ARCUS User Knobs

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1.0.0

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Introduction

The ARCUS User Knobs' main purpose is to provide custom knobs with a visual feedback on knob positions, showing precise high/mid/low boundaries, with an ability to curve and smooth the output. It can also be used as a CV shaping device and a way to turn linear or jagged-edge automation lanes into smooth and adjusted curves. If it's coupled with an External MIDI Instrument and a MIDI loopback, it can directly control any other widget with precision and curving. Etc.

The ARCUS has plenty of options (with possibly more to come), aiming for flexibility, along with lots of back panel I/O. Each section can be rewired, allowing 1 knob to control multiple sections, the use of performance properties inside a combinator, more outputs, variations on a single signal, etc.

The knobs come from an upcoming device that will probably inherit some of this design.

If you get confused, there are help popup menus on the front and back of the device. There are also some example combinator patches included that use many of the features.

General Controls

The top row of controls has smoothing and other options contained in a drop-down menu:

Smooth Batches
This averages the set number of past batches (the small segment of audio and CV each RE acts upon) with the current batch, smoothing the signal. It defaults to 0 or no smoothing.

Options Menu

Smooth Batches Conversion Rate
Set this sample rate to the rate that Reason is currently using, and then if you change Reason's sample rate, the device will compensate and try to have the same amount of smoothing. It does this via dividing or multiplying the number, so the accuracy depends on which way the conversion is going and how low or high the smoother is set to).

Smooth Before Curving
By default, the smoothing happens at the end, after all calculations. This makes it happen on the knob/mod value, before curving, etc.

Center Levels and Output Amounts
This chooses how to use levels and amounts: basic multiplication (as a bipolar signal); centered in the middle of the **high**/**low** range (average); or centered on the **midpoint**.

Knobs with Non-Default Sources (Special Behavior)
Knobs with **sources** that are not pointing to themselves will alter the output using of these behaviors: do nothing (default), add (as bi or uni at full or half level), or scale/multiply (as bi, uni, or centered uni). This behavior will also apply to knobs with back panel mid inputs if the option below is used.

Separate Knobs with Mod Inputs
Disconnect knobs that are using knob mod inputs and use the above behavior.

Special Behavior Before Curving
Do the separate knob behavior before instead of after curving.

Note Mode
Mono (for Retrig and Legato) or Poly (pseudo-poly, without note recall).

Direct Knob Outputs Polarity
Bipolar or unipolar (default is bi).

Use S-Curve on Knobs
The main **s-curve** toggle turns all s-curves on and off, but if you want to only s-curve some knobs, you can turn the others off via these. These properties are duplicated in the individual section menus.

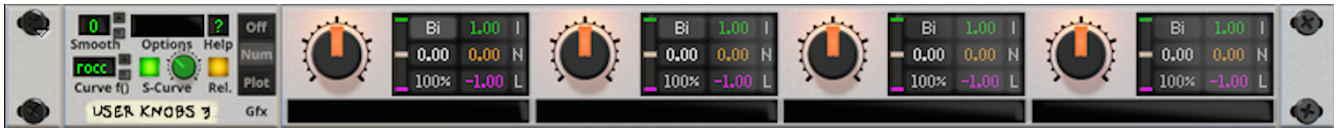
Both Mid Curve and S-Curve
When s-curving, the default is to also curve the **mids**, but this option will turn that off, only doing the **s-curve**. These are also duplicated in the individual menus.

Set all Sources/Modes
Set all sections' **sources** or **modes** at once.

The options display gives abbreviations and backgrounds around them to indicate the major options:

The top device's visible options are: 44.1 khz smooth base rate, center midpoints when leveling, and add as bipolar when sources are non-default.
The bottom device's visible options are: 96 khz smooth base rate (done before curving instead of after), center on average when leveling, scale as unipolar for non-default sources, separate knobs with mod inputs, and do this behavior before curving.

The s-curve options have indicators in the main displays:



This is showing s-curve being used on the first 2 sections and not the last 2. The 2nd section also has the option to not curve the midpoint when using s-curve.

Help Menu
Next to the **options** menu, this is a popup that gives an overview of each property. There is also one on the back panel on the lower right.The next row of controls are for curving:

The next row of controls deal with curving and midpoints:

Curve Type/Function
This is a curve function used by **midpoint** curving and **s-curving**. There are two pairs of functions that are “rotations” of the function (x^n and lg x), and a single function that is symmetrical (ROCC).

Showing the same midpoint values for the different functions. The more extreme values are more obvious (left and right sides).

S-Curve Enable
This splits the output in half, curving the latter half with the opposite **s-curve amount**, centered on the **midpoint**.

S-Curve Amount
A positive/negative amount for s-curving.

Showing different s-curve values and functions: #3 is not curving the midpoints and #4 is not using s-curve.

Relative Midpoints

When on, the **midpoints** are treated as a curve amount and the actual midpoint will move around as **high** and **low** are moved while the shape/curve of the output remains the same. When off, **midpoints** are at a fixed point and the curve is auto-adjusted as **high** and **low** are moved. The **midpoint** can be greater or lesser than both **high** and **low**, creating a V or inverted V shape. Use **s-curving** to make this a more rounded (negative s-curve) or sharper (positive s-curve) shape.

This shows the difference between relative and non-relative midpoints. The first two devices have the same midpoint for each section, with different high/low settings. The third device is using midpoints greater or lesser than both high and low, with the first 2 using an s-curve to round the curve.

Display Type

Choose between **off**, **numbers**, and a 2d **plot** for the main displays.

Knobs and Displays

User Knob
A knob that sweeps through part of the color wheel: violet on the left (-1), orange in the middle (0), and green on the right (1).

Custom Text Labels
These show up on the front, back, and folded front.

Number Display

The first column starts with a combination popup menu of the **source**, **mode**, and some **s-curve** options (described in the general controls section). Below that is the current **value** and a **level** modifier.

Source
This defaults to the corresponding knob and can also point to the other knobs and performance properties. (**Source**, **mode**, and **level** show on the plot display when non-default.)

Mode
Output modes: Bipolar, Unipolar, Unipolar Negative (0 to -1), Notes (the normal intervals), Unclamped Notes (basically just unipolar but displayed as the nearest note value), and Velocities (also just unipolar but displayed as the velocity integers).

Value
This is the current output value corresponding to the position of the knob (or mod input).

Level
A level boost applied after the high/mid/low shaping. How it is applied to the signal is determined by the **center levels** option. (The displayed number value is affected by this but the meter display is not.)

The next column has **high**, **mid**, and **low** (when inverted, **high** < **low**, the boxes are colored):

High
The highpoint of the output, though it can also be the lowpoint if it's less than **low**. Colored green to correspond to the knob's color at 1.

Midpoint
Depending on the **relative midpoints** setting, it's either the exact point corresponding to the middle of the knob's range (with a **level** of 100%) or the curve amount. Either way, the midpoint is displayed in the number display, but the two behave differently when moving **high**, **low**, **level**, etc. Colored orange to correspond to the knob's value in the middle (0).

Low
The lowpoint. Colored violet/purple to correspond to the knob's color at -1.

Plot Display

This is a 2d plot of the shaping. **High**, **mid**, and **low** can be altered via dragging up and down on the plot (**low** on the left, **mid** in the middle, and **high** on the right). When the **source**, **mode**, or **level** is non-default, it's shown here.

Both Displays

Meter
On the left side of the displays, this shows the **high**, **mid**, **low**, and current **value**, colored correspondingly. The meter is not affected by the **level**, though the **value** in the number display is. When the **midpoint** is modded via the back panel, its position in the meter (and plot display) will change, while the value shown on the number display will just show the base value.

These 3 small controls on the right alter **high**, **mid**, and **low** directly (they are not toggles or permanent properties themselves).

Invert
This swaps **high** and **low**, adjusting **mid** to basically invert the signal in-place. Hold **shift** or **control** to leave **mid** alone.

Negate
Similar to **invert** but it's based off of the bi/uni boundaries, actually multiplying the properties by -1 (for uni modes, it does this before converting to uni).

Level Adjust
Separate from the main **level** property, this will instead directly alter the **high**/**mid**/**low** boundaries. **Control** will leave **low** alone, expanding from the bottom; **alt** will leave **high** alone, expanding from the top; and holding **shift** makes the movement slower, (like it does with all draggable properties).

Examples

This is four copies of the same device with different first knob positions. The other three sections are using the first knob as their source and currently ignoring their own knobs (the special behavior option is on "do nothing" but it could be set to add or multiply the the knob value, treated as bi or uni).

This a basic setup where the latter two knobs have a non-default midpoint and are using their level properties. The 2nd device is the same as the first, showing the plot displays.

This is a pair of curved unipolar signals and another pair of negated unipolar signals. (They go from 0 to -1.)

This device is set up for controlling filters. It has 2 main filter frequency controls. The last 2 sections use the first 2 as sources for inverted filter resonance mods that can be tweaked using the knobs (adding as bipolar).

Relative midpoints is off. All 4 leave the midpoint at 0, with different high and low values (the curve is auto-adjusted to pass through that point). The last 2 midpoints are greater or less than both high and low, creating a rounded V shape.

The first device is using different modes (bipolar, unipolar, notes, and negative uni). The second device is using the same modes, with the mod wheel as the source on 1, 2, and 4. The 3rd is using note number as its source. It's also scaling these values by the knobs (as bipolar) via the special behavior option (all scaling at 1x in this picture). (This would get put inside a combinator, assigning the mod wheel and notes to the device via the programmer).

Back Panel

Inputs

Mod Knob
Directly mods the knob itself, with an **amount** control (this defaults to 100% and has a range of plus or minus 200%). See the general options for changing the behavior of the knob when this is connected (choose a **special behavior** and use the **separate knobs** option). These can also be chosen as **sources**.

Mod Midpoint
Directly mods the **midpoint**.

Note that when modding these knobs, it's clamped between -1 and 1 (or 0 and 1 for uni outputs). Those limits correspond to **low** and **high**. You can also use the **level** property and the **mod amount** so that there's plenty of room for a full signal to mod different positions of the **knob** or **mid** without clipping, and then amplify it afterwards to go beyond the bipolar/unipolar limits.

Outputs

Main Outs
The main 3 outputs use the front panel settings. They are the first column of outputs, colored uniquely in each section to stand out.

Extra Outs
These 3 outputs can be individually altered with **invert**, **negate**, and **amount** controls. **Invert** flips the signal so that **high** is **low** and **low** is **high**, etc. **Negate** actually multiplies by -1 or the equivalent, inverting around the middle axis. The **amount** control defaults to 100% and has a range of 0% to 400%. Exactly how this level is applied to the output is determined by the **center levels** option.

Direct Knob Out
This is the raw knob value (located to the left of the main outs, on the bottom row). It's bipolar by default but an option in the general options menu can make it unipolar.

The top device is showing the defaults, while the bottom is showing different settings.

Contact Info

For suggestions, feedback, support, beta testing, etc. contact:

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