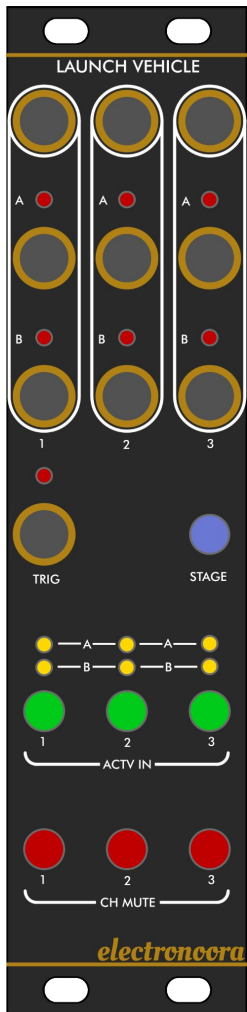


electronoora
LAUNCH VEHICLE



Launch Vehicle is a 6HP eurorack module specifically designed to be a helpful tool for musicians who perform live with their modular synthesizer.

Typically, when performing breakdowns or drops, or when introducing voices to the performance, the musician performing with a eurorack needs to accurately time an action like moving a switch that controls signal flow in the rack.

This module was designed to allow multiple voices to be controlled in coordination, and timed to occur to a common trigger or clock. As the musician will be able to stage the changes in advance, and the module then applies the changes later, the musician's hands will be freed for other tasks like turning knobs on other modules.

The module consists of three independently operating channels numbered 1-3. Each has two input jacks labeled A and B, and an output jack. The user is able to select which inputs are sent to the outputs using tactile push buttons. Using another set of buttons, the outputs can be muted and unmuted.

Input and mute/unmute changes for multiple channels can be staged, and then committed simultaneously either manually by pressing a button, or automatically when a trigger signal is received by the module.



The output is the topmost jack on each channel. It's marked with a white ring around the jack.

Below are two input jacks - **A** and **B**. The red LED above each input provides a visual feedback on the signal currently patched into the jack.

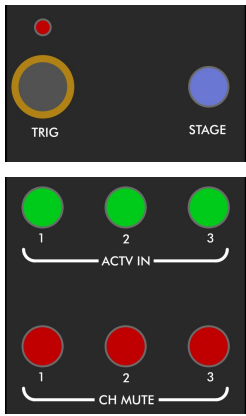
The **A** and **B** inputs are normaled left-to-right between channels. So when cables are patched to inputs on channel 1, the signals are copied also to the corresponding inputs on channel 2 if it has nothing patched in. Likewise from channel 2 to channel 3. Note that the normaling is not buffered, and works in the same way as a passive mult - eg. 1V/oct CV may sag and cause oscillators to be detuned.

Generally - the module works best with trigger or gate signals, but can also be used with control voltages.



The **ACTV IN** button selects which input is active and being sent to the channel's output. The yellow LEDs above it indicate which is the currently active input.

Using the **CH MUTE** button you can mute or unmute the channel's output. The button is lit red when the channel is muted.



The **STAGE** button allows you to stage changes for committing them all at the same time. Hold the **STAGE** button down and tap the **ACTV IN** and **CH MUTE** buttons. The buttons will start to blink, indicating that those changes are staged. If you want to remove a staged change, press the button again while you're still holding down **STAGE**. When you have the desired changes staged, release the **STAGE** button to “arm” the staging. The button will remain lit blue, and the staged buttons will remain blinking.

When you want to commit all the armed changes simultaneously, tap the **STAGE** button. The changes are committed, the other buttons will stop blinking, and the **STAGE** button will become unlit.

If you want to commit the staged changes automatically, patch a clock, trigger or a gate signal to the **TRIG** jack. After the staging has been armed, the module will commit the changes on the rising edge of the signal patched to the jack. A red LED above the jack provides a visual feedback of the signal patched into the module.

To cancel already armed changes, hold the **STAGE** button for longer than one second, after which the blinking buttons will cease to blink. Now you can either stage changes again, or just release the **STAGE** button.

Here are some **tips and tricks** that may provide inspiration as you explore the Launch Vehicle.

- Patch a clock occurring at the start of every four bars into **TRIG**. Staged changes will then commit neatly in time and fit into the structure of your performance.
- You can still perform manual changes even if you have armed changes waiting. If you have a normal snare pattern on input A and a drum roll on input B, arm an input change first. Then start the drum roll by switching to input B manually. When a clock occurs at the start of a bar, the module will commit the armed change and switch back to input A again.
- If you have a TR-style trigger sequencer, patch one track into **TRIG**. This way you can have the change pre-programmed as a part of a stored pattern in your sequencer.
- When playing 303-style basslines, use two different sources for accent gates and switch between them to get two different rhythmic feelings to the same note pattern.
- Launch Vehicle is a nice companion to a 3-channel topographic drum sequencer. For example, by using it to switch between clock-divided drum gates and the ones generated by the sequencer.

A few **answers** to some **questions** on using the Launch Vehicle:

Q: *Staged changes are armed, but have not been committed yet - what happens if I press the flashing select or mute buttons?*

A: The button press will switch the input or mute/unmute the channel immediately. When the trigger occurs, the change is committed again. So if you muted a channel manually, it will be automatically unmuted.

Q: *I'm holding the STAGE button and have some changes staged already and a trigger signal occurs - what happens?*

A: Nothing - the incoming trigger signal is ignored when the **STAGE** button is held down.

Q: *Staged changes are armed, but I want to cancel them and start holding down the **STAGE** button to do so. But before one second has elapsed, a trigger signal occurs - what happens?*

A: As above, nothing happens - holding down the **STAGE** button will ignore the incoming trigger signal even when the changes are already armed.

Finally, a some **technical details** for those who are curious about the hardware on Launch Vehicle.

- The core of the module is an ATmega808 AVR microcontroller running at 16MHz.
- The firmware is written in C, and is available as open source so you can customize it if you wish. The standard firmware uses less than 2K of the available 8K bytes of the on-chip flash memory. The microcontroller is in-system programmable using an UPDI interface.
- Switching between the two inputs and muting are both performed by a pair of DG4053 analog switch chips. The MCU controls them digitally, but the signal path from inputs to output is fully analog.
- A pair of TPIC6C595 8-bit shift registers is used to drive the input and mute LEDs. The shift registers are connected so that the overflow bit from one register cascades to the least significant bit of the other.
- The red LEDs above the input jacks are not controlled by the shift registers, but instead by 3904 NPN transistors with the input signals from the jacks driving them through a resistor.
- The power supply section of the module only taps into the +12V rail. It has a 5819 schottky diode for polarity protection, and an LM1117 linear regulator to create the +5V DC used internally on the module.

Thank you!

