Bohm Eurorack Manual

Bohm is a stereo dual-voice Eurorack kick set of modules.

Note

To update Bohm to the latest firmware version, please visit Firmware Update.

To calibrate Groove and/or Performer expanders after your purchase, please visit Calibration Mode.

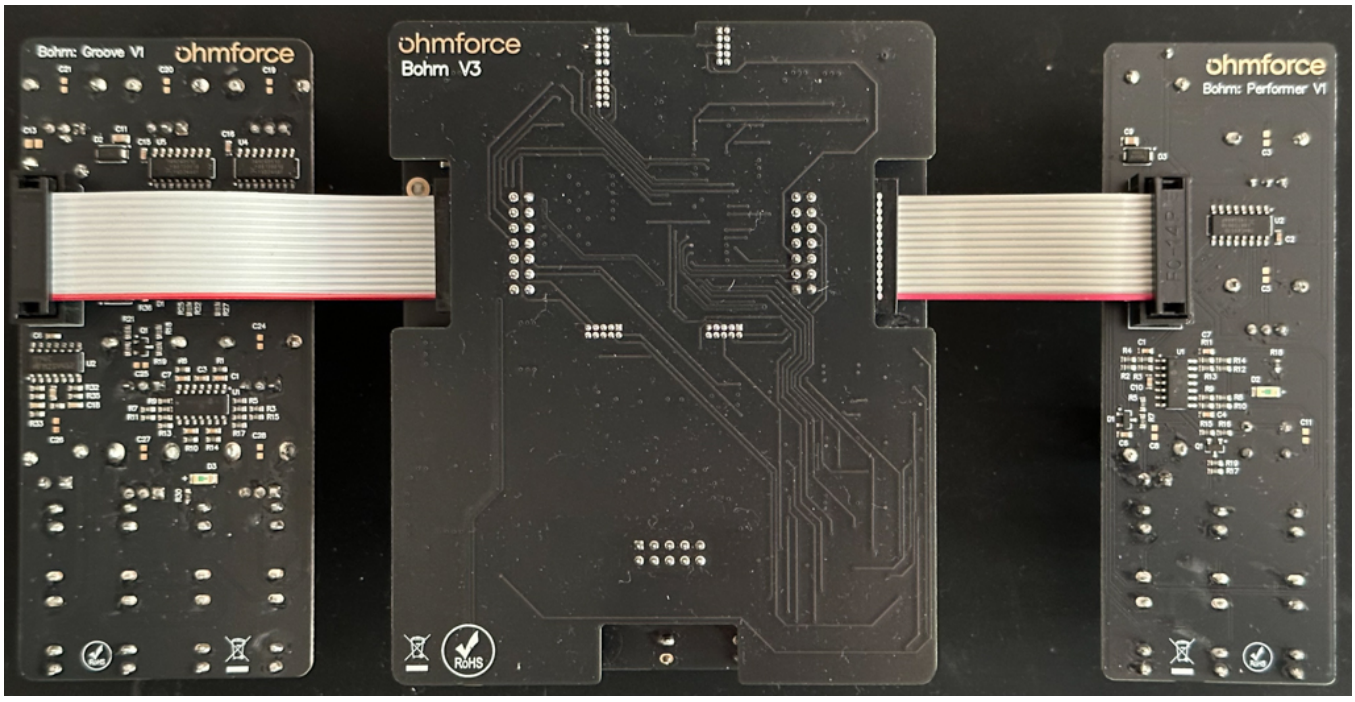
Installation

Follow the instructions below carefully to avoid any damages.

Groove and Performer Expanders

You can skip this section if you didn't purchase the Bohm Groove or Performer expanders.

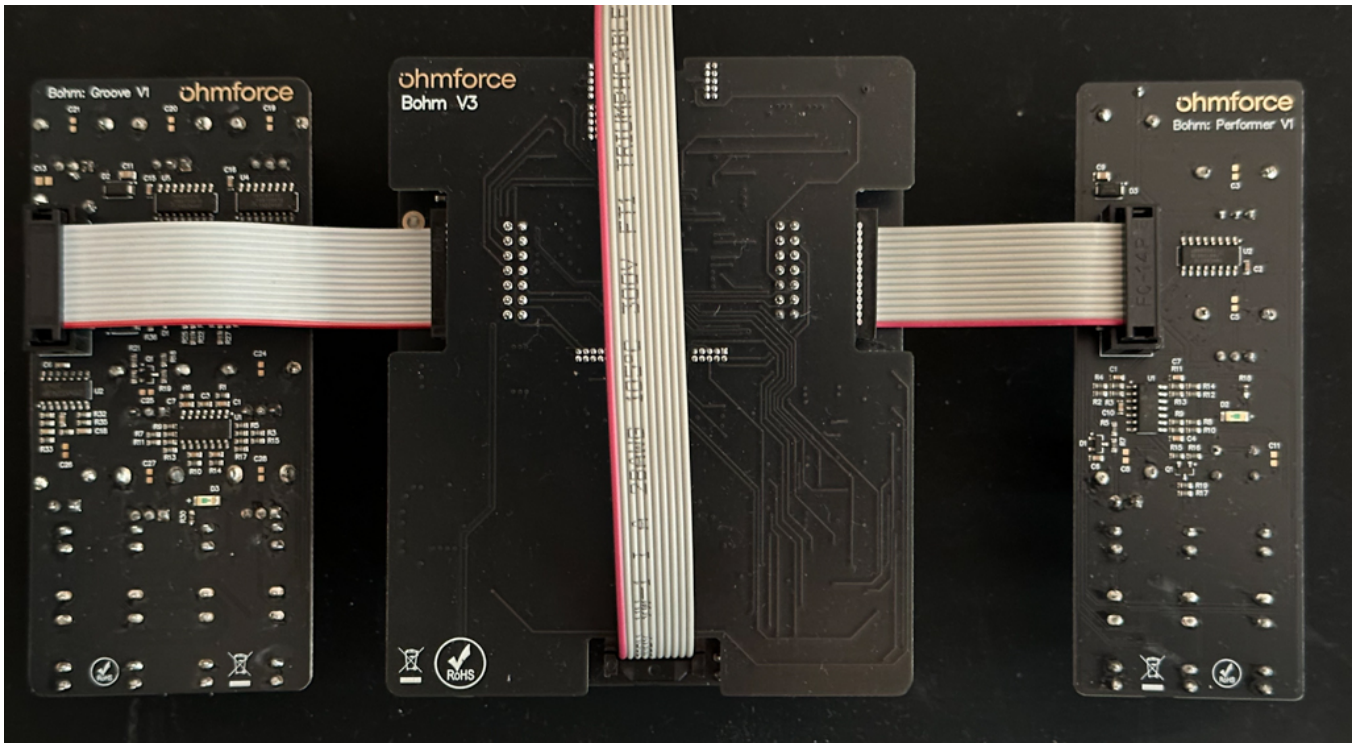
1. Turn the modules face down
2. Connect the expanders using the supplied ribbon cables. With the module face down, note that Groove is connected on the **left** of the Bohm module, and Performer on the **right** of the Bohm module



Bohm

1. **Power down** your Eurorack system before installing the module

2. Locate a position in your rack to install the module. Bohm requires 18HP of space, Groove requires 10HP and Performer 8HP. The entire Bohm set requires 36HP of space
3. Connect the 10-pin connector to the module, making sure pins are aligned and most importantly that the **red stripe on the ribbon cable** is on the **left** of the module as shown in the picture below
4. Connect the 16-pin connector to your rack, and ensure that the **red stripe** on the ribbon cable matches the **-12V** pin on the header
5. Position the module in the desired position in your rack
6. Secure the module to the rack using the supplied screws. **Do not overtighten**
7. Power up your Eurorack system



If you have bought one of the Groove or Performer expanders, you might want to calibrate them for optimal performance, as explained in the Calibration Mode chapter.

Technical Specifications

General

- Width: Bohm 18HP / Groove 10HP / Performer 8HP
- Height: 3U
- Depth (including connectors): Bohm 28mm / Groove 26mm / Performer 26mm
- Power Consumption
  - +12V: Bohm 130mA / Groove 20mA / Performer 10mA
  - -12V: Bohm 10mA / Groove 10mA / Performer 5mA
  - +5V: 0mA (unused)

Audio

- Sample rate: 48kHz
- Hardware audio converters bit-depth: 24-bit
- Internal processing bit-depth: 32-bit floating point
- True Stereo Audio
- High fidelity Texas Instruments Burr-Brown audio converters
- Latency: 0.33ms

Controls

- Knobs resolution: 16-bit (65536 distinct values)
- CV Inputs
  - Voltage: ±5V (0..5V compatible)
  - Resolution: 16-bit (65536 distinct values)

Memory

- Current model, last model variations for up to 12 models
- 32 programs of 16 steps each
- Systems settings

SD Port

- Type: microSD, SDHC class 10 or greater
- Capacity: Up to 32GB
- Format: Only FAT32 with MBR (Master Boot Record) is supported

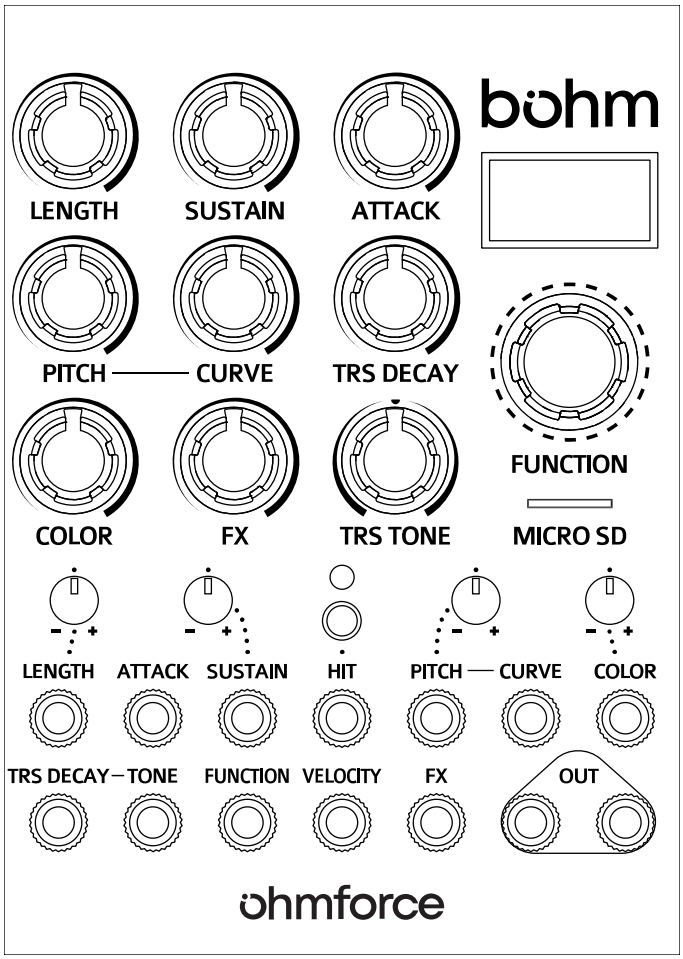
The SD port is used to update the module firmware, store the Bohm kick models as well as user-provided wavetables and samples.

Overview

Bohm comes preloaded with “models” which represents different kick drum machines and their unique circuitry.

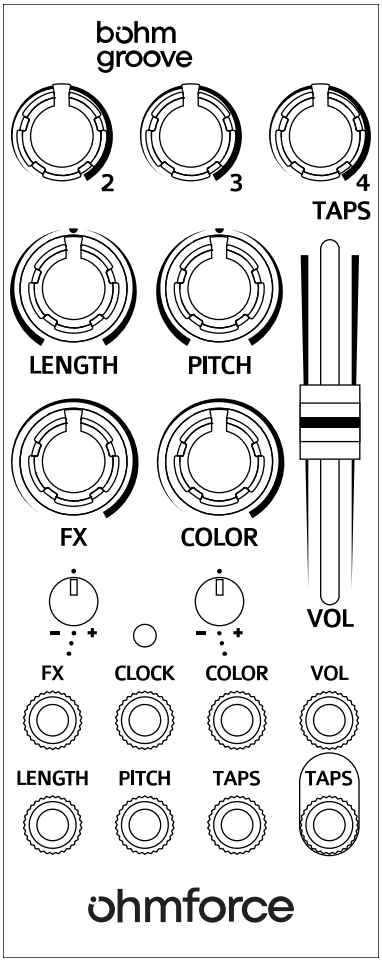
Each model has its own interpretation of the knobs positions. The following section describes what concepts the models tend to follow in practice.

Bohm



- HIT : Kick trigger
- VELOCITY : Kick velocity
- LENGTH : Kick duration
- SUSTAIN : Kick volume
- ATTACK : Kick attack amount
- PITCH : Pitch of the kick, from C1 (32.70Hz) to C2 (65.41Hz)
- CURVE : Pitch curve, from 808-style curve counterclockwise to 909-style curve clockwise
- TRS DECAY : Transient (click) duration
- COLOR : Timbre of the sub-bass oscillator
- FX : Amount of kick post-effect
- TRS TONE : Transient (click) tone, from dark counterclockwise to bright clockwise
- FUNCTION : Model and model variations selector
- MICRO SD : microSD slot for models, firmware and user-customisable wavetables and samples
- OUT : Stereo audio output

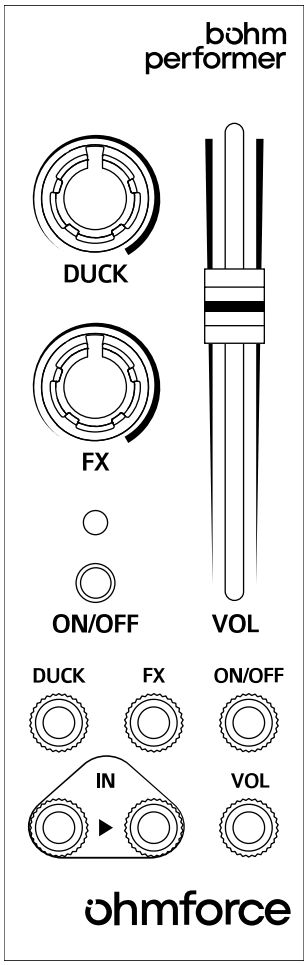
Groove



Groove is a secondary kick voice, typically used for techno rumbles or kick tops.

- CLOCK : Groove trigger
- TAPS (2 3 4) : Groove volume envelope
- LENGTH : Groove duration, relative to the Bohm kick duration
- PITCH : Groove pitch, relative to the Bohm kick pitch
- COLOR : Groove sound source
- FX : Amount of Groove post-effect
- VOL : Groove volume

Performer



- `IN` : Stereo audio input
- `DUCK` : Input ducking amount
- `FX` : Amount of performance effect
- `ON/OFF` : Performance effect activation toggle
- `VOL` : Volume of Bohm kick and Groove

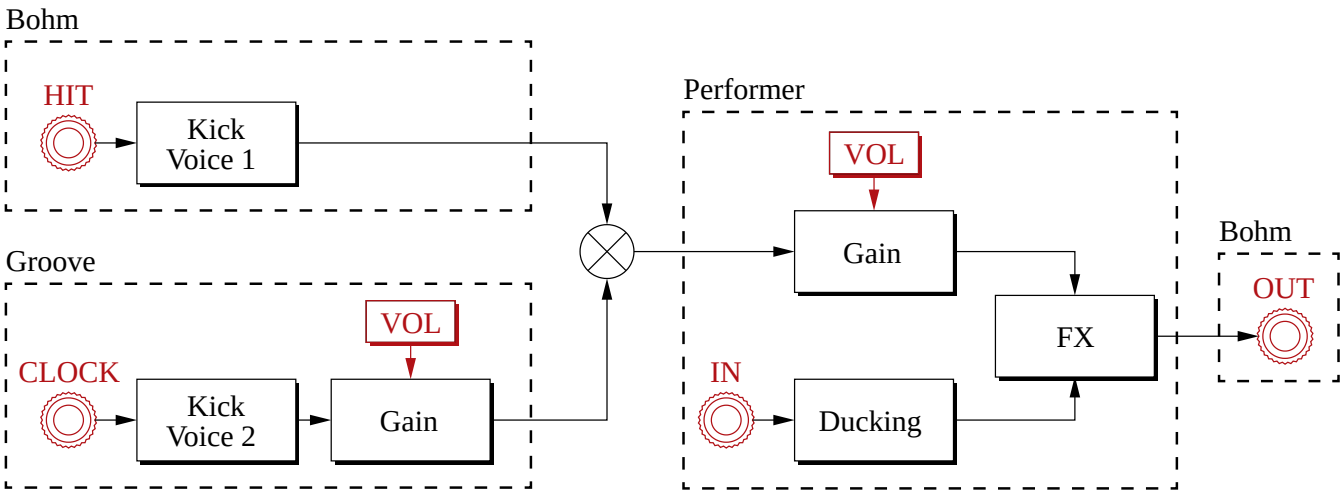
Functions

Internally, the Bohm engine processes models generated from a patching environment especially made for it. As a result, each “model” files (the `.oiff` files on the microSD card) are as many gigantic patches made of around 400 modules, each module being for example a wavetable oscillator, a filter, a function, or a high-order function.

As such, all the knobs and CVs on the Bohm user interface control macros of those models, and each model can have its very own interpretation of a control. For example, the `ATTACK` knob controls the frequency modulation amount of model FM-2X in order to bring “more attack”, but some other models would use a more traditional ADSR envelope to achieve a similar effect.

Therefore, the following describes the most commonly shared features of all models. In any case, the Core Models Library chapter describes in more details all those models.

Routing



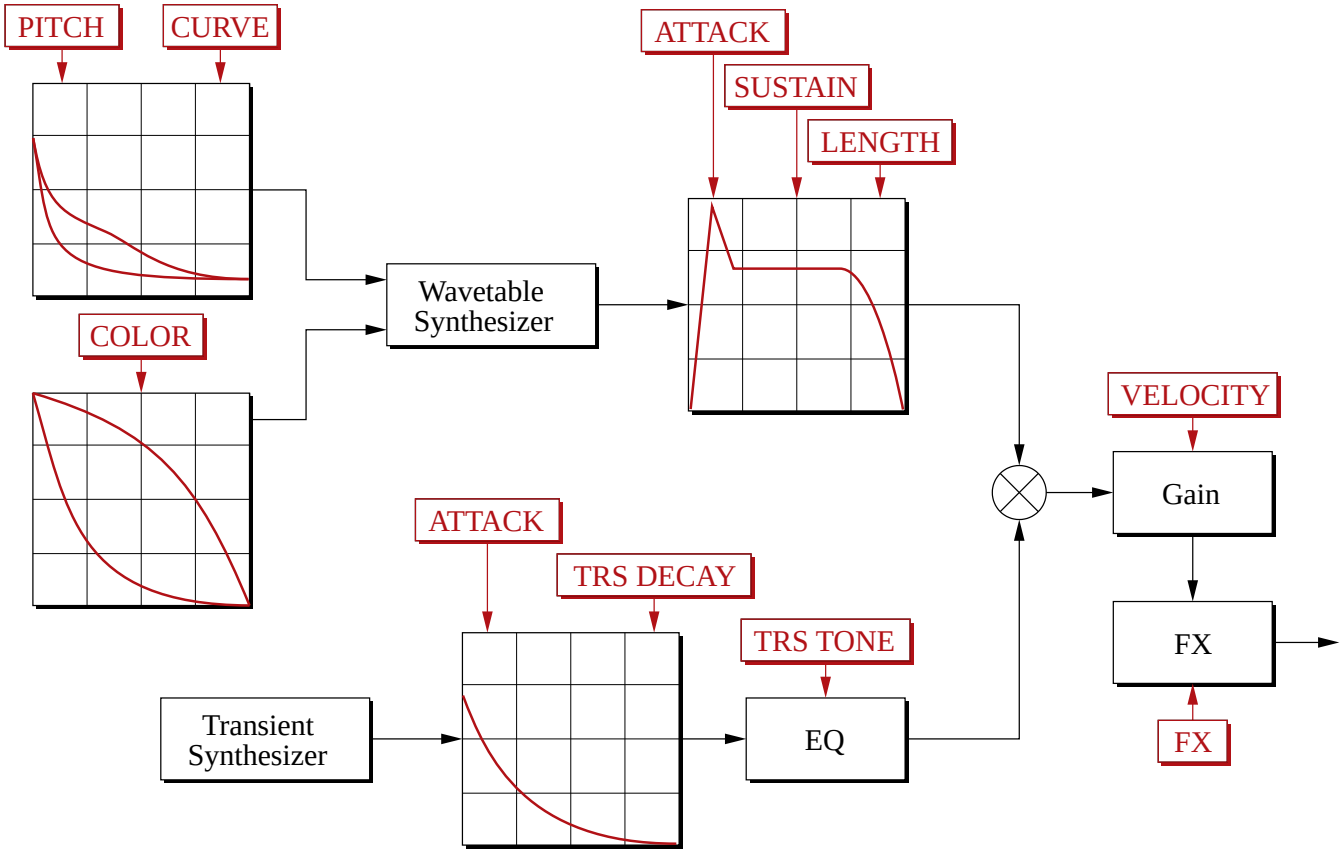
Bohm is a first kick voice triggered by the HIT input or button.

The optional **Groove** expander is a second kick voice triggered by the CLOCK input. The Groove VOL allows to balance the Groove secondary kick voice with the Bohm first kick voice.

> **Important**
>
> The optional **Groove** expander second kick voice needs to be triggered with the CLOCK input. This is typically done with, but not limited to, a traditional 16th note Eurorack clock.

Both signal enters the optional **Performer** expander. The Performer VOL allows to balance the Bohm and Groove kick voices with the Performer audio IN. Both signals enter the effect section, and its output goes to the Bohm audio OUT. When the Performer expander is not present, the Bohm and Groove kick voices output directly goes to the Bohm audio OUT.

Bohm



PITCH controls the oscillator fundamental frequency from C1 (32.70Hz) to C2 (65.41Hz). The pitch follows a CURVE which ranges from 808-style curve counterclockwise to 909-style curve clockwise.

> **Note**
>
> The counterclockwise curve reaches the fundamental frequency quicker than in the clockwise position, so that if LENGTH is short enough, the oscillator will not reach the fundamental frequency.

Pitch tracking can be used to play bass lines, provided LENGTH is long enough or a gate is used for HIT (see below). For pitch tracking to work properly, put the PITCH knob completely counterclockwise, PITCH attenuverter completely clockwise, and select an appropriate voltage range from 0V to 1V, 1V to 2V or 2V to 3V in the Bohm system settings depending on the output voltage range of your sequencer.

> **Important**
>
> If your sequencer supports multiple pitch control standards, make sure to select 1 Volt per octave.

The oscillator is often a wavetable synthesizer, and COLOR controls the position curve over time.

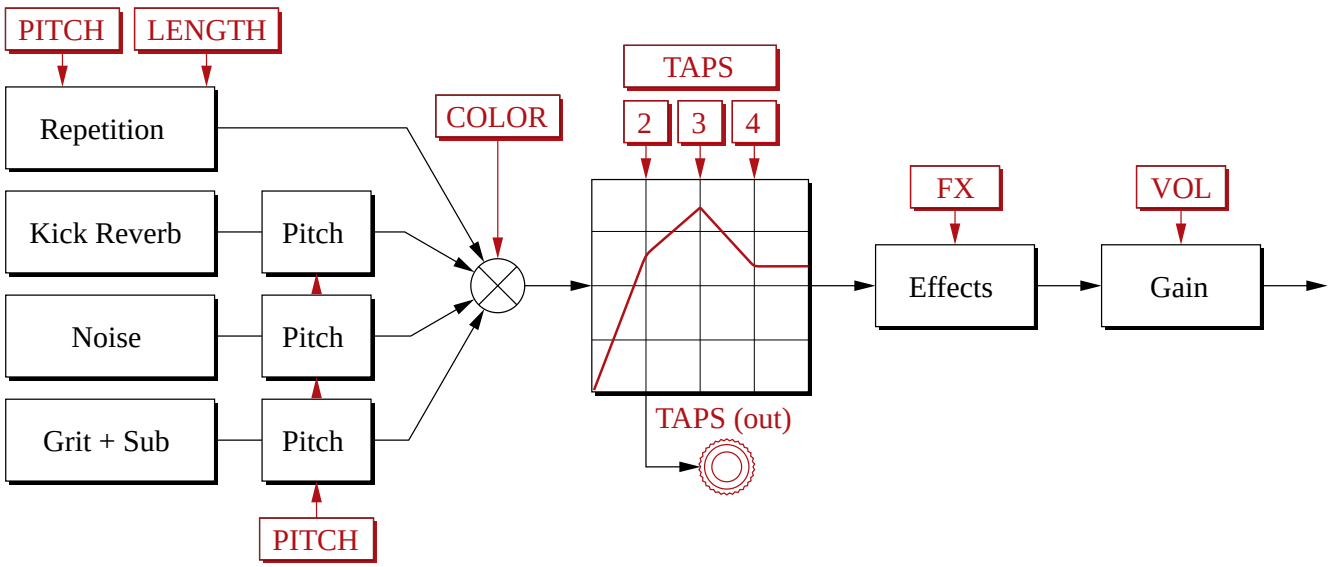
The oscillator then goes through a volume envelope. ATTACK and SUSTAIN are analog to classical ADSR envelopes. LENGTH then represents the total duration of the kick.

HIT can work both as a trigger or a gate control. If HIT remains on (for example by keeping the button pressed), the kick will sustain. When HIT is released, the sound will decay.

ATTACK also controls the volume of the transient synthesizer, and TRS DECAY affect the decay time of the transient. Finally the transient synthesizer goes through a tone filter with TRS TONE, from dark counterclockwise to bright clockwise.

The wavetable and transient synthesizers are then mixed, a VELOCITY volume is applied, and the signal finally enters the effect section for which FX controls the effect amount.

Groove



At the heart of the Groove are 4 sound generators: repetitions of the Bohm kick, reverb, noise and gritty noise mixed with sub frequency. The sound generators can be selected and blended using the COLOR control.

The repetitions are not delayed version of the kick: they are triggered every time CLOCK is triggered. Each repetition is called a “tap”. The volume of each tap, except the one on the down-beat, can be controlled using the 2, 3, 4 knobs as well as the TAPS CV. The repetition LENGTH and PITCH can be also altered.

The other sound generators follow a slightly difference concept: the volume defines by the 2, 3, 4 knobs as well as the TAPS CV produces a volume envelope that is applied to the sound generator. The sound generators PITCH can be also altered, but LENGTH has no effect.

> **Important**
>
> LENGTH has only an effect for the repetition sound generator, so from around 3 o'clock to fully clockwise.

LENGTH (when applicable) and PITCH on Groove are relative to the LENGTH and PITCH on Bohm. When LENGTH or PITCH on Groove is at the central position, then the actual length or pitch of Groove will be the same as Bohm. If the LENGTH or PITCH on Groove is turned to the left, then the LENGTH or PITCH will be lower than the one on Bohm, but never below the minimum value on Bohm. Conversely, If the LENGTH or PITCH on Groove is turned to the right, then the LENGTH or PITCH will be higher than the one on Bohm, but never above the maximum value on Bohm. For example, if Bohm PITCH is at the minimum (a low C key), then the Groove PITCH knob will have no effect from full counterclockwise to center position.

In more details, the volume envelope works as follow:

- When HIT is triggered, the envelope is retriggered
- The subsequent CLOCK triggers define the speed to reach the following 2, 3, 4 taps
- After that, and as long as the envelope is not retriggered, the value of the envelope depends on the `GRV ENV` system option:
  - If set to `FALL`, the envelope will smoothly go back to 0
  - If set to `SUSTAIN`, the envelope will stay at the level defined by tap 4

And typically:

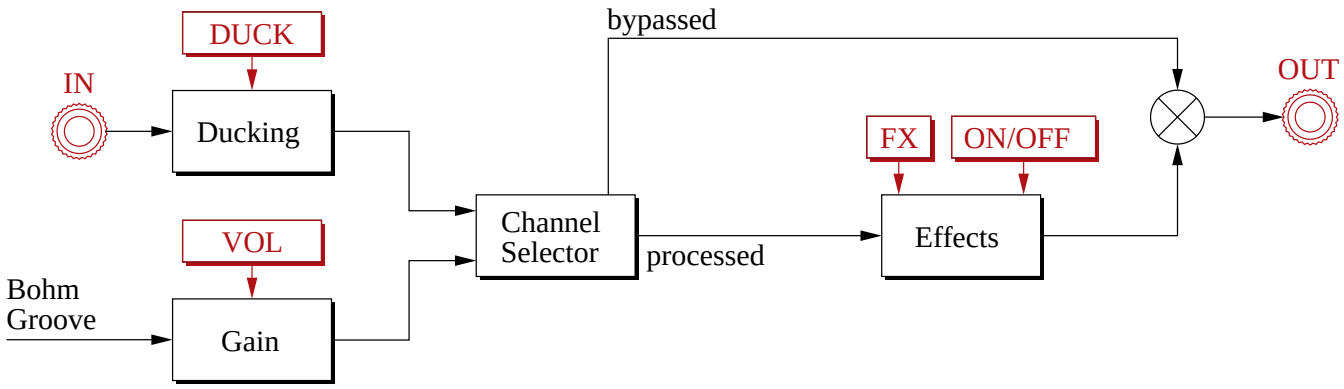
- When using triplets for the clock, the envelope will work as intended, with 2, 3 being the only relevant taps
- If there are more than 4 clocks between each HIT (for example for a very fast tempo where the kick won't be triggered every beat), one can use the TAPS CV input to further shape the volume envelope

The sound generators then enter the effect section for which FX controls the effect.

Finally a volume control VOL is applied on the output of the Groove effect section.

The final volume envelope generated by the 2, 3, 4 knobs combined with the TAPS CV input is available on the TAPS CV output.

Performer



The external stereo audio IN is ducked on every HIT trigger, and DUCK controls the amount of ducking.

VOL controls the volume of the Bohm and Groove output before the ducked audio input and kick goes into the effect section.

A channel selector allows to select what signal is processed by the effect, and what is bypassed. It is possible to send either only the kick, or only the external audio input, or both the kick and input to the effect section.

The effect can be activated and deactivated using the ON/OFF control, and the actual activation or deactivation can happen either immediately, or synchronously to the HIT trigger using a system settings option. The FX controls the effect parameter.

Finally, the processed and bypassed signals are summed and sent to the Bohm stereo audio OUT.

Model Variations

Each model coming with Bohm is its own kick drum machine. As such, all models come with specific settings, called “variations” that alter the sound of the machine.

In general, for the Bohm part, most variations are very specific to each model and for this reason is exposed in the “Core Library” chapter. The rest of this section introduces the basic concepts, as well as the Groove and Performer variations, which tend to remain the same. It also shows some common Bohm variations.

Those variations can only be accessed in “Studio” mode, the mode when the module is switched on.

Navigation

Clicking the FUNCTION button opens a page with all model variations. The root level contains all Bohm variations, and separate Groove and Performer sub-menus are available for Groove and Performer specific variations.

In the model variation page, turning the FUNCTION encoder will navigate up and down, and clicking on a menu item allows to either change the value of that item, or enter the sub menu if the item is a sub menu.

At the top of each menu is a menu item which allows to go one step upper in the menu hierarchy, and ultimately back to the models browser.

Randomization

All Bohm models are all sweet spots, so randomization is a must to quickly find the sound you want or get some new inspiration.

To randomize the current model variations, navigate to the end of the model variations list to the `RANDOMIZE` sub menu, and then choose between the two randomization options:

- `BOHM + GROOVE` will randomize only Bohm and Groove
- `ALL` will randomize Bohm, Groove and Performer

In Studio mode, the FUNCTION CV input will randomize the current model variations. One can also exclude Performer from randomization using the `FUNC RAND` option of the system setings.

Snapshots

One can “snapshot” the current kick to reuse it later. It is the building block to prepare for a live performance, but it can be also used to save your prefered set of variations when in the studio.

For live performance, refer to the “Running Modes” chapter.

Snapshots can be saved by nagivating to the `SNAPSHOT` sub menu, and then choose `SAVE`. A slot in the current program can be then selected and the kick can be optionally renamed.

Conversely, snapshots can be recalled by navigating to the `SNAPSHOT` sub menu, and then choose `LOAD`. The user will then select the slot they want to recall. Only the variations of the snapshot are reloaded (*ie.* not the pots positions).

One can also choose instead `LOAD W/ POTS`, which will recall all the variations as well as pots positions of the snapshot. This allows to copy or make tweaks of a snapshot when preparing a live performance. When a snapshot is recalled with pots positions, all the pots are behaving like `LATCH` mode, that is a pot needs to be a bit turned for the change to be registered and for the value to "jump" to the new position.

Example, copying a snapshot:

- `LOAD W/ POTS` and select slot to copy
- `SAVE` and select new slot

Example, modifying a snapshot:

- `LOAD W/ POTS` and select slot to modify
- Move one or more pots
- `SAVE` and select the same slot

Bohm Common Variations

FX

- `TUBE` is a slight distortion giving a nice analog feeling
- `BASS` is a slight distortion that selectively distort basses. Traditionally, it is used on 808-style lengthy kicks
- `SOFT` is a soft-clipper
- `HARD` is a hard-clipper
- `WAVEFOLD` is a wavefolder distortion
- `BITCRUSH` (on a few selected models) is a bit crusher distortion
- `DECIM` (on a few selected models) is a sampling rate reduction distortion

STEREO

`STEREO` controls the stereo width of the Bohm signal, from `0%` (mono), to `100%` (full stereo)

Groove Variations

FX

- `LP` sets the Groove effect to a low-pass filter. The **FX** parameter then controls the cut-off frequency of the filter

- `HP` sets the Groove effect to a high-pass filter. The `FX` parameter then controls the cut-off frequency of the filter
- `BP` sets the Groove effect to a band-pass filter. The `FX` parameter then controls the center frequency of the filter
- `DIST` sets the Groove effect to a distortion. The `FX` parameter then controls the gain of the distortion

`STEREO`

`STEREO` controls the stereo width of the Groove signal, from `0%` (mono), to `100%` (full stereo)

Performer Variations

`DUCK TIME`

`DUCK TIME` controls the release time of the ducking curve.

`DUCK SMTH`

`DUCK SMTH` controls the smoothing of the ducking curve, which is more pronounced during the attack section, when the volume is abruptly cut off.

This variation allows to slightly let the transients of the external audio input pass through, while still keeping a pumping effect when the Duck band split is not used.

`DUCK BS`

`DUCK BS` controls the frequency of the band split. All frequencies below the band split frequency are ducked while the frequencies above are preserved.

The band split is smooth enough (-12dB/oct) for its effect to not be too noticeable while still preserving frequencies correctly.

This variation is typically used when ducking should feel more transparent, when pumping is not the main artistic intent.

`FX`

- `DJ FILTER` sets the Performer effect to a DJ filter. The `FX` parameter is a low-pass filter counterclockwise, and high-pass filter clockwise, with the center position being neutral
- `HP` sets the Performer effect to a high-pass filter. The `FX` parameter controls the cutoff frequency, from passing all frequencies counterclockwise to blocking clockwise

- `LP` sets the Performer effect to a low-pass filter. The **FX** parameter controls the cutoff frequency, from blocking all frequencies counterclockwise to passing clockwise
- `BEAT ROLL` sets the Performer effect to a beat roll. The **FX** parameter controls the amount of beat roll, from beat-synchronized counterclockwise to stuterring effects as the knob is turned clockwise
- `SLIP ROLL` sets the Performer effect to a slip roll. It is the same as the beat roll, except the input is resampled on every **HIT**

`DJ RESO`

When `FX` is set to `DJ FILTER`, `HP` or `LP`, `DJ RESO` controls the resonance of the filter, from `0%` (no resonance) to `100%` (full resonance, to have a more pronounced “rave” effect)

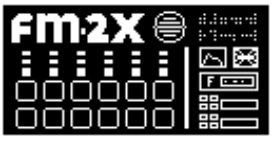
`CHN`

The channel selector allows to select which audio signals are processed through the effect section:

- `ALL` routes both the kick and external audio input to the effect section
- `KICK` routes only the kick to the effect section
- `INPUT` routes only the external audio input to the effect section

Core Models Library

FM-2X



The FM-2X model is a 2-operator carrier/modulator FM kick. The carrier is a sub-bass oscillator with frequency controlled by **PITCH** and its **CURVE**, and amplitude controlled by **ATTACK**, **SUSTAIN**, **LENGTH** and **VELOCITY** as described in the Functions chapter.

The carrier operator itself is a wavetable oscillator, and **COLOR** controls the wavetable position:

- To a square waveform in the counterclockwise position,
- To a sinus waveform in the center position,
- To a triangle waveform in the clockwise position,

And waveforms interpolation in-between.

The modulator operator modulates the frequency of the carrier to bring the transient typical of FM-based bass kicks. ATTACK will control the frequency modulation amount of the first operator to the second, while TRS DECAY controls the duration at which the frequency modulation will decay, from 10ms to 100ms.

The modulator operator is itself as well a wavetable oscillator, and TRS TONE controls the wavetable position, from counterclockwise to clockwise:

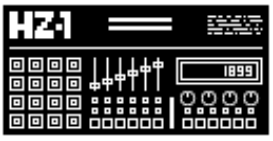
- Square,
- Derived Square,
- Quarter Sinus,
- Sinus,
- Half Sinus,
- Alternating Sinus,
- “Camel” Sinus,
- Positive Sinus,

And waveforms interpolation in-between. Those waveforms are similar to the OPL3 waveforms.

The ratio between the carrier frequency and the modulator frequency can be adjusted in the model variations menus using the `RATIO` menu. The possible ratio values are 0.5, 1 to 10, 12 and 15.

Another instance of those two operators is used for the Repetition sound source of the Groove expander.

HZ-1



The HZ-1 model is a wavetable oscillator kick combined with a transient synthesizer.

The wavetable oscillator is frequency-controlled by PITCH and its CURVE, and amplitude-controlled by ATTACK, SUSTAIN, LENGTH and VELOCITY as described in the Functions chapter.

The COLOR parameter controls the amount and duration of high frequency transients produced, by varying the wavetable position:

- Fully counterclockwise, the wavetable oscillator is just a sinus
- As the knob is turned clockwise, the oscillator sounds more distorted in the transient phase of the kick, but the tail remains a sinus

- Fully clockwise, the wavetable oscillator only reaches the sinus position if the `LENGTH` is long enough

The wavetable waveform itself can be changed using the `WT` model variation menu, which a choice of “analog-style” waveforms.

The transient synthesizer type of click can be configured using the `CLK` model variation menu, with a choice of different clicks, pops, ticks, and tocs.

Another instance of the wavetable oscillator is used for the Repetition sound source, but without the transient synthesizer.

OLP4

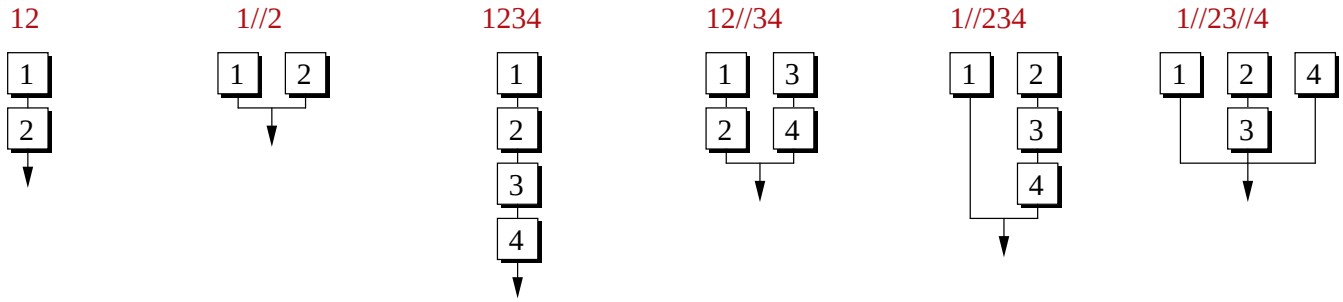
The OLP4 model is a 4-operator FM kick, insipired by the OPL3 chip. It is probably the most experimental model of the library.

The 4 operators are themselves as many wavetable oscillators, using the same waveforms as described upper in the FM-2X model. This time however, those waveforms are not interpolated and can be selected using the `WF1` and `WF2` model varations menus:

- `WF1` selects the waveform for operator 1 and 3,
- `WF1` selects the waveform for operator 2 and 4.

The operators can be arranged in different configurations called “algorithms”:

- `12`: operator 1 into operator 2, then to out,
- `1//2`, operator 1 and 2 in parallel, summed to out,
- `1234`, operator 1 to operator 4 in serie, then to out,
- `12//34`, operator into operator 2, in parallel of operator 3 into operator 4, summed to out,
- `1//234`, operator 1 in parallel of operator 2 to operator 4 in serie, summed to out,
- `1//23//4`, operator 1 in parallel of operator 2 into operator 3 and operator 4, summed to out.



TRS TONE controls the amount of FM feedback from operator 3 to operator 1, which makes it more noisy. COLOR is inactive.

PM-K1

The PM-K1 model is a physical model of an acoustic bass drum.

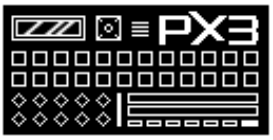
This model is completely different from the others, and as such, all the parameters have a different meaning:

- PITCH controls the size and tension of the bass drum,
- ATTACK controls the volume of the beater, typically captured at the microphone dedicated hole,
- TRS TONE controls the decay of the reverberation of the beater, leading to a more dark or brigther tone,
- SUSTAIN controls the volume of the ambiant microphone, and LENGTH the size of the room,
- FX controls the stereo spread of the ambiant microphone, from mono counterclockwise to wide clockwise.

All the other controls are inactive.

The Groove expander is not supported with this model.

PX3



The PX3 model is a wavetable oscillator kick with weird wavetables combined with drum layering samples made of various objects hitting diverse surfaces, post-processed with reverbs and distortions. It tends to sound “harder” and “more experimental” than most other models.

The wavetable oscillator is frequency-controlled by PITCH and its CURVE, and amplitude-controlled by ATTACK, SUSTAIN, LENGTH and VELOCITY as described in the Functions chapter.

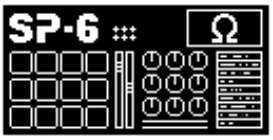
The COLOR parameter controls a function which modulates the wavetable position.

The wavetable waveform itself can be changed using the WT model variation menu.

Drum layering samples can be changed using the LAYER model variation menu.

Another instance of the wavetable oscillator is used for the Repetition sound source, but without the drum layering sampler.

SP-6



The SP-6 model is a wavetable oscillator kick with “digital-sounding” wavetables combined with drum layering samples made from synthesized transients (FM hihats and FM snares).

The wavetable oscillator is frequency-controlled by PITCH and its CURVE, and amplitude-controlled by ATTACK, SUSTAIN, LENGTH and VELOCITY as described in the Functions chapter.

The COLOR parameter controls the amount and duration of high frequency transients produced, by varying the wavetable position:

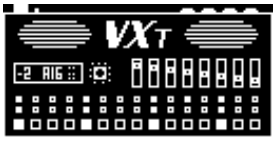
- Fully counterclockwise, the wavetable oscillator is just a sinus
- As the knob is turned clockwise, the oscillator sounds more distorted in the transient phase of the kick, but the tail remains a sinus
- Fully clockwise, the wavetable oscillator only reaches the sinus position if the LENGTH is long enough

The wavetable waveform itself can be changed using the WT model variation menu.

Drum layering samples can be changed using the LAYER model variation menu.

Another instance of the wavetable oscillator is used for the Repetition sound source, but without the drum layering sampler.

VX-T



The VX-T model is a wavetable oscillator kick combined with a transient synthesizer.

The wavetable oscillator is frequency-controlled by PITCH and its CURVE, and amplitude-controlled by ATTACK, SUSTAIN, LENGTH and VELOCITY as described in the Functions chapter.

The COLOR parameter controls the amount and duration of high frequency transients produced, by varying the wavetable position:

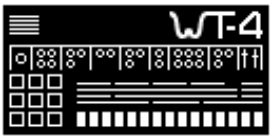
- Fully counterclockwise, the wavetable oscillator is just a sinus
- As the knob is turned clockwise, the oscillator sounds more distorted in the transient phase of the kick, but the tail remains a sinus
- Fully clockwise, the wavetable oscillator only reaches the sinus position if the LENGTH is long enough

The wavetable waveform itself can be changed using the WT model variation menu, which a choice of “analog-style” waveforms.

The transient synthesizer is a 4-operator FM based configuration, where TRS DECAY controls the amplitude decay, effectively leading in “toc” sounds counterclockwise and hihat sounds clockwise. The synthesizer is then fed to a band-pass filter for which TRS TONE controls the center frequency.

Another instance of the wavetable oscillator is used for the Repetition sound source, but without the transient synthesizer.

WT-4



The WT-4 model is a wavetable oscillator kick with “analog-sounding” wavetables combined with drum layering samples made from synthesized transients (FM hihats and FM snares).

The wavetable oscillator is frequency-controlled by PITCH and its CURVE, and amplitude-controlled by ATTACK, SUSTAIN, LENGTH and VELOCITY as described in the Functions chapter.

The COLOR parameter controls the amount and duration of high frequency transients produced, by varying the wavetable position:

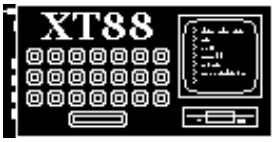
- Fully counterclockwise, the wavetable oscillator is just a sinus
- As the knob is turned clockwise, the oscillator sounds more distorted in the transient phase of the kick, but the tail remains a sinus
- Fully clockwise, the wavetable oscillator only reaches the sinus position if the LENGTH is long enough

The wavetable waveform itself can be changed using the WT model variation menu.

Drum layering samples can be changed using the LAYER model variation menu.

Another instance of the wavetable oscillator is used for the Repetition sound source, but without the drum layering sampler.

XT-88



The XT-88 model is a wavetable oscillator kick combined with drum layering samples, where the user can load their own wavetables and samples.

There are 2 folders on the sd card, `wavetables` and `samples`. The user can place their files in the corresponding folder. Only the WAVE file format is supported.

The wavetables must be in the following format:

- Either generated from Xfer Records Serum or Serum 2, and a 2048 cycle length is assumed,
- Or Mono, 32-bit float, and a 1024 cycle length is assumed.

Additionally, a maximum of 16 wavetables can be loaded, or until the wavetable 1.4 Mbytes dedicated memory is full.

The samples must be in the following format:

- Mono or stereo
- 16-bit, 24-bit integer or 32-bit float
- 48kHz

Additionally, a maximum of 256 samples can be loaded, or until the sample 14 Mbytes dedicated memory is full.

The wavetable oscillator is frequency-controlled by **PITCH** and its **CURVE**, and amplitude-controlled by **ATTACK**, **SUSTAIN**, **LENGTH** and **VELOCITY** as described in the Functions chapter.

The wavetable waveform itself can be changed using the `WT` model variation menu, and will display the loaded wavetables of the user.

COLOR controls the wavetable position. Then a modulated EQ filter is applied to the output of the wavetable oscillator, which brightness can be tuned using the `BRIGHT` model variation menu.

Drum layering samples can be changed using the `LAYER` model variation menu, and will display the loaded samples of the user.

The `LAYER VOL` variation menu allows to change the layering sample volume.

Another instance of the wavetable oscillator is used for the Repetition sound source, but without the drum layering sampler.

Running Modes

Bohm has 3 distinct running modes:

- **Studio** mode made for producing,
- Live **Song** and **Jam** modes made for live performances.

Studio Mode

The **Studio** mode, the default when the module is switched on, is typically used at home or in the studio, and every change of parameter is instant.

This allows for example to cycle through the entire list of models by just turning the encoder, letting one to “dial-in” the perfect kick quickly for recording on the DAW or sampler.

If in another mode (such as Live Song or Jam mode), Studio mode can be accessed by pressing the `FUNCTION` encoder and keeping it pressed for at least 2 seconds, and then choosing `STUDIO` from the menu.

Live Modes

The more advanced **Live** modes are typically used when preparing for live conditions. The main idea is to be able to automate kick changes, while keeping room for improvisation.

The Live **Song** mode is preferred when playing a track with limited room for improvisation. All kicks of a program are organised into a sequence, and the `FUNCTION` trigger is used to advance from one kick to the next in that sequence.

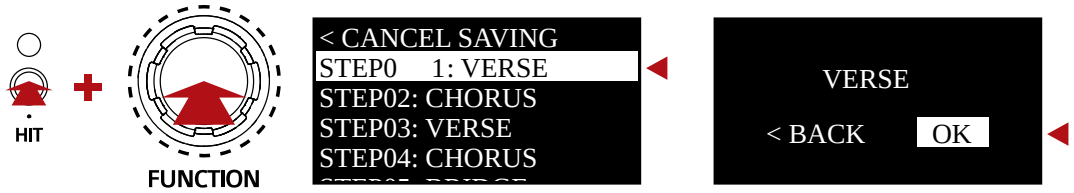
In contrast, the Live **Jam** mode is preferred when playing a performance with no strong preconception of the outcome, and keep maximum room for improvisation. In this mode, all kicks are regrouped in programs, and the user can freely select the kick to play next.

Kick Snapshot

In both modes, the user will prepare their performance by saving snapshots of their kicks, which includes model variations as well as all knob positions. Those snapshots or “steps” are organised into a program, and each program defines how one can take over knobs for improvisation.

One can snapshot a kick by pressing the `HIT` button and keeping it pressed, and then click the `FUNCTION` encoder. Alternatively, in **Studio** mode, snapshots can be saved by nagivating to the `SNAPSHOT` sub menu, and then choose `SAVE`.

One will select a step, click the `FUNCTION` encoder and then name the step if desired.



Functions

Bohm has 32 programs, and each program is defined by:

- Its **number of steps**, from 1 to 16
- The **actual steps**, which contain an entire snapshot of a kick (model variations and knob positions)
- The **knob options** (Latch, Relative or Override)
- The **follow action** (None, Loop or next program number, only relevant in Song mode)
- The **performer mode** (Include or exclude)

Regarding the per sequence knob options:

- With the **Latch** `LAT` option, the parameter value will “jump” to the knob position as soon as the knob is turned
- With the **Relative** `REL` option, the parameter value is relative to the knob position when the step was loaded
- With the **Override** `OVR` option, the step parameter value is ignored and the current knob position is used instead

During a live performance, the artist will often want the Performer settings to be the same for all program steps. Instead of making sure that each step of the program has the Performer correctly configured, and have to change every steps in case of a mistake, the program can ignore the

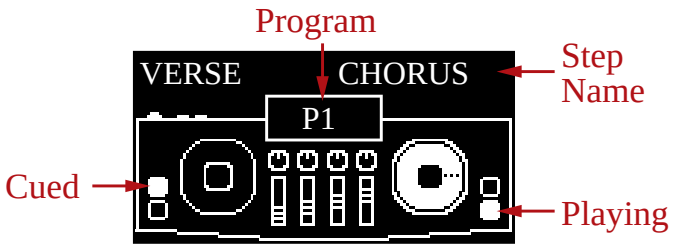
Performer settings of the steps and take instead the one which was active when the live mode was started. This is called the “Exclude” (`EXCL`) option, and is the default.

If the user actually wants to explicitely recall the Performer settings that were saved for each step, they can include them by selecting the “Include” (`INCL`) option.

Song Mode

The Live **Song** mode interprets each program as a sequence of steps.

In that mode, 2 decks are displayed. Each deck can play a kick while the other is preparing the next kick by loading it in advance.



To advance by one step into the sequence, FUNCTION can be sent a trigger, and the kick becomes active as soon as HIT is pressed or triggered.

> **Note**
>
> Because it takes some time to load a model, Bohm will start to pre-load the next step as soon as a step becomes active. Therefore two steps can only be as close in time as the time it takes to load the next model.

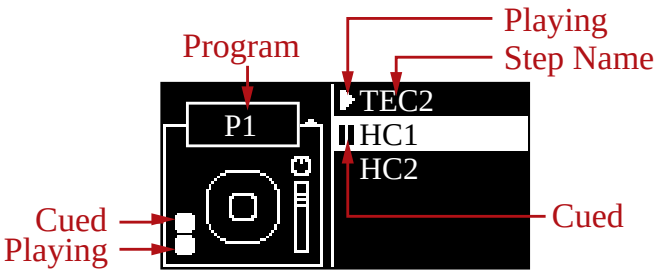
One can define the number of steps of the sequence, which can be looped, simply end or can start another sequence when it ends.

The follow action dictates what to do after the program end is reached:

- With the **Loop** option, the sequence goes back to the first step
- With the **End** option, the sequence stops, and keeps the last step active
- With the **program number** option, the sequence will automatically start the program designated by the choosen number

Jam Mode

The Live **Jam** mode display each program as a set of kicks.



The FUNCTION encoder is used to select the next kick to play. As the encoder is turned, the kick is automatically loaded.

One can then “Cue” the kick by clicking on the FUNCTION encoder, and the kick becomes active as soon as HIT is pressed or triggered.

Program Clear

It is possible to completely clear and reset a program to its defaults by navigating in `LIVE` then select the target “Program Number” (`PRG NBR`) and finally go to the end of the list, click `CLEAR` and confirm the action.

Examples

Example: Song Mode

Alex wants to setup their live set for which they have different kicks for each verse, chorus and bridge sections, organised in a classic verse-chorus-verse-chorus-bridge-chorus sequence. They also want to keep control of the Bohm COLOR knob at all time, so that the knob position of the kick when saved is simply ignored.

In that configuration, Alex will want to use Live **Song** mode for simplicity. They could have also used the **Jam** mode, but **Song** mode allows them to free their mind a bit, as they just need to trigger FUNCTION to go to the next kick, while they are busy on other instruments. They can even sequence those kick changes completely from their sequencer if they want.

First they will setup for example program 1, with 6 steps, and appropriate mode for the Bohm COLOR knob:

- Long press FUNCTION to access system settings
- Go to `LIVE` sub menu
- Set `PRG NBR` (program number) to `1`
- Set `NBR STEPS` (program number) to `6`
- Navigate `POT OPTIONS` then `BOHM` then `COLOR` and set to `OVR` (override)

- Then exit the system settings by navigating `BACK`

Then, they will prepare the kicks:

- Prepare the first kick for the verse
- They press `HIT` and `FUNCTION` and choose step 1 and repeat this operation for step 3
- Similarly, they prepare their chorus kick and save it to steps 2, 4 and 6
- Similarly, they prepare their bridge kick and save it to step 5

Finally it is time to start the Live in Song mode:

- long press `FUNCTION` and navigate to `LIVE` then `START SONG`

Example: Jam Mode

Blake wants to setup their live set which will be a jam with other musicians. The music genre is known and they want to prepare a set of their favorite kicks for the style to use during that jam.

First they will setup for example program 2:

- Long press `FUNCTION` to access system settings
- Go to `LIVE` sub menu
- Set `PRG NBR` (program number) to `2`
- Then exit the system settings by navigating `BACK`

Then, they will prepare the kicks, and snapshot them by pressing `HIT`, keeping it pressed and then click `FUNCTION`, and choose an available step.

Finally it is time to start the Live in Jam mode:

- long press `FUNCTION` and navigate to `LIVE` then `START JAM`

System Settings

The system settings are accessed by pressing the `FUNCTION` button for at least 2 seconds.

Post EQ option

This option allows to set an EQ on the signal output. The signal output EQ only affects Bohm and Groove, but not the Performer audio input.

The Post EQ has:

- 1 low shelf, with configurable frequency and level
- 1 peak filter, with configurable frequency, gain and Q factor
- 1 high shelf, with configurable frequency and level

By default, all levels and gains are set to 0dB, so the post EQ has no effect.

Note that the Post EQ is a system setting and not a per-model setting. Its intent is to be able to make quick EQ changes before a live set in a club, for example if the PA over-emphasizes bass frequencies.

In Vol option

By default, the audio input volume on Performer is 0dB. This option allows to lower the volume of the external audio input from -60dB to 0dB, in 1dB steps.

It is a convenience feature to lower the volume of a module without output level control directly connected to Bohm, allowing to save one VCA in limited rack space configuration (live sets).

Perf Vol option

By default, the `VOL` slider and CV on Performer controls the volume of the combined Bohm and Groove, to balance it against the Performer external audio input. It is possible to select which signal is controlled by `VOL`:

- `B+G`: Bohm and Groove
- `BOHM`: Bohm only

This feature also allows to make the Groove drone without hearing the Bohm kick.

Perf Max option

By default, when `VOL` slider or CV are to the max, the output of the Bohm and/or Groove are at their maximum, 0dB.

It is possible to set the maximum level when the `VOL` slider or CV are to the max, from -18dB to 0dB, in 1dB steps.

This allows to put back the Bohm volume to a desired level in live with a swift gesture, without having to aim for a precise slider position.

Pitch CV option

By default, the PITCH CV is not tracking musical pitch and the entire kick octave can be CV controlled using for example a LFO with a ±5V output range.

Bohm can pitch track the kick octave using 1 Volt/Octave. This options then allows to select the 1V voltage range to map to the octave, either 0..1V, 1..2V or 2..3V.

> **Important**
>
> If your sequencer supports multiple pitch control standards, make sure to select 1 Volt per octave.

ATTVERT 2 option

By default, the SUSTAIN attenuverter is mapped to the SUSTAIN CV. It is however possible to map it instead to the VELOCITY CV.

Func Rand option

By default, the FUNCTION trigger in Studio mode will randomize only the Bohm and Groove (*ie.* not the performer). It is possible to randomize everything using this option:

- `ALL`: Randomize Bohm, Groove and Performer
- `B+G`: Randomize only Bohm and Groove

Perf FX option

By default, activating or deactivating the Performer FX section is synced to HIT. It is also possible to toggle it immediately:

- `INSTANT`: Toggle FX section immediately
- `SYNCED`: Sync FX to next HIT

Perf ON/OFF option

By default, pressing the ON/OFF button or sending a trigger to the ON/OFF CV will toggle the FX activation. It is also possible to have a gate behavior:

- `TRIG`: Toggle FX on trigger or button click
- `GATE`: Activate FX while CV is on or button is hold

Grv Env option

By default, the groove envelope will fall after the 4th tap. It is also possible to sustain it, to use Groove as a drone, or when there is more than 4 taps between two `HIT` (typically at higher tempos):

- `FALL`: Fall the envelope after the 4th tap
- `SUSTAIN`: Sustain the envelope at 4th tap level after the 4th tap

Taps Out option

By default, the `TAPS` output CV emits the envelope of the Groove. It is also possible to emit the Bohm or Performer envelopes:

- `GROOVE`: Groove envelope
- `I BOHM`: Inverted Bohm envelope
- `PERF`: Performer envelope
- `BOHM`: Bohm (non-inverted) envelope

Typically, the `GROOVE`, `I BOHM` and `PERF` envelopes would be used with a VCA, while the `BOHM` envelope would be used for a compressor.

Panning option

By default the stereo audio input signal, the Bohm signal and Groove signal are processed in stereo. This option allows to place those signals either on the audio output left or right channel. This makes possible to selectively process further those signals using other Eurorack modules, but in mono.

- `BOHM`: sets the main kick voice panning mode
- `GROOVE`: sets the secondary kick voice panning mode
- `PERFORMER`: sets the audio input panning mode

The panning modes are:

- `LEFT`: The stereo signal is hard-panned left, and will output on the audio output left channel only
- `CENTER`: The stereo signal remains untouched
- `RIGHT`: The stereo signal is hard-panned right, and will output on the audio output right channel only

Scrn Saver option

By default, the screen saver option is `ON`, as it is important to maximize the lifetime of your Bohm OLED screen. However in some situations it might undesirable, for example when shooting a video or during a live performance. The screen saver can therefore be turned `OFF` to accomodate those cases.

Lock Model option

When using the Bohm in live but using `STUDIO` mode instead of one of the live modes, an accidental rotation of the **FUNCTION** encoder will change the model.

This option allows to lock the current selected model in `STUDIO` mode.

This setting is not persistent: when the Bohm is powered up the **FUNCTION** encoder rotation is always unlocked.

Shop Mode option

By default, the module will remember the last model used, as well as all variations settings of the last 12 models used, and the other system settings listed above.

By turning on the Shop Mode option, one can prevent that, allowing a shop owner to reset the module in the same condition for customers to have the same initial experience with the module.

Backup/Restore

One can backup the entire internal memory of the Bohm into a file on the SD card. This backup contains everything, the module setup as well as all the programs and snapshots of the module.

Those backups can then be archived on a computer, and one can use them to manage multiple live performances.

- `BACKUP` will copy the entire internal memory to a `backup.bohm` file on the SD card. **If a file already exists with the same name on the SD card, it will be overwritten**
- `RESTORE` will copy a file found with extension `.bohm` on the SD card and copy it to the internal memory. A file can then be named for example `my_live_at_berghain_2025.bohm`, but you must ensure to have **only one** `.bohm` **file on the SD card**

While backup contains the module calibration, restoring restores everything except the module calibration.

Restoring takes a few seconds, and the module will automatically restart after it is completed.

Factory Reset

One can reset the module back to the same state as when it left our factory. Resetting to factory settings will reset all the system settings listed above, as well as all the programs and snapshots. However it will keep the factory calibration data.

> **Warning**
>
> Factory reset will remove everything in the Bohm internal memory, including programs and snapshots. It is advised to backup the module before doing so.

Factory reset takes a few seconds, and the module will automatically restart after it is completed.

Firmware Update

The firmware and models of your module can be conveniently updated using the provided SD card.

Upgrading the firmware and models bring new features and bug corrections.

To check your firmware version, press the **FUNCTION** encoder for 2 seconds, turn the encoder fully to the right to navigate to the `ABOUT` menu, click the **FUNCTION** button, and look at the version displayed on the screen.

The latest SD card content, with firmware and latest models, is available here.

To update the firmware and models, please follow the instructions below:

1. Download the zip archive above
2. Decompact the zip archive
3. Turn off your Eurorack system
4. Take the Bohm SD card out of the Bohm module
5. Insert the SD card in your computer-integrated or external SD card reader
6. Copy the content of the archive to the root of the SD card. For example, the file `Bohm.bin` **must** be at the top level of the SD card

7. Eject the card securely
8. Put back the Bohm SD card in the Bohm module
9. Turn on your Eurorack system

It will take around 20 seconds for the firmware to update, and nothing will appear on the Bohm screen during that update.

The next time you will turn on your Eurorack system, the Bohm module will see that the firmware on the SD card is the same as the one in the module, and won't update it again.

Calibration Mode

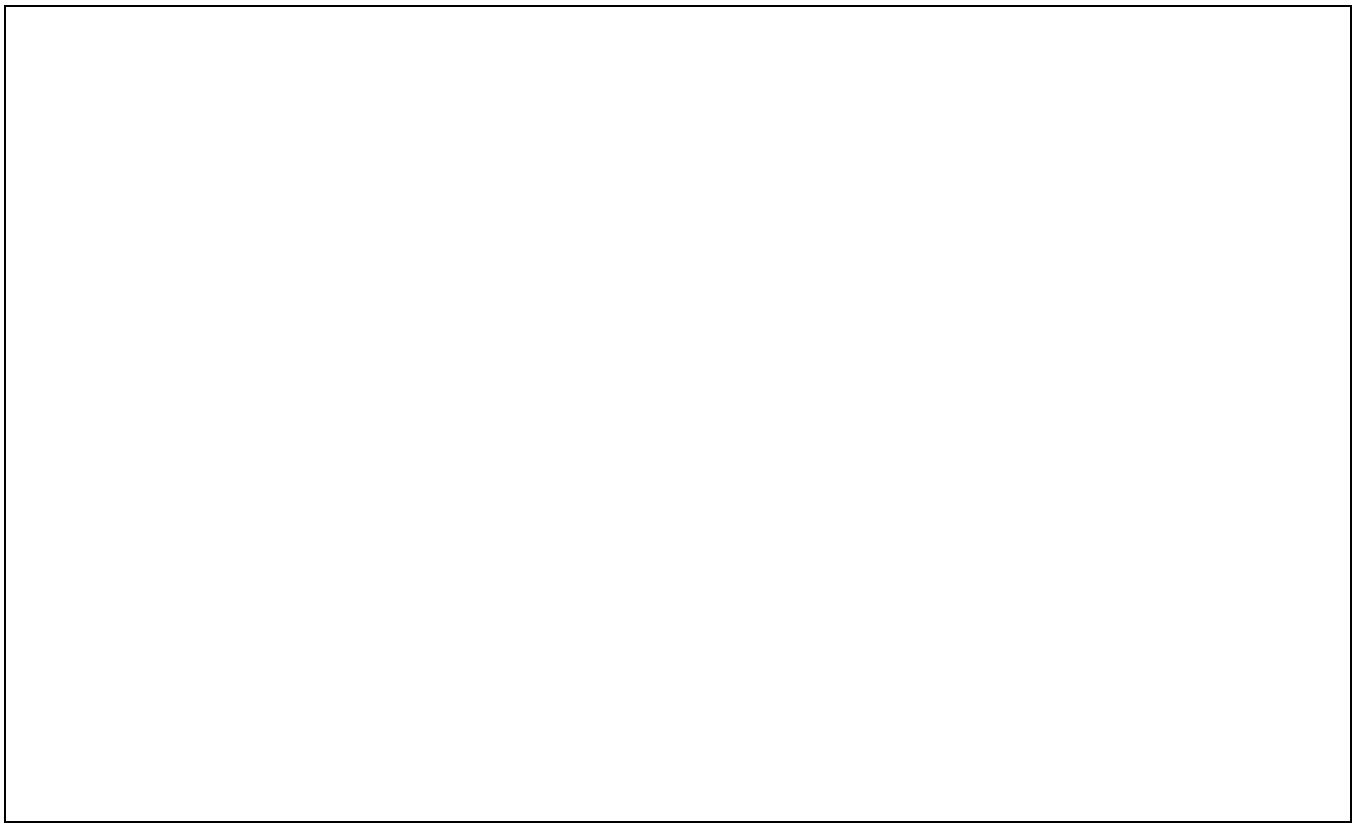
In the factory, your Bohm has been calibrated with Groove and Performer expanders, but there are little chances that those are the same Groove or Performer you purchased. The calibration data already present in your Bohm might be already good enough, but you might want to calibrate Groove and/or Performer to achieve optimal performance.

Furthermore, depending on electrical conditions or ambiant temperature, your module CV and knobs might be slightly off and might require recalibration.

Configuring the Groove and Performer expanders doesn't require any special equipment.

Configuring the Bohm module requires an Eurorack-compatible device that can produce 3V for `PITCH` CV calibration, typically a Volt/Octave device such as the Arturia Beatstep Pro or the Intellijel µMIDI Eurorack module.

The video below shows how to calibrate the Groove and Performer expanders. The entire operation takes a little bit more than 1 minute.



The rest of this chapter is a textual version of it.

Entering Calibration Mode

To enter calibration mode:

1. **Turn off** your Eurorack system
2. **Remove all the Eurorack patch cables** connected to the module
3. **Press** the FUNCTION button, **keep it pressed**, and **turn on** your Eurorack system
4. A welcome message will appear, follow the onscreen instructions

After the welcome message, the screen will show something similar to:

```
DETECTED
BOHM
GROOVE
PERFORMER
```

Make sure that all your expanders appear in that list. Then:

- To only calibrate the Groove and/or Performer expanders, click the FUNCTION button
- To calibrate all modules, press the FUNCTION button for at least 1 second

Calibrating Expanders

If the Groove expander is present:

1. Turn the `2` knob fully on the left, then fully on the right, then press `FUNCTION`
2. Repeat the previous step for the `3`, `4`, `LENGTH`, `PITCH`, `FX`, `COLOR` knobs, `VOL` slider, and then for the `FX`, and `COLOR` attenuverter trims
3. Acknowledge that you have already removed all patch cables and press `FUNCTION`
4. Wait until the module calibrates CVs automatically

If the Performer expander is present:

1. Turn the `DUCK` knob fully on the left, then fully on the right, then press `FUNCTION`
2. Repeat the previous step for the `FX` knobs and `VOL` slider
3. Acknowledge that you have already removed all patch cables and press `FUNCTION`
4. Wait until the module calibrates CVs automatically

After the expanders have been calibrated, `CALIBRATION SAVED` will appear on the screen. Clicking the `FUNCTION` button will restart the module.

Calibrating Bohm and Expanders

Calibrating Bohm is only required if you observed that your Bohm CV and knobs are slightly off.

Configuring the Bohm module requires an Eurorack-compatible device that can produce 3V for `PITCH` CV calibration, typically a Volt/Octave device such as the Arturia Beatstep Pro or the Intellijel µMIDI Eurorack module.

> **Note**
>
> If you suddenly realize mid-way that your 3V source is missing or not good enough, don't be scared: nothing is written into the Bohm internal memory until the very last `CALIBRATION SAVED` step. You can cancel the procedure at any time by turning your Eurorack system off.

1. Turn the `LENGTH` knob fully on the left, then fully on the right, then press `FUNCTION`
2. Repeat the previous step for the `SUSTAIN`, `ATTACK`, `PITCH`, `CURVE`, `TRS DECAY`, `COLOR`, `FX`, `TRS TONE` knobs, and then for the `LENGTH`, `SUSTAIN`, `PITCH` and `COLOR` attenuverter trims
3. Acknowledge that you have already removed all patch cables and press `FUNCTION`
4. Wait until the module calibrates CVs automatically
5. Connect a cable between your stable 3 Volts source and `PITCH` CV input

6. The module shows the voltage value measured, and it should be close to 3000mV. Adjust the voltage (typically the octave on your device) as necessary. When this is done, press FUNCTION
7. Wait until the module calibrates the PITCH CV automatically

The test mode and calibration will then follow with the available expanders if any. For more details, follow the instructions in the previous section.

Functional Test Mode

Should you have a problem with the modules, our support team will ask you to run “test mode” to have a rough idea of what the problem is. This mode is also the mode used in factory to functionally test and calibrate the modules before they are delivered to you.

This operation requires a bit of care because you will need to access the back of your module while turning the module on, in order to access test mode.

As for equipement, you will need:

- A simple LFO and VCO
- A stable 3V voltage source such as one coming from a Volt/Octave device (an external or Eurorack device, such as the Arturia Beatstep Pro or Intellijel µMIDI or equivalent will do)

Entering Test Mode

To enter test mode:

1. **Turn off** your Eurorack system
2. **Remove all the Eurorack patch cables** connected to the module
3. Remove the module from the rack, but **keep its power cord attached**
4. **Press** the FLASH_SW button at the top, between the two printed circuit boards of the module, **keep it pressed**, and **turn on** your Eurorack system. The test mode welcome screen will appear
5. Press FUNCTION, the screen will turn entirely white. Check that the screen is working properly, and press FUNCTION again

The screen will show something similar to:

```
DETECTED
BOHM
GROOVE
PERFORMER
```

Make sure that all your expanders appear in that list. Then:

- To only test the expanders, click the FUNCTION button
- To test all the modules, press the FUNCTION button for at least 1 second

Testing Expanders

If the Groove expander is present:

1. Check that the CLOCK LED is blinking, press FUNCTION
2. Turn the 2 knob fully on the left, then fully on the right, then press FUNCTION
3. Repeat the previous step for the 3, 4, LENGTH, PITCH, FX, COLOR knobs, VOL slider, and then for the FX, and COLOR attenuverter trims
4. Acknowledge that you have already removed all patch cables and press FUNCTION
5. Wait until the module calibrates CVs automatically
6. Use your LFO in sinus mode and connect it to the FX CV
7. Repeat the previous step for CLOCK, COLOR, VOL, LENGTH, PITCH, and TAP CVs
8. Connect a cable between the TAPS CV output and TAPS CV input, then press FUNCTION

If the Performer expander is present:

1. Press the ON/OFF button
2. Check that the ON/OFF LED is blinking, press FUNCTION
3. Turn the DUCK knob fully on the left, then fully on the right, then press FUNCTION
4. Repeat the previous step for the FX knobs and VOL slider
5. Acknowledge that you have already removed all patch cables and press FUNCTION
6. Wait until the module calibrates CVs automatically
7. Use your LFO in sinus mode and connect it to the DUCK CV
8. Repeat the previous step for FX, ON/OFF and VOL CVs
9. Use your VCO in sinus mode and **connect it to the right input** IN **first**
10. Repeat the previous step with the left input IN

After the expanders have been calibrated, `CALIBRATION SAVED` will appear on the screen. Clicking the **FUNCTION** will show the “QC passed” stamp, which means that your module is in specs (no problem were found) and calibration is complete.

You can now turn off your Eurorack system, and reinstall the module into your rack.

Testing All Modules

It is completely similar to the expanders test, except the central Bohm module will be also tested and calibrated. For this reason you will need, on top of the LFO/VCO requirements for the expanders, a stable 3V voltage source.

Typically, you will want to use a Eurorack sequencer, or a MIDI to CV module.

If you are only testing the module and don’t have a stable 3V voltage source, you can turn off your Eurorack system before reaching the `CALIBRATION SAVED` step mentioned in the previous section.

1. Press the **HIT** button
2. Check that the **HIT** LED is blinking, press **FUNCTION**
3. Make sure a SD card is in the microSD card slot and press **FUNCTION**
4. Read the SD card test status and press **FUNCTION**
5. Turn **FUNCTION** 10 times on the left, then 10 times on the right
6. Turn the **LENGTH** knob fully on the left, then fully on the right, then press **FUNCTION**
7. Repeat the previous step for the **SUSTAIN**, **ATTACK**, **PITCH**, **CURVE**, **TRS DECAY**, **COLOR**, **FX**, **TRS TONE** knobs, and then for the **LENGTH**, **SUSTAIN**, **PITCH** and **COLOR** attenuverter trims
8. Acknowledge that you have already removed all patch cables and press **FUNCTION**
9. Wait until the module calibrates CVs automatically
10. Use your LFO in sinus mode and connect it to the **LENGTH** CV
11. Repeat the previous step for **ATTACK**, **SUSTAIN**, **HIT**, **PITCH**, **CURVE**, **COLOR**, **TRS DECAY**, **TONE**, **FUNCTION**, **VELOCITY** and **FX** CVs
12. Connect a cable between your stable 3 Volts source and **PITCH** CV input, then press **FUNCTION**
13. Wait until the module calibrates the **PITCH** CV automatically
14. Connect a patch cable from **OUT** left to your audio output and make sure a 440Hz tone is playing, press **FUNCTION**
15. Repeat the previous step with **OUT** right

The test mode and calibration will then follow with the present expanders if any. For more details, follow the instruction in the previous section.

Changelog

Version 2026.0311.1445

- Performer FX LED shows now an intermediate state (blinking) while transitioning and waiting for `HIT` in synced mode
- New `PERF ON/OFF` system setting allows to either toggle FX (`TRIG`, old behavior, default) or set FX as a gate (`GATE`)
- New `LOCK MODEL` system setting to prevent accidental model changes in a live set when using `STUDIO` mode. It is automatically turned off when powering up Bohm
- New `TAPS OUT` system setting to select which envelope to output from Groove (`GROOVE`, old behavior, default), Inverted Bohm (`I BOHM`), Performer ducking (`PERF`) or (non-inverted) Bohm envelope (`BOHM`)
- New `IN VOL` system setting to lower the volume of the external audio input
- New `PERF VOL` system setting to select which signals are affected by the Performer volume slider/CV, either Bohm and Groove (`B+G`, old behavior, default) or only Bohm (`BOHM`)
- New `PERF MAX` system setting to restrict the maximum volume when slider or CV is full on
- New `DUCK TIME` model setting to change the release time of the ducking curve
- New `DUCK SMTH` model setting to smooth the ducking curve
- New `DUCK BS` model setting to set the maximum frequency below which the ducking is operating
- New `LAYER VOL` setting in the XT-88 model, to set the volume of the layering sample
- New `POST EQ` system settings as a sub-menu, with 1 low shelf, 1 peak filter (boost/cut) and 1 high shelf
- OLP4 model now supports Groove
- When using HIT in sustain mode (using a long gate), Bohm can now reach C1 and C2 for every position of `CURVE`
- It is now possible to load a snapshop with pots positions, which allows to copy a snapshot or make tweaks when preparing a live performance

Version 2025.0827.1600

- New engine version with system settings variations allows a system setting to now “talk” to the model
- New `GRV ENV` system settings allows the Groove envelope to `FALL` after the 4th tap (new feature, now the default when at factory settings), or `SUSTAIN` (old behavior, drone)
- Shop mode now also reset base system settings to their default on start, to ensure a consistent customer experience in shops’ showrooms
- Fixed a flaw where 1 second was needed (for rate limiting) for a program clear or snapshot saving to be effectively written to internal memory. This is now immediate

- New `FACTORY RESET` system menu, to put back Bohm at the same state as when it left the factory (ie. everything is reset apart from calibration)
- New `BACKUP` and `RESTORE` menus to backup and restore the entire Bohm system (apart from calibration) to/from a file on the SD card
- New end of chain soft clipper that prevents hard clipping when input signal is too strong. The soft clipper starts to slowly clip above 0dB (±5V in Eurorack), with the 4.6dB headroom the audio codec has
- `DJ FILTER` (`NEUTRAL`/`RAVE`) has been changed to `DJ RESO` to control the filter resonance from 0% to 100%, in 10% increments. The `RAVE` lowest frequency in the `LP` portion used to be limited to 500Hz, this is no longer the case
- New Stereo width variation for Groove and Bohm models, when the signal is not already mono
- New `PANNING` system settings, allows each signals (Bohm, Groove, Audio Input) to be either stereo (default), hard-panned left or hard-panned right

Version 2025.0722.1625

- Initial release

Third Party Licenses

Bohm includes the following additional software packages, each licensed under its respective terms shown below.

pffft

```
Copyright (c) 2013  Julien Pommier ( pommier@modartt.com )

Based on original fortran 77 code from FFTPACKv4 from NETLIB,
authored by Dr Paul Swarztrauber of NCAR, in 1985.

As confirmed by the NCAR fftpack software curators, the following
FFTPACKv5 license applies to FFTPACKv4 sources. My changes are
released under the same terms.

FFTPACK license:

http://www.cisl.ucar.edu/css/software/fftpack5/ftpk.html

Copyright (c) 2004 the University Corporation for Atmospheric
Research ("UCAR"). All rights reserved. Developed by NCAR's
Computational and Information Systems Laboratory, UCAR,
www.cisl.ucar.edu.

Redistribution and use of the Software in source and binary forms,
with or without modification, is permitted provided that the
following conditions are met:

- Neither the names of NCAR's Computational and Information Systems
Laboratory, the University Corporation for Atmospheric Research,
nor the names of its sponsors or contributors may be used to
endorse or promote products derived from this Software without
specific prior written permission.

- Redistributions of source code must retain the above copyright
notices, this list of conditions, and the disclaimer below.

- Redistributions in binary form must reproduce the above copyright
notice, this list of conditions, and the disclaimer below in the
documentation and/or other materials provided with the
distribution.

THIS SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND
NONINFRINGEMENT. IN NO EVENT SHALL THE CONTRIBUTORS OR COPYRIGHT
HOLDERS BE LIABLE FOR ANY CLAIM, INDIRECT, INCIDENTAL, SPECIAL,
EXEMPLARY, OR CONSEQUENTIAL DAMAGES OR OTHER LIABILITY, WHETHER IN AN
ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN
CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS WITH THE
SOFTWARE.
```

Thanks

Ohm Force would like to thank all the following people for their involvement in beta-testing, advices, help and ideas, in alphabetical order:

- Ax/Audiorial
- Blush Response
- Jessica Kert
- Krista Bourgeois
- Laurent de Soras
- Mads Lindgren
- Marc Faenger
- Miquel Dangla
- Rory St John
- Sarah Sommers
- Stéphane Lefrançois
- Steve Duda
- The Electrosmith Daisy team and community
- The entire team at Schneidersladen

And our beloved families for supporting us through the challenges of musical instruments design.