many inputs and outputs.

Patchbay Details

- **Outputs**: Marked with a label inside white outline.
- **Inputs**: Labeled with white text without any outline.



Input Ranges

- PLAY IN and NOTE IN **-0.2V to 7V**
- CLK IN, RESET IN, C IN, G IN **0V to 5V**
- LFO MOD, MODE IN, TIMBRE IN, ENV IN, LFO RESET, TRIG IN: **-5V to +5V**
- L/R IN: **-10V to +10V**

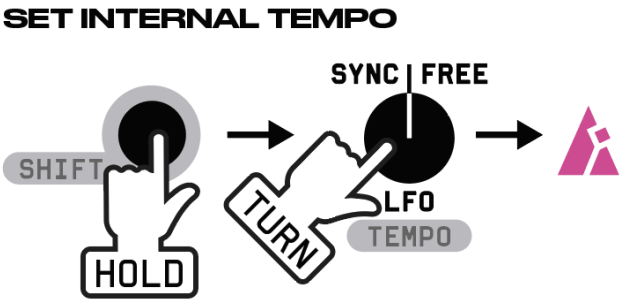
Output Ranges:

- CLK OUT, ENV OUT, CV OUT, LFO TRI OUT,LFO PULSE OUT: **0V to +5V**
- L/R OUT **-5V to +5V**
- Headphone output up to 2Vpp (line level compatible)

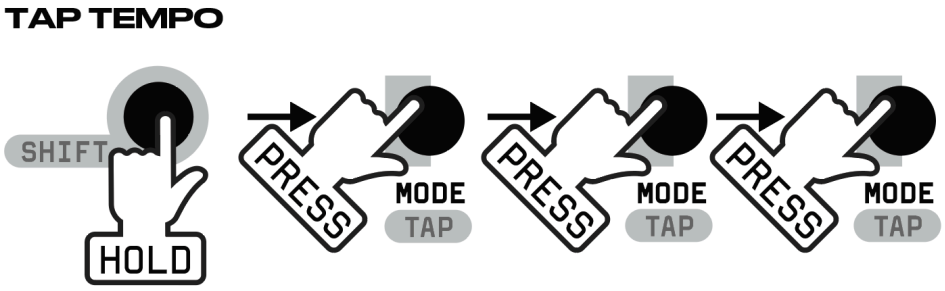
TEMPO GENERATOR

The **Tempo Generator** operates independently from the **LFO** but allows the **LFO** to be synchronized to the tempo. The tempo source can be either internal or external.

Set the Internal Tempo



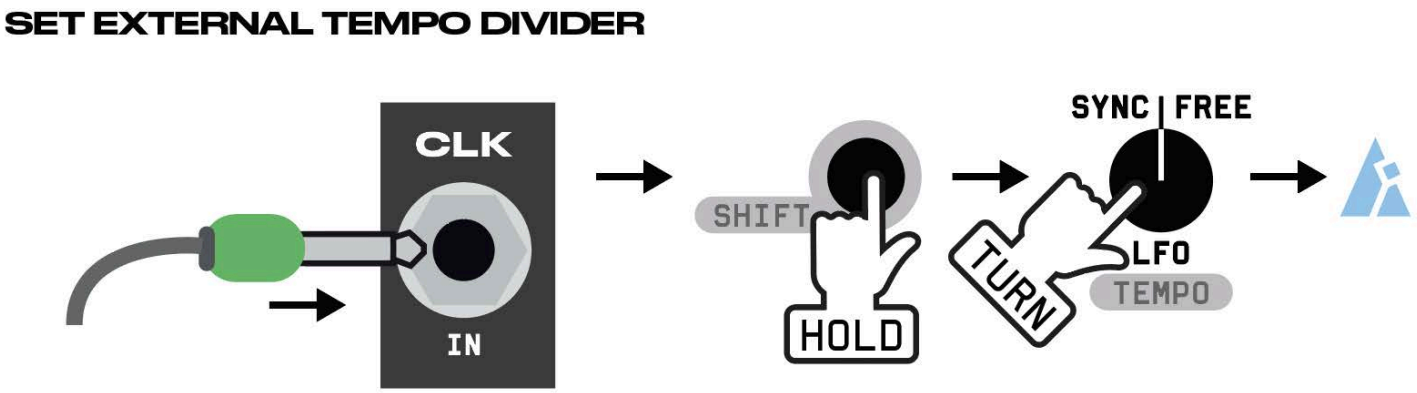
👆🎛️ Hold **SHIFT** and turn the **LFO knob**, indicated by the magenta-colored metronome light.



👆👆 Hold **SHIFT** and press **MODE** repeatedly to **TAP** the tempo.

Sync to External Tempo

Connect an analog clock signal to the **SYNC IN**.



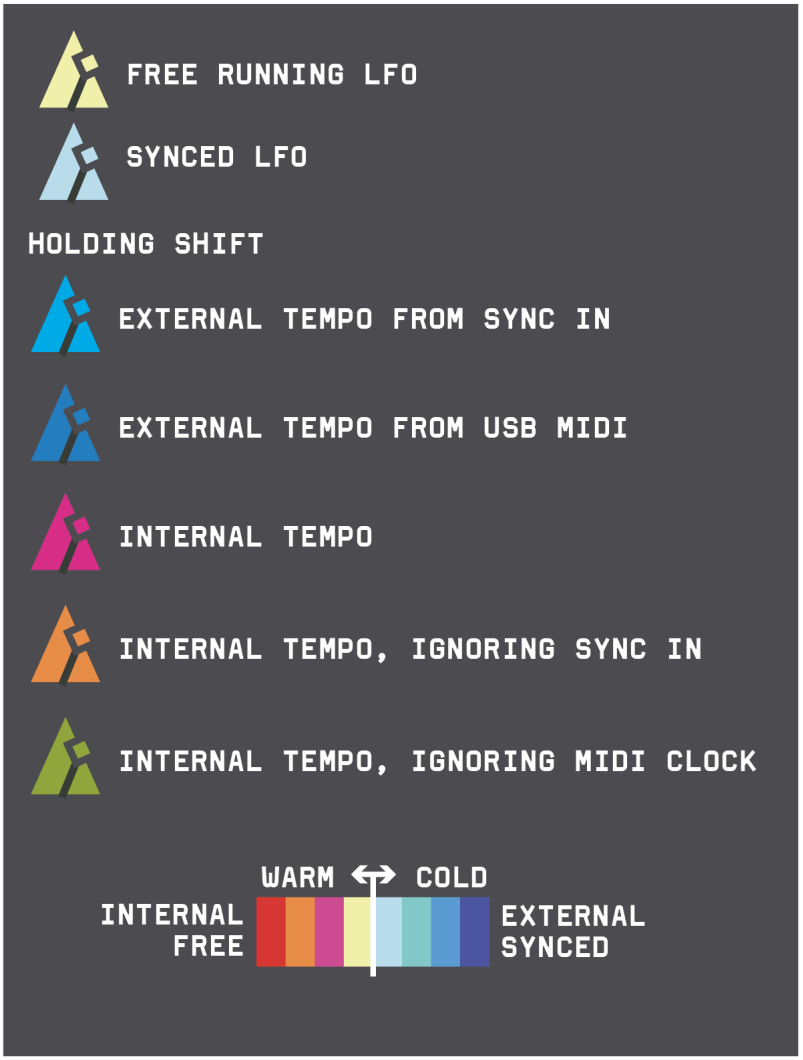
👆🎛️ Hold **SHIFT** and turn the **LFO knob** to select the tempo divider, indicated by the cyan-colored metronome light.

While holding the **SHIFT button**, the metronome light indicates the clock status:

- **Light blue (cyan)**: External tempo is active.
- **Light pink (magenta)**: Alchemist is running on the internal clock.
- **Blue:** Alchemist is running on the MIDI clock. See the **MIDI** section for more info.
- **Orange**: Alchemist is using the internal clock and ignoring the external analog clock.
- **Khaki:** Alchemist is using the internal or external clock and ignoring the MIDI clock.

NOTE: The regular clock priority is: MIDI clock, over the SYNC IN, over the internal clock.

NOTE: To toggle between allowing or ignoring the external clock or MIDI clock, refer to the **Advanced settings** section.



SYNC

SYNC IN

To sync the **Alchemist** to an external clock, connect an analog clock source to the **SYNC IN** jack. The clock signal will be detected on the left channel of the jack and used as the tempo source.

While holding the **SHIFT button**, the metronome light blinks **light blue (cyan)** to indicate that external tempo is active.

Adjust the tempo divider/multiplier by holding **SHIFT** and turning the **TEMPO knob**.

If the clock signal is not detected for more than 2 seconds, the **Pattern Generator** will reset to its first step, ensuring alignment with your external sequencers when the clock resumes.

NOTE: When the **SYNC IN** jack is connected, the **Alchemist** will always wait for the external clock and will not switch to the internal clock—unless the external clock is set to be ignored. See the **Advanced settings** section for more details.

If a jack cable is not connected to the **SYNC IN** jack, you can instead patch a clock signal to the **SYNC IN** patch point in the **patch bay**. If a clock is detected there, the **Alchemist** will automatically sync to that clock.

When the clock patched through the **patch bay** is not detected for more than 2 seconds (while no jack is connected to **SYNC IN**), the **Alchemist** will switch back to its internal clock.

NOTE: When connecting the **LFO PULSE output** to the **SYNC IN patch point**, ensure the **LFO knob** is in the free (unsynced) section to avoid glitches.

SYNC OUT

Connect **SYNC OUT** to the clock input of a receiving instrument to synchronize it with the clock of **Alchemist**.

You can set the **TEMPO** on the **Alchemist** by holding **SHIFT** and turning the **LFO knob**.

Additionally, you can patch from the **SYNC OUT** patch point to various inputs.

SYNC THRU

When an external clock is connected to the **SYNC IN**, the **SYNC OUT** acts as a **SYNC THRU**. While you can adjust clock dividers/multipliers on the **Alchemist**, all downstream devices will remain synchronized with the master clock.

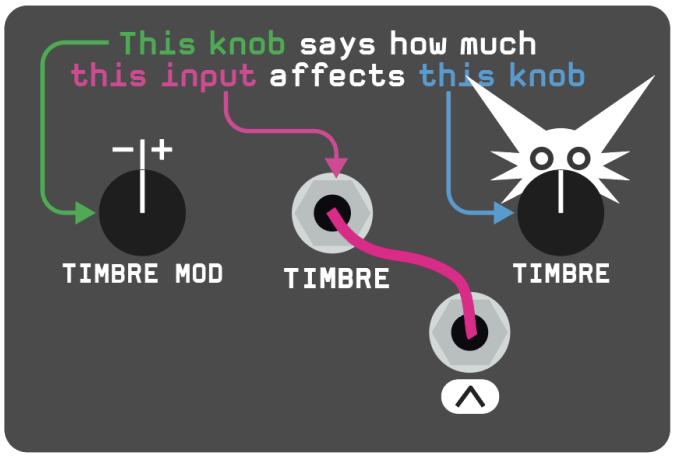
MIDI sync

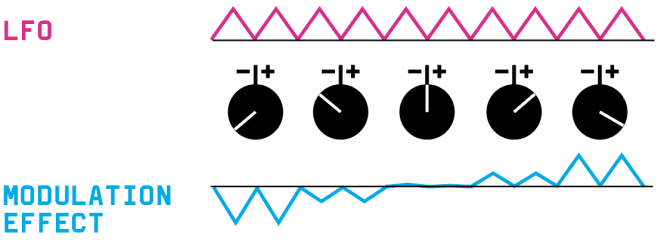
Alchemist can be synced to TRS MIDI CLOCK or USB MIDI clock. Please see the **MIDI chapter** for more information.

MODULATION

The **Citadel** features several modulation sources:

- The **Pattern Generator** is always synced to the tempo.
- The **LFO** can operate in either synced or free mode.
- The **ENV** serves as the primary envelope controlling the amplitude.





Envelope (ENV) (0V to +5V)

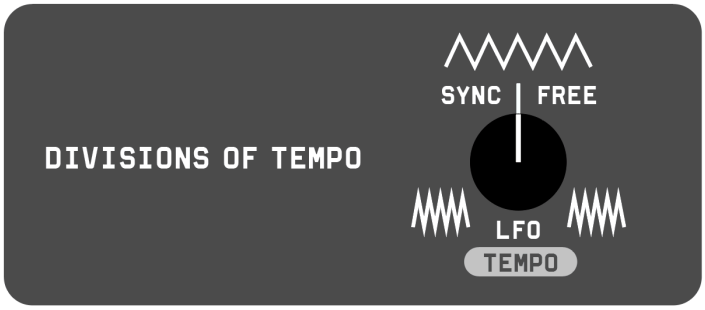
The **ENV output** originates from the main **ALCHEMIST** envelope, adjusted by the **ENV knob**. This envelope controls the loudness or the synth sound. For additional details, refer to the **ENV chapter**.

The **ENV output** can also be used to modulate the **TIMBRE MOD** or other parameters.

LFO (0V to +5V)

The **LFO speed** is adjusted via the **LFO knob:**

- At the **middle position**, the LFO operates at its slowest speed.
- Turning the knob **left syncs** the LFO **to the tempo**, indicated by **cold white light**, with the knob setting the tempo divider.
- Turning the knob **right sets** the LFO to **free-running mode**, indicated by **warm white light**, with increasing speed as the knob turns further.



LFO Outputs and Inputs

LFO offers **TRI** and **PULSE** outputs, **RESET** input and **LFO MOD** input.

- **LFO TRI**: The triangle shape is variable by patching **LFO PULSE** to **RESET** or **LFO MOD** (see below).
- **LFO PULSE**: Outputs a high signal when the triangle is rising.
- **LFO RESET**: The rising edge resets the LFO to the highest point of the triangle waveform.
- **LFO MOD**: Attenuverting input allows for variable LFO shapes when **LFO PULSE** is patched into it.

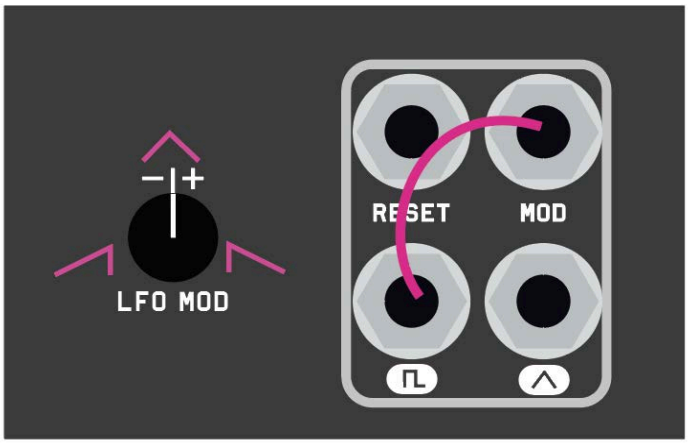
NOTE: Modulation does not switch between synced and free LFO modes but only speeds up or slows down the LFO.

Changing Modulation Shapes

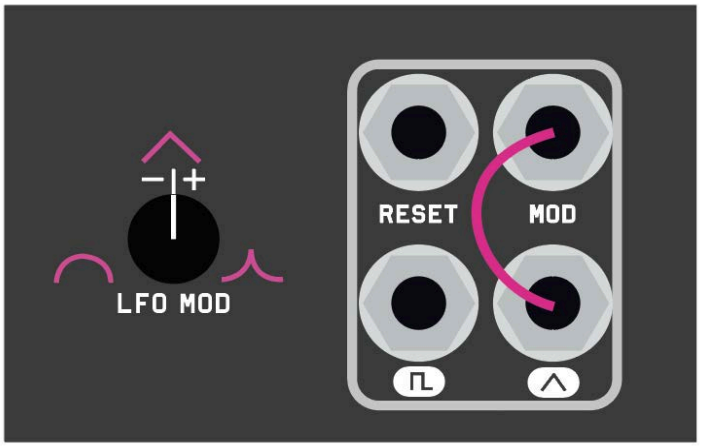
Modulation shapes can be adjusted through **patch programming**.
NOTE: The following methods will also affect the LFO speed.
The **LFO PULSE** output changes its pulse width, remaining high while the triangle rises and low while it falls.

LFO Patch Programming variants

- **Ramp or Saw Shape**:
  Patch the **LFO PULSE** to the **LFO MOD input** and adjust the **LFO MOD** to tilt the triangle into a ramp or saw shape. Adjust the **LFO knob** to fine-tune the result, as turning the **LFO MOD** will affect the LFO frequency.

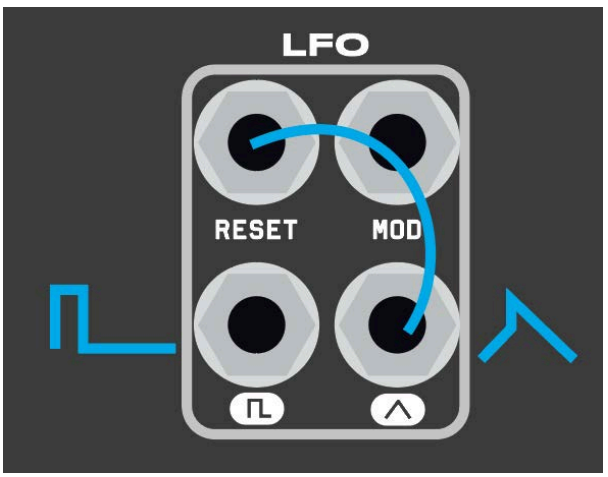


- **Exponential or Logarithmic Shape**:
  Patch the **LFO TRI** to the **LFO MOD input** and adjust the **LFO MOD** to make the triangle shape more exponential or logarithmic.



- **Saw Wave Shape**:
  Patch the **LFO PULSE** to the **LFO RESET** to transform the triangle shape into a saw wave.

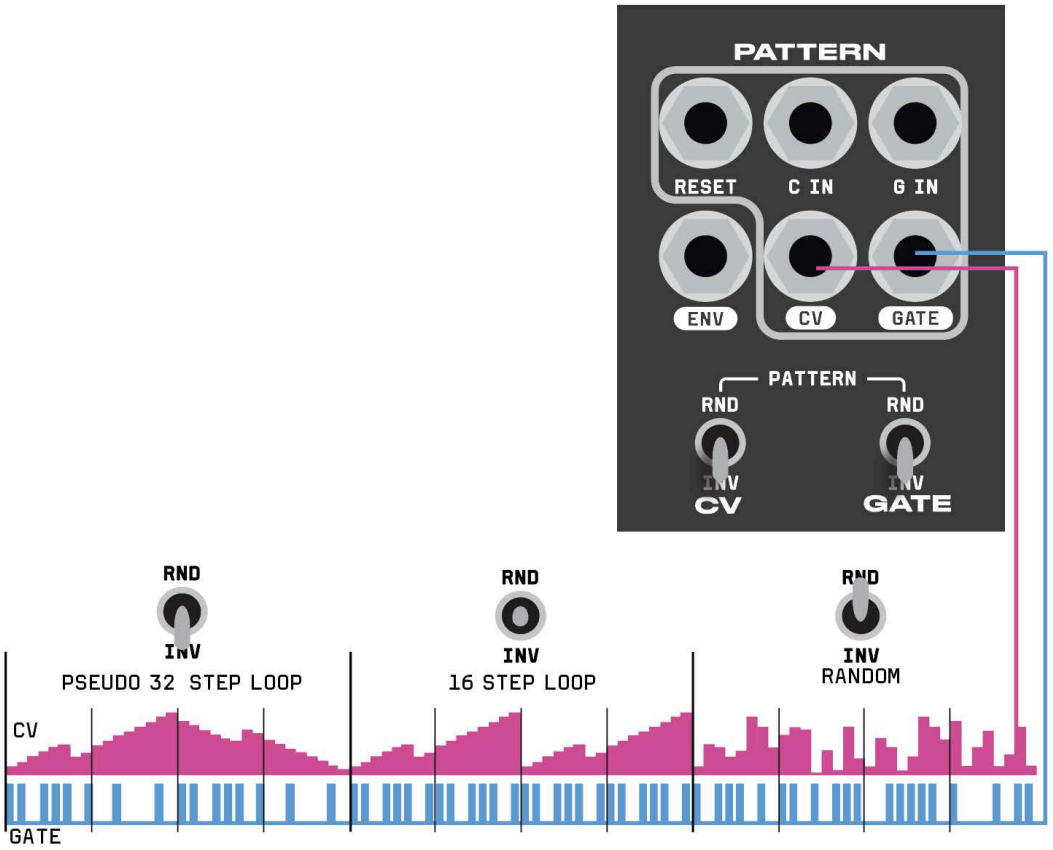
- **Hybrid Wave Shape**:
  Patch the **LFO TRI** to the **LFO RESET** to create a hybrid wave from the triangle shape.



Pattern Generator (0V to +5V)

The **Pattern Generator** produces two signals: **GATE** and **CV**, both of which are always clocked by the tempo and run on a 16-step sequence.

- **GATE**: Provides rhythmic information, with the gate length fixed at 75% of the step duration.
- **CV**: Outputs varying stepped voltages.



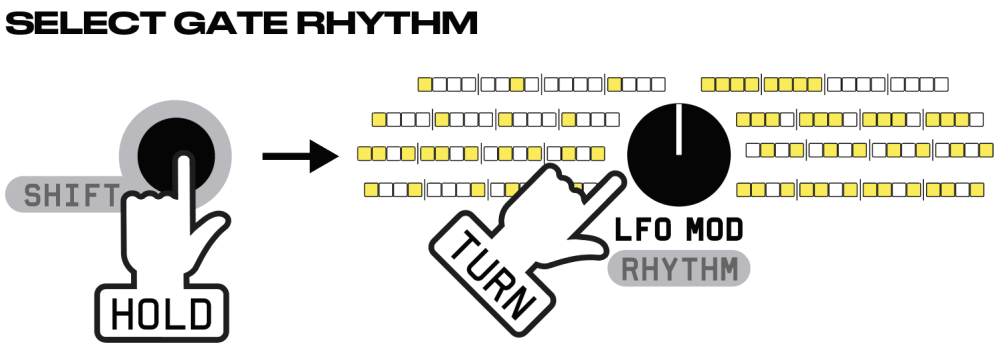
Reset

The **GENERATOR RESET input** (PATTERN R – the middle pin) resets both the **GATE** and **CV sequences** upon detecting a rising edge.

- This can be used for synchronization purposes.
- It can also shorten the pattern sequence, for example, by patching in the **LFO**.

Gate

👆🎛️ Hold **SHIFT** and turn the **LFO MOD** knob to generate the **RHYTHM sequence** at the **GATE output**. The sequence will be selected from a table of patterns, which are editable via the **WEB APP**.



The **GATE PATTERN SWITCH** is normalized to the GATE GENERATOR input **G IN** and is only active when there is no jack in the G IN. It modifies the **GATE sequence** in the following ways:

- Switch in the **MIDDLE** or G IN voltage in between 1.6 and 3.2V: the gate sequence remains unchanged.
- Switch in the **UP** position or G IN voltage above 3.2V: the current position in the gate sequence is randomized.
- Switch in the **DOWN** position or G IN voltage below 1.6V: the current position in the gate sequence is inverted (inactive steps become active and vice versa).

TIP: Try flipping the switch temporarily to alter the sequence partially.

CV

The **CV PATTERN SWITCH** is normalized to the CV GENERATOR input **C IN** and is only active when there is no jack in the C IN. It modifies the **CV sequence** in the following ways:

- Switch in the **MIDDLE** or C IN voltage in between 1.6 and 3.2V: the CV sequence remains unchanged.
- Switch in the **UP** position or C IN voltage above 3.2V: the current level of the CV sequence is randomized.
- Switch in the **DOWN** position or C IN voltage below 1.6V: the current level of the CV sequence is inverted around a center at 2.5V (e.g., 0V becomes 5V, 1V becomes 4V, and 2V becomes 3V, etc.).

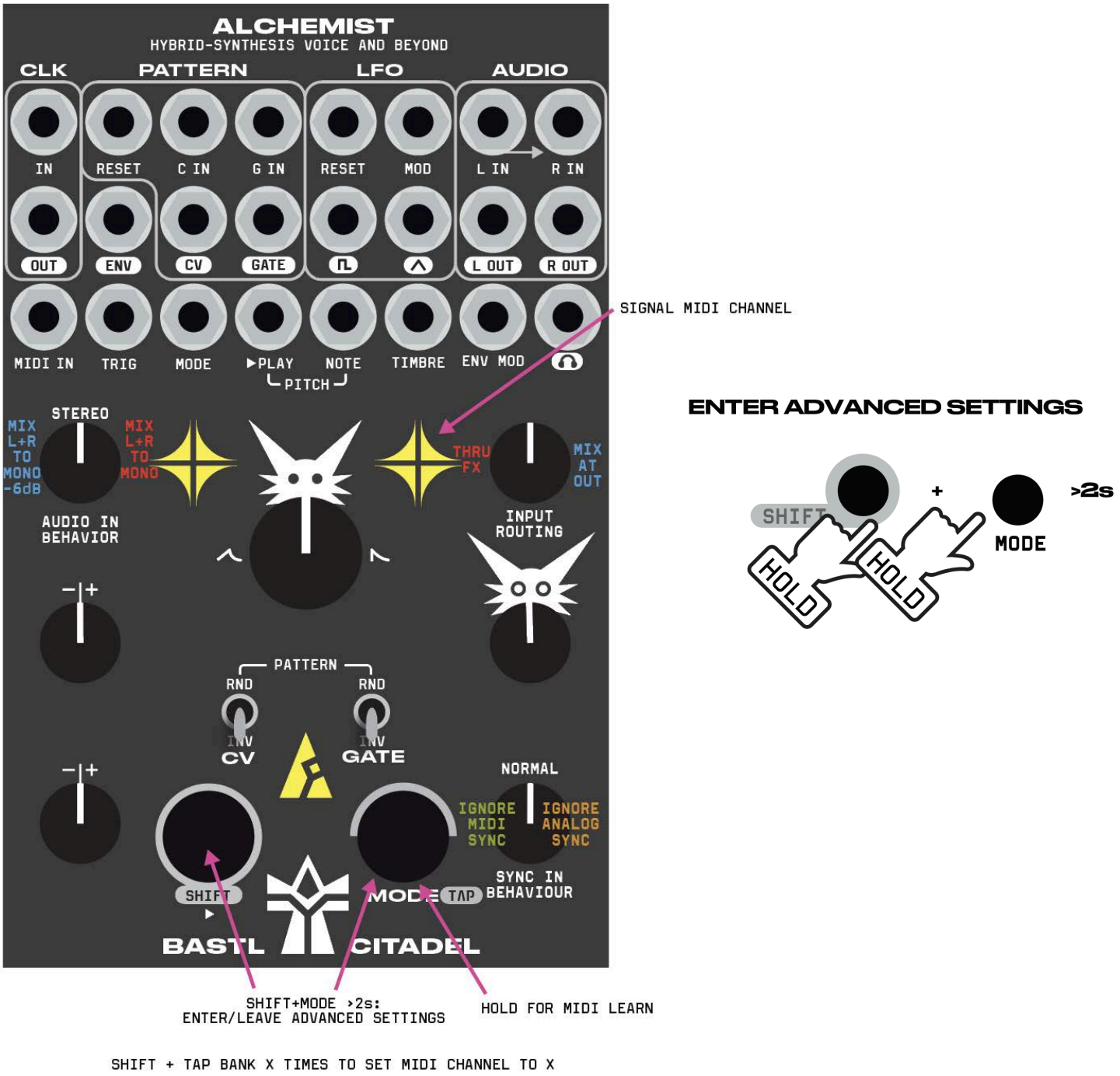
TIP: Connect varying voltages to the C IN to create semi-random and evolving sequences.

Try flipping the switch temporarily to alter the sequence partially until it fits your needs.

NOTE: The switch in the **DOWN** position or C/G IN voltage below 1.6V the sequence will continuously invert itself, making it appear **32 steps long**.

Advanced Settings

Press and hold both the **SHIFT** and **MODE buttons** for over 2 seconds to enter **Advanced Settings mode**. This mode unlocks expanded connectivity options, allowing you to enhance the capabilities of your **Alchemist**.



Audio Input Behavior

While in **Advanced Settings mode**, adjust the **PITCH MOD knob**, and the **top left light** will change colors to indicate the input mode:

- **BLUE**: mix L+R inputs to Mono with -6dB gain. Turn the knob **left**.
- **WHITE**: Stereo input. Leave the knob in the **center position**.
- **RED**: mix L+R inputs to Mono. Turn the knob **right**.

Note: when using the RED mono mix setting and plugin only into the L input the signal will effectively boost +6dB, because it is normalised to the R input the signals will add up.

Input Routing

Use the **PITCH knob** to determine the internal routing of **AUDIO IN**:

- **Turn Right (BLUE LIGHT)**: Mix the AUDIO IN with the **Alchemist** sounds at the output.
- **Turn Left (RED LIGHT)**: Route the AUDIO IN through the **Alchemist's effects**.

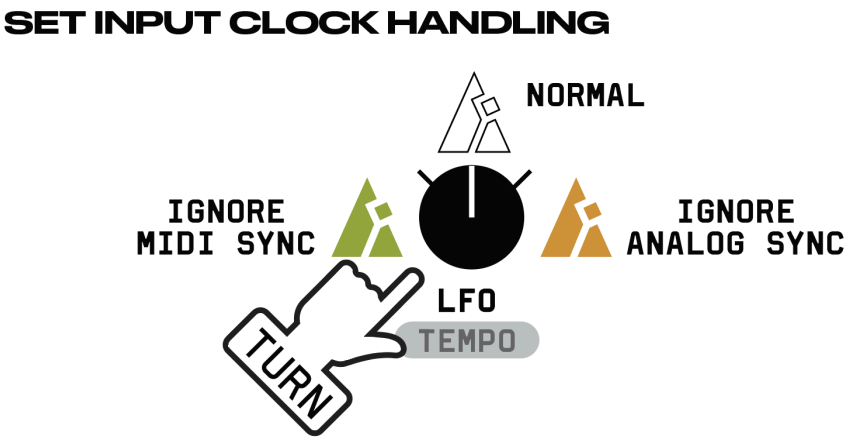
Ignore USB MIDI Clock / Sync Input

You can configure your **Alchemist** to always use its internal clock and ignore the external clock connected via the **TRS** or **USB MIDI, SYNC IN jack** or **patch input**.

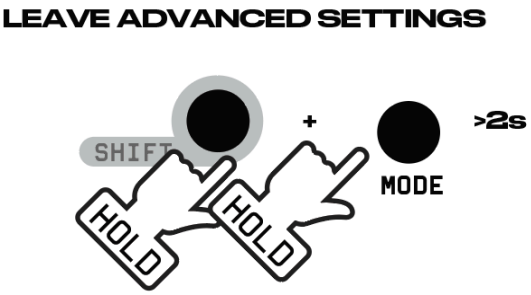
This allows the **SYNC IN jack** to be repurposed for inputting external voltages and routing them to desired destinations.

While in **Advanced Settings mode**, adjust the **LFO knob**, and the **LFO light** will change colors:

- **KHAKI:** Ignore MIDI Clock (turn the knob **left**).
- **WHITE:** Normal operation (knob in the **center** position) = honors the regular clock priority: MIDI clock, over the SYNC IN, over the internal clock.
- **ORANGE**: Ignore sync input (turn the knob **right**).



To exit **Advanced Settings mode,** hold **SHIFT** and **MODE** for 2 seconds.



MIDI IMPLEMENTATION

Citadel has a TRS MIDI Input (Type A) jack in the patch bay for receiving MIDI. It also can send and receive MIDI via the USB MIDI connector on the back of the module.

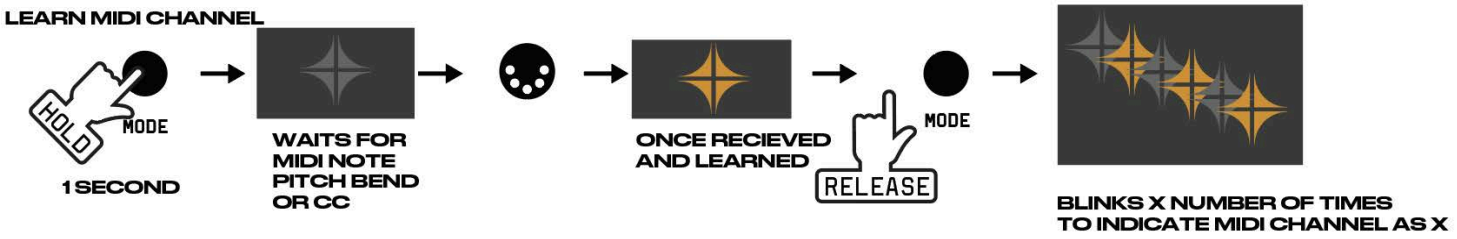
Setting the MIDI channel

Citadel uses the same MIDI channel for both input and output.

NOTE:
The MIDI channel applies to Note, Pitch Bend, and CC (Control Change) messages. As the MIDI Clock messages do not carry channel information, channel settings have no effect on clock transmission or reception.

You can **learn or set the MIDI channel** in the Advanced settings mode. Enter (or leave) the Advanced Settings mode by holding **SHIFT and MODE** for 2 seconds.

Learn the MIDI channel

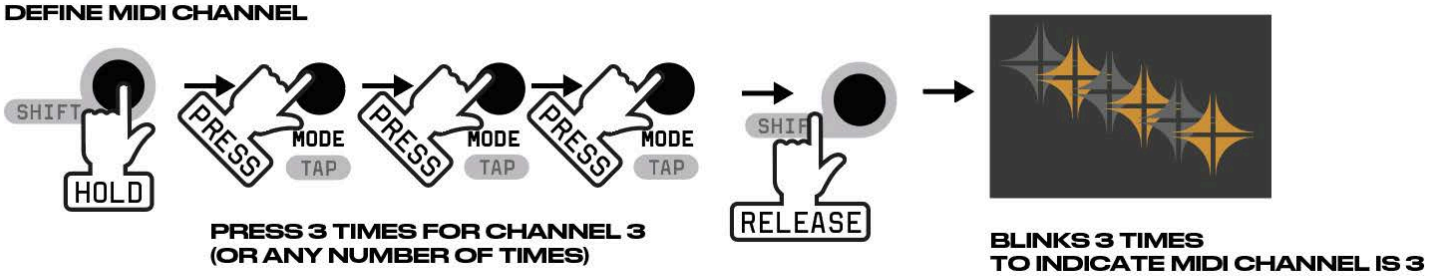


To MIDI learn the MIDI input/output channel, hold the MODE button for at least 1 second. The top right light will turn off.

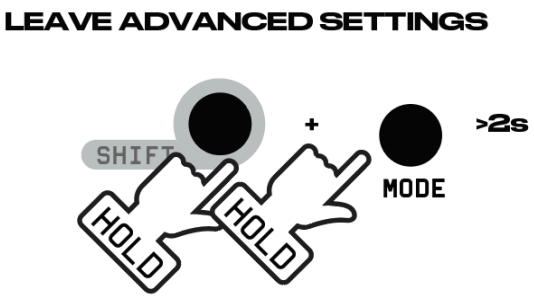
Send any MIDI message (Note, CC, or Pitch Bend). The channel of the received message will be assigned as the new MIDI input/output channel. The top right light will turn orange to confirm the assignment.

Release the MODE button. The top right light will blink to indicate the selected MIDI channel number (e.g., 3 blinks = channel 3).
NOTE: If MODE and SHIFT buttons are held simultaneously, the MIDI Learn function will NOT be activated.

Set the MIDI channel directly



Hold the SHIFT and press the MODE button a number of times to set the MIDI channel number manually. The number of presses will be counted once the SHIFT button is released and the top right led will blink the number of times to indicate the MIDI channel number.



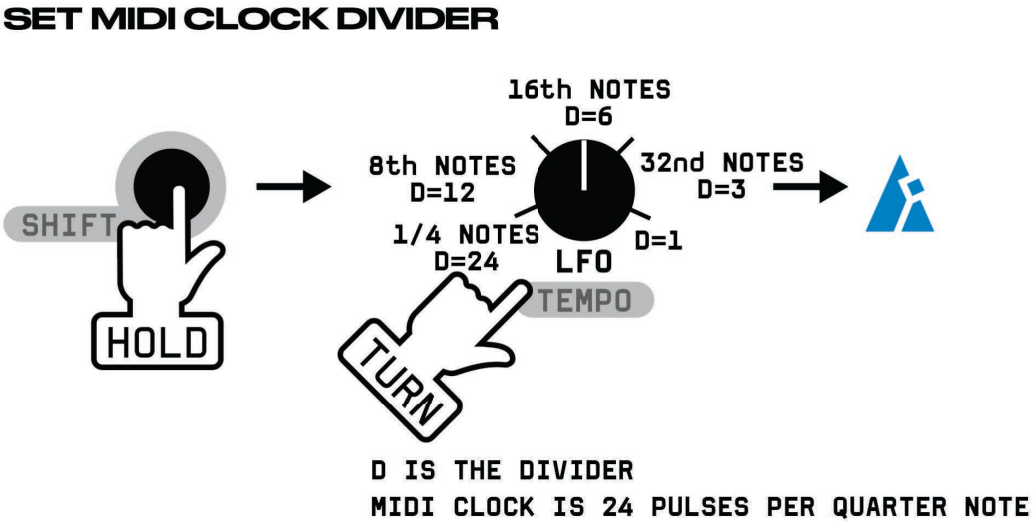
Receiving MIDI Sync (Real Time Messages)

Citadel automatically syncs to the MIDI clock. If it is present, it will take the highest priority over the internal and external analog sync clock.

Note: When a clock is received using both USB and TRS MIDI, Citadel locks onto the first arriving MIDI source for the clock. When that clock becomes inactive, it switches to the other.

MIDI Clock

When the MIDI clock is active, TEMPO (SHIFT+LFO) selects the divider of the MIDI clock.



The pattern generator will render a step each:

- 24 MIDI clocks (¼ note)
- 12 MIDI clocks (8th note)
- 6 MIDI clocks (16th note)
- 3 MIDI clocks (32nd note)
- 1 MIDI clock (1:1)

The Transport Controls behavior:

- **MIDI Start** resets the pattern generator to the first step and waits for the MIDI clock to start running. Resets the LFO when LFO is in sync mode.
- **MIDI Stop** resets the pattern generator and stops the sequencer (the MIDI clock may continue running in the background, but the pattern will

not run). The MIDI clock is still used to sync the LFO when present even after MIDI Stop.

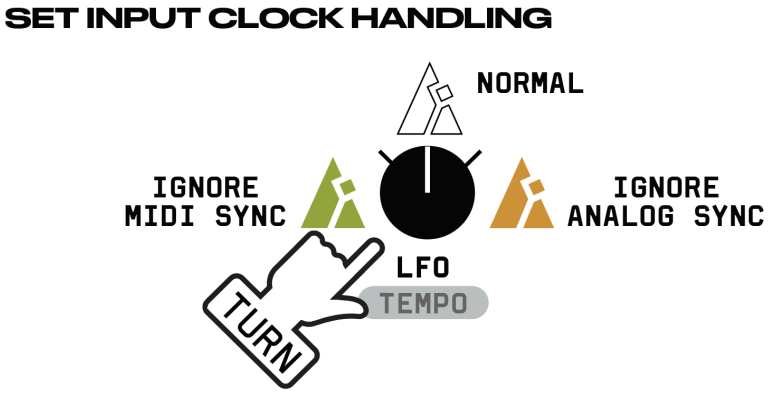
- **MIDI Continue** starts running the pattern generator from its current position but does not reset it.

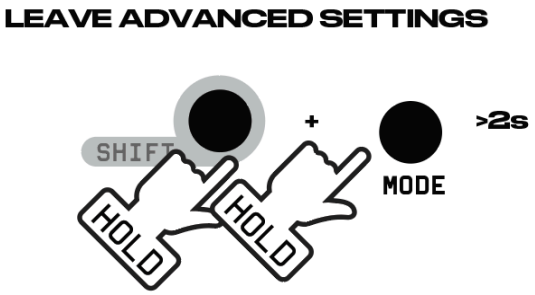
When holding **SHIFT**, the LFO light is **BLUE** to indicate that the MIDI clock sync is active.

You can set Citadel to **ignore** the MIDI Clock in the Advanced settings mode. Enter (or leave) the Advanced Settings mode by holding SHIFT and MODE for 2 seconds.

The LFO knob now offers 3 options for clock handling:

- Turn it **LEFT** to ignore the MIDI clock, indicated by **khaki** light.
- In the **CENTER** position, it follows the standard clock priority: MIDI clock over SYNC IN, over internal clock, indicated by **white** light.
- Turn it **RIGHT** to ignore analog SYNC IN, indicated by **orange** light.





Sending MIDI sync (Real Time Messages) (only USB MIDI)

Citadel sends out MIDI clock and transport controls only if it is NOT receiving MIDI Clock. If MIDI Clock was received during a session, you'll need to stop sending it and restart the Citadel. Alternatively, you can activate the **Ignore MIDI Clock** feature in Advanced settings mode to resume sending MIDI Clock.

When using the **internal clock source**, the MIDI clock is always being sent. Resetting the pattern generator with the PATTERN R input will send both MIDI Stop and MIDI Start messages consecutively.

When **SYNC IN** is used as the clock source, Citadel will convert it to MIDI Clock. The conversion rate is based on the clock divider setting (TEMPO knob), and MIDI Clock messages are sent as if the pattern generator were advancing on every 16th note (this translates to 6 MIDI Clock ticks per pattern step).

If SYNC IN is inactive for more than 2 seconds (or twice the previous clock interval), the Citadel will send a MIDI Stop message and stop sending the MIDI Clock.

Once the external clock resumes, the Citadel will send a MIDI Start message and continue sending MIDI Clock.

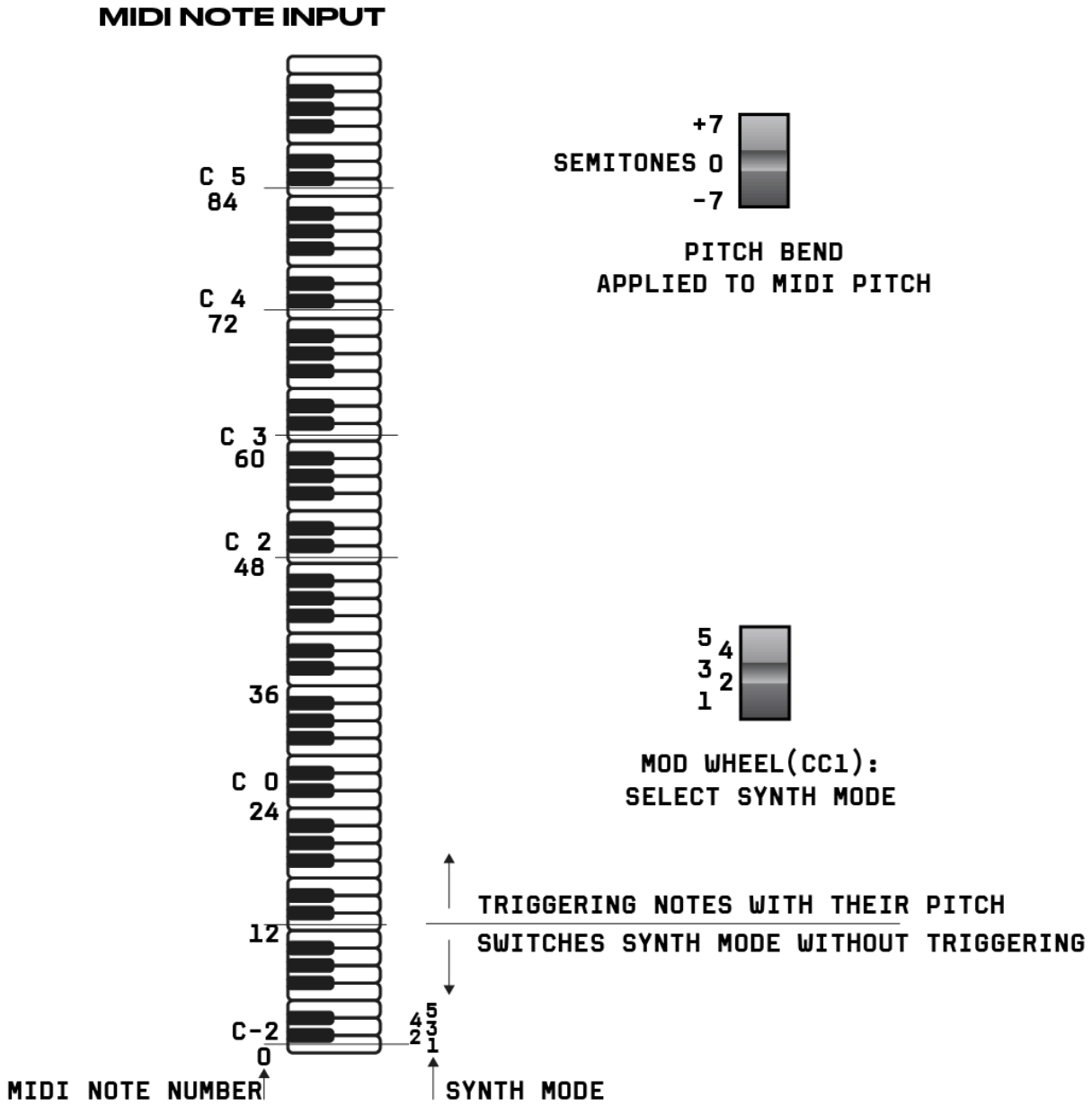
Receiving MIDI Notes

The Citadel reacts to MIDI Note On messages. Velocity information is not utilized. Note Off messages are ignored.

MIDI Notes in the lowest octave (0–11) will switch the synth mode without triggering it. The first synth mode (FILTER) is aligned to note C.

NOTE:

- SYNTH MODE switching is controlled by using the mod wheel on CC1.
- Notes above note 12 trigger the note and adjust its pitch.



When using MIDI notes there will be two ways to calculate the pitch of the synth: MIDI Pitch and Patch Pitch.

The MIDI Pitch is turned on by a Note On message and kept until one of the following happens (then it switches back to Patch Pitch):

- change on any PITCH input is detected
- adjusting Pitch knob
- adjusting the Scale (MODE+PITCH MOD)
- adjusting the Root of the Scale (MODE+TIMBRE MOD)

PATCH pitch = scale(NOTE + PITCH knob + PLAY) + root + fine + slide
MIDI pitch = MIDI Note pitch + quantizer(PLAY) + fine + slide

NOTE: When adjusting the PITCH knob, SCALE or ROOT via CC, the Citadel will also switch back to patch pitch.

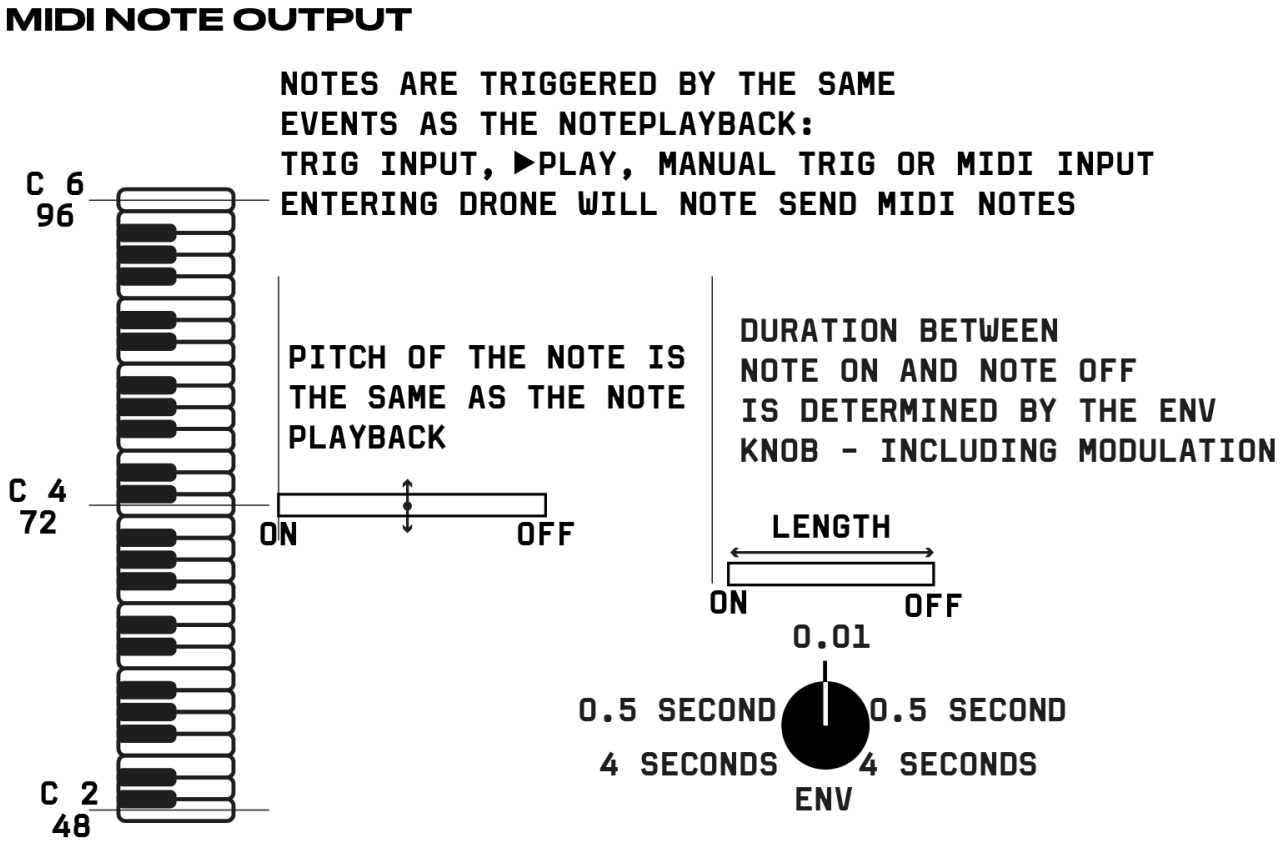
Sending MIDI Notes (only USB MIDI)

When a note is triggered either by the TRIG input, NOTE or PLAY input, manual trigger via SHIFT button or the MIDI input, the Note On message is sent with the same pitch information as the played note.

The MIDI Note Off message will be sent when the envelope at ENV OUT fades out. The MIDI Note On/Off will NOT reflect entering/leaving the DRONE mode.

The MIDI Note represents the Alchemist's final pitch with the exception of the FINE TUNE setting and PITCH SLIDE (pitch envelope and portamento).

MIDI Note Off is sent after the duration defined by the ENV knob has passed.
Note Off is also sent right before re-triggering another note (if the previous note hasn't finished yet).



Receiving Pitch Bend

Receiving the Pitch Bend message adjusts the pitch continuously in the range of +/- 7 semitones.

NOTE: Pitch Bend message is applied only to MIDI Pitch which means you need to send some Note On message to be able to use Pitch Bend message. When modulating the Note input the Citadel will return to Patch Pitch and Pitch Bend will be disabled.

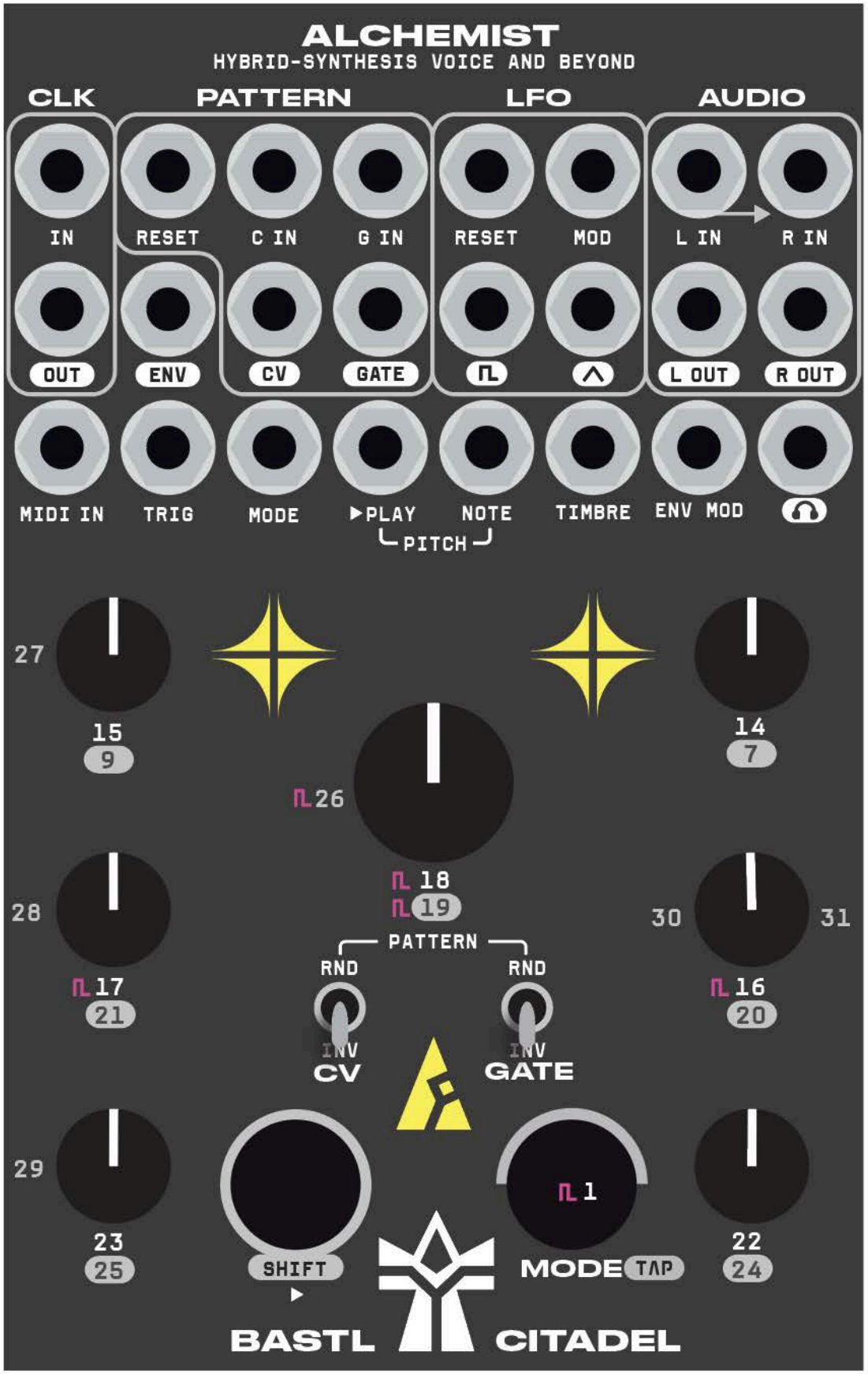
Receiving MIDI CC = Control Change / knob values

Any MIDI CC message contains three key pieces of information:

1. MIDI Channel – indicates which channel the message is sent on. (See instructions on **Setting the MIDI channel**.)
2. CC Number – Acts as the address of which knob or parameter is being controlled (e.g. CC16).
3. Value – Represents the position of the knob.

💡When a CC message with the correct number is received, the corresponding knob is virtually adjusted to match the value—and it stays there until the physical knob is moved again.

INPUT CC NUMBERS FOR DIRECT PARAMETER SETTING



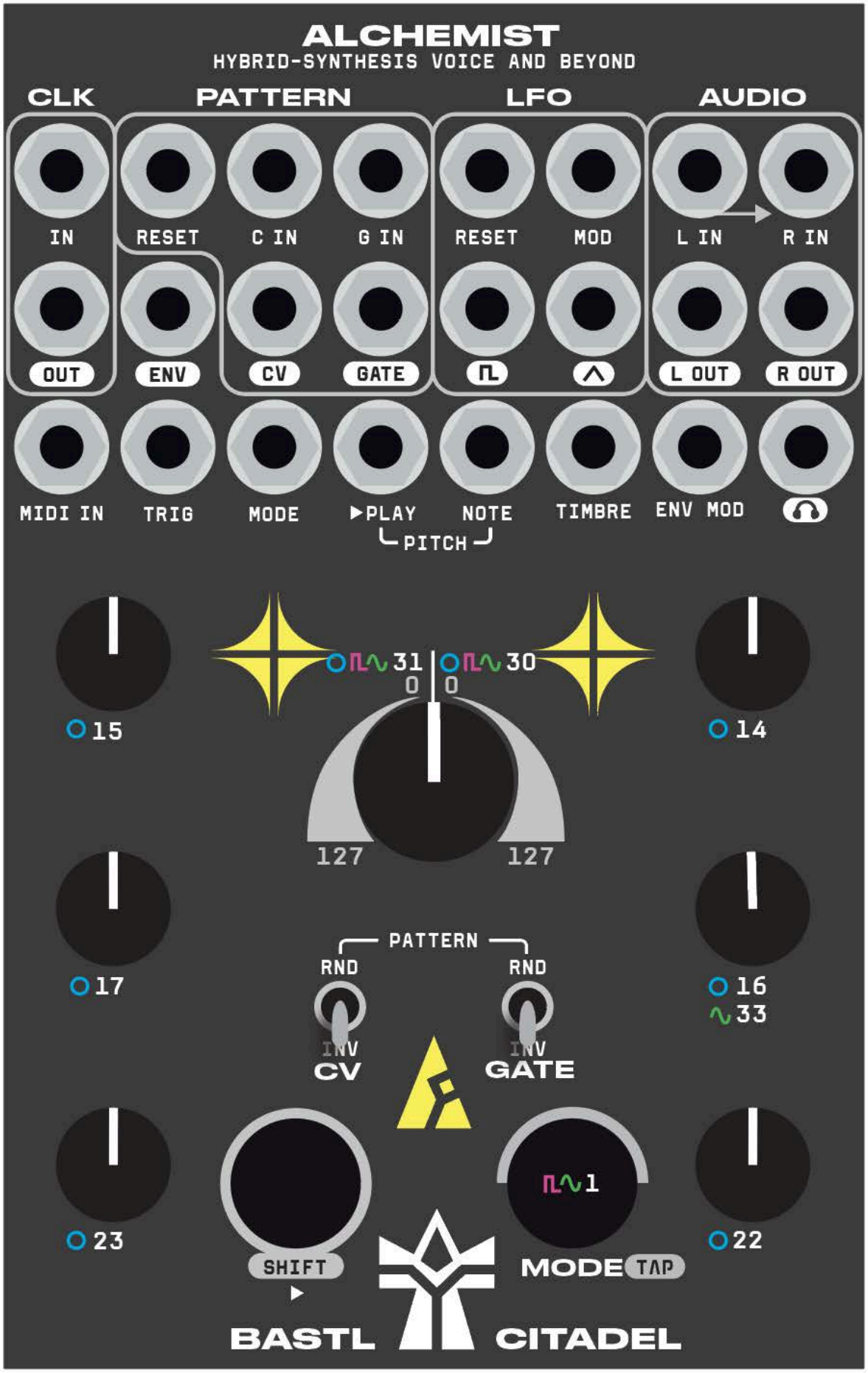
ON WAVE BARD THESE ARE UPDATED ONLY RIGHT BEFORE SOUND IS TRIGGERED

CC	ALCHEMIST	Note
1	MODE – updated only right before trigger or Note On	Maps 0–127 to 0–number of values
7	Output Volume	SHIFT + top right knob
9	Input Gain	SHIFT + top left knob
14	PITCH	Top right knob
15	PITCH MOD	Top left knob
16	TIMBRE	Middle right knob
17	TIMBRE MOD	Middle left knob
18	ENV – updated only right before trigger or Note On	Center knob
19	ENV MOD – updated only right before trigger or Note On	SHIFT + center knob
20	RATIO	SHIFT + middle right knob
21	FX	SHIFT + middle left knob
22	LFO	bottom right knob
23	LFO MOD	bottom left knob
24	TEMPO	SHIFT + bottom right knob
25	RHYTHM	SHIFT + bottom left knob
27	SCALE	MODE + top left knob
28	PITCH ROOT	MODE + middle left knob
29	FINE TUNE	MODE + bottom left knob
30	Portamento	MODE + middle right knob CCW
31	Pitch envelope	MODE + middle right knob CW
121	Reset all controllers	Goes back to knob control for values

Sending MIDI CC = Control Change (only USB MIDI)

The knobs (when adjusted) send their values scaled to 0-127 on specific CC numbers.
On the ALCHEMIST some carefully considered modulations can be also forwarded to the MIDI stream in order to not overload it and make it easy to map in DAW.
CC messages are sent on the same MIDI channel as the incoming MIDI channel. See the **Setting the MIDI channel** section.

Mapping guide: To map the CCs sent by the knobs undo all patch cables first. After entering MIDI mapping (in your DAW) make sure to move only the desired knob.
CC1 is always sent when triggered. Patch only GATE or LFO to the TRIG input to map CC1.



- ○ DIRECT KNOB POSITION
- ⎍ UPDATED ONLY RIGHT BEFORE SOUND IS TRIGGERED
- ∿ MODULATION APPLIED TO THE FINAL CC VALUE

CC	ALCHEMIST	Note
1	MODE	Mapped to 0–127 always sent right before Note On/trigger. Not sent on manual trigger (short SHIFT press)
14	PITCH knob	Knob value (sent when knob moved)
15	PITCH MOD knob	Knob value (sent when knob moved)
16	TIMBRE knob	Knob value (sent when knob moved)
17	TIMBRE MOD knob	Knob value (sent when knob moved)
22	LFO knob	Knob value (sent when knob moved)
23	LFO MOD knob	Knob value (sent when knob moved)
30	ENV decay(right half)	0–127 sent when knob moved in the forward range or right before Note On / trigger when modulation changed - applied together with modulation.
31	ENV attack (left half)	127–0 sent when knob moved in the backward range or right before Note On / trigger when modulation changed
33	TIMBRE MODULATION	TIMBRE + TIMBRE MOD mapped 0–127 sent continually if changed. Sent on manual trigger (short SHIFT press)

ALCHEMIST SPECIFIC MIDI CC output (only USB MIDI)

In order to utilize the power of the sequencing on the Alchemist there are few extra special CC messages sent.

CC1: (MOD WHEEL)

Sends Synth mode mapped to 0-127
Mapping guide: CC1 is always sent when sound is triggered. Unpatch all cables and patch only GATE or LFO to the TRIG input to send CC1.

Bipolar ENV CC30 and CC31

The forward and backward direction of the ENV knob are sent as a separate CC number so you can map them for example to ATTACK and DECAY/RELEASE separately.
CC30 has value 0 in the middle and increases in the clock-wise direction. Counter-clock-wise direction does not send CC30.
CC31 has value 0 in the middle and increases in the counter-clock-wise direction. Clock-wise direction does not send CC31:
This CC value includes the ENV modulation combined with the ENV knob and is sent when the knob is adjusted or right before the sound is triggered when the input is modulated.

Mapping guide: Unpatch all cables and move the ENV knob either to forward or backward range. Start the mapping and move the knob slightly to map either forward CC30 or backward CC31.

Final TIMBRE CC33

This CC value includes the modulation thru the TIMBRE MOD knob combined with the TIMBRE knob and is sent continually when the combined value changes, or when note is triggered manually with short press of the SHIFT button.

Mapping guide: Unpatch all cables and manually trigger the sound by short pressing the SHIFT button.

MEMORY RESET

Press and hold the **SHIFT** and **MODE buttons** for over **10 seconds** to perform a memory reset. This will restore all settings to their default values, including tempo, volume settings, input behavior etc.

FIRMWARE UPDATE

1) Disconnect Citadel from your Eurorack power!
2) Use a **USB-C cable** to connect your **Alchemist** to your computer while holding the SHIFT button.
3) The **Alchemist** will boot into **Update Mode** (no sound will play).
4) Copy the **.uf2 file** to the **RPI-RP2 disk** that appears on your computer.

Check Firmware Version

1) **Boot into Test Mode:** Hold the **MODE** button and turn the power **ON**.
2) **Listen to the Headphone Output directly:** The **Alchemist** will announce the firmware version via its voice output.
3) Turn power OFF and ON to leave the test mode

APPENDIX

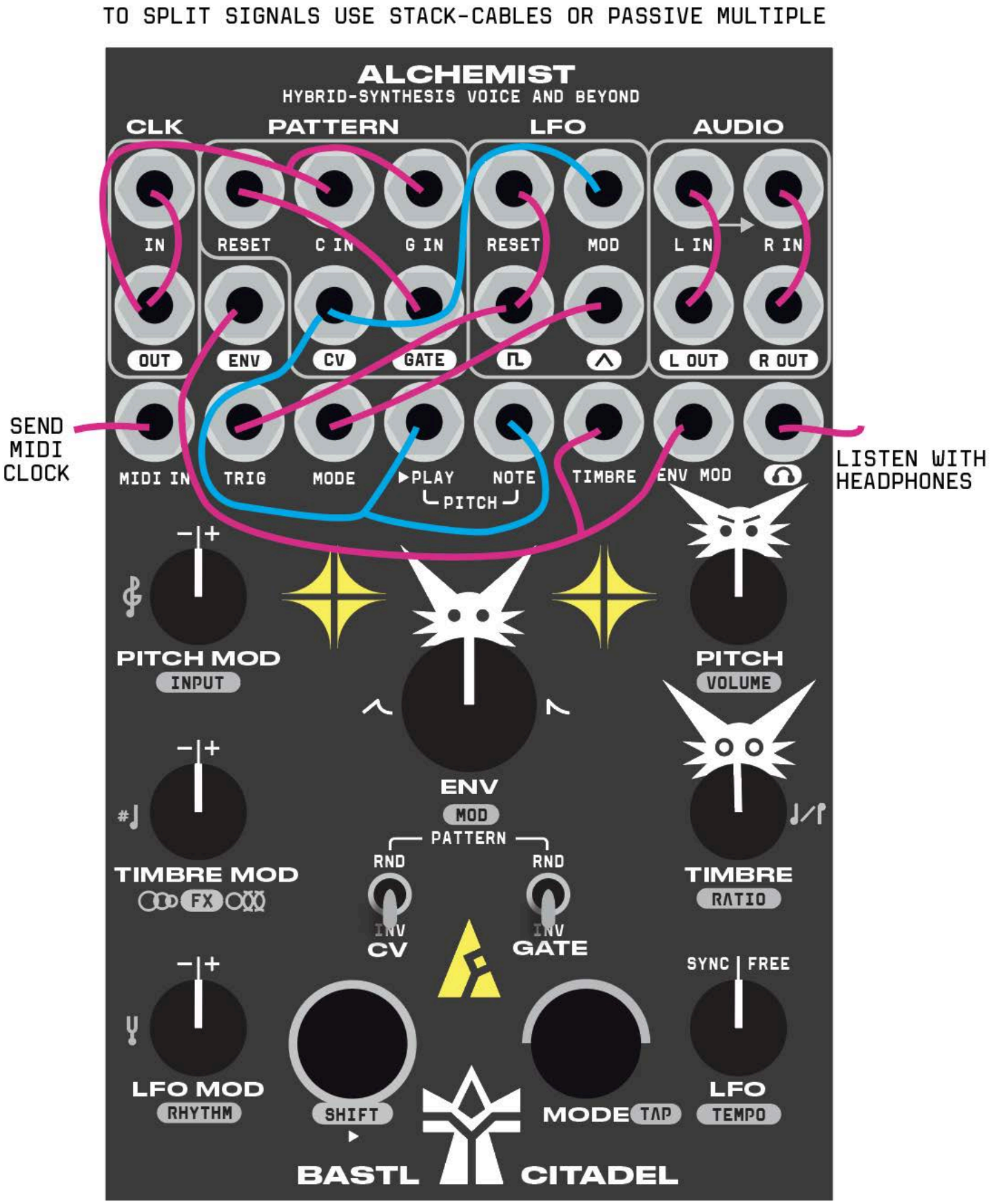
Test Mode

In order to test the hardware, the Alchemist includes an integrated test mode.
Hold MODE and turn power ON to enter the test mode. Listen to the headphones output: the Alchemist will announce the firmware version via its voice output.

To perform the full HW test do the following:

1. Turn the power in your eurorack system **OFF**
2. Patch the following connections with patch cables (use stack-cable or passive multiple to split signals):
    a. L OUT to L IN
    b. R OUT to R IN
    c. LFO PULSE to LFO RESET
    d. LFO PULSE to TRIG
    e. CLK OUT to CLK IN
    f. CLK OUT to PATTERN “G”
    g. CLK OUT to PATTERN “C”
    h. ENV to TIMBRE MOD
    i. ENV to ENV MOD
    j. CV to PLAY PITCH MOD
    k. CV to NOTE PITCH MOD
    l. CV to LFO MOD
    m. LFO TRI to MODE IN
    n. GATE to PATTERN “R”
3. Connect headphones to the headphones output and listen to them
4. Hold **MODE** and turn the power of the eurorack system **ON**.
5. The Alchemist will announce the introduction.
6. LEDs will light **red** and automatic testing will start. Each successful test is signalized by a **ding sound**.
7. All automated tests should **pass** and LEDs turn **blue**.
8. Turn all the knobs all the way left and all the way right.
9. Press both buttons.
10. Send MIDI Clock to the MIDI Input

11. The test should be complete and indicated by green lights, and the Alchemist announcing “Test Success”.



Manual final tests

Since the automated test cannot test Toggle switches and Jack Detection on Audio Input, they need to be tested manually.

12. Keep the module ON after "Test Success" and unplug all the jacks.
13. Now test the audio inputs – the metronome light should glow green if the left or the right jack are plugged in. Test each separately.
14. Then test the toggle switches. Their state is signalised at the top two lights with the following colors:
    down = red, center = blue, up = green.

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The idea turned into reality
thanks to everyone at Bastl Instruments
and thanks to the immense support
of our fans.
❤️‍🔥

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