



metafunction

Modular Junction

Max For Live

Modulation Expander

User Manual

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V 1.0

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Tech Note



A section headed Tech Note provides some technical information that may help enhance your knowledge of audio. A complete technical understanding is not needed for everyday operation of the Modular Junction.

DSP Advice



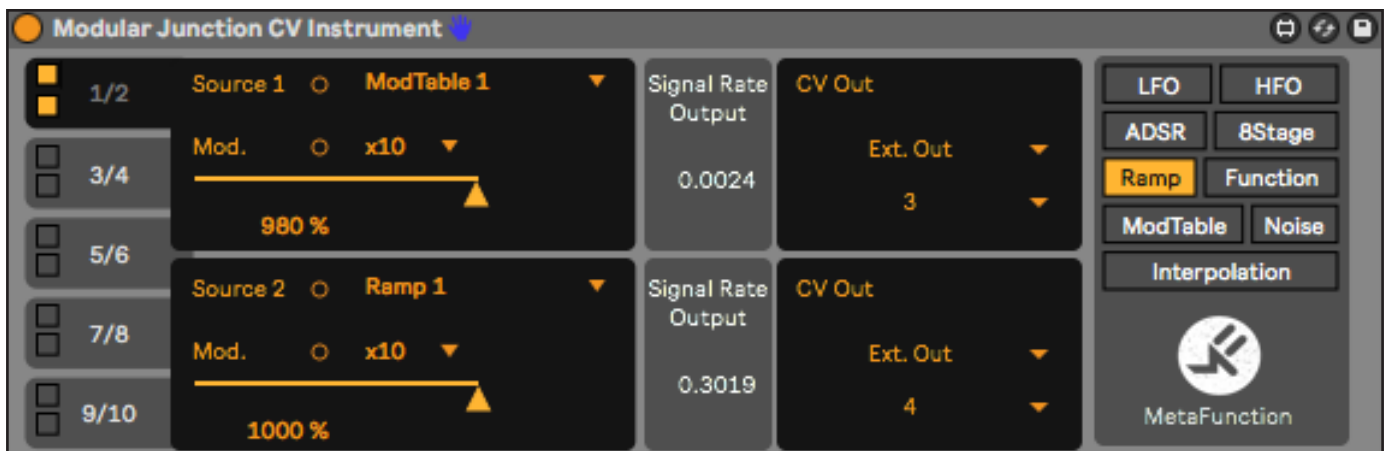
A section headed DSP Advice gives you tips to conserve your CPU resources when using the Modular Junction.

For a quick start overview of mapping software device parameters to modulation sources in the Modular Junction, see Chapter 18: Work Flow Tips.

For a quick start overview of routing modulation sources in the Modular Junction to external CV based hardware instruments, see Chapter 18: Work Flow Tips.

Section 1: Welcome to the Modular Junction

The Modular Junction is a modulation expander Max For Live device for Ableton Live. Designed to add new functionality to your workflow, the Modular Junction provides a myriad of modulation tools that can augment existing hardware and software devices. The Modular Junction provides a selection of modulation sources that can be mapped to any parameter in Live, or patched to any CV based hardware instrument via a DC coupled audio interface. The Modular Junction is designed to spark creativity, add new possibilities to both familiar or new software instruments and audio effects and offers new modulation sources for compatible hardware modular instruments.



The Modular Junction feature set includes:

- Ten modulation slots for assigning modulation sources to any parameter in Live (i.e. Wavetable Osc Position, Hybrid Reverb Decay etc.)
- Ten modulation slots for routing modulation sources out of a DC coupled audio interface (i.e. to a eurorack or 5U system)
- In the Max MIDI Effect and the Max Audio Effect, each modulation slot can be mapped to four parameters simultaneously
- Thirty four modulation sources freely assignable to any modulation slot, with user control of modulation amount, polarity, width and smoothing. Custom DSP algorithms written in C code
- Four Low Frequency Oscillators with rate (sync or Hz), polarity, bias and waveshape
- Four High Frequency Oscillators with rate (sync or Hz), polarity, bias and waveshape
- Four ADSR envelopes that can be triggered from MIDI note input or at subdivision clock rates via project transport
- Four 8 Stage Envelopes for complex shapes, that can be triggered from MIDI note input or at subdivision clock rates via project transport
- Four Ramps that can be triggered from MIDI note input or at subdivision clock rates via project transport
- All envelope stages can be set to Ms, Secs or tempo clock subdivisions (i.e. Attack to 16th)
- Four Functions with user drawable curves and presets, that can be triggered at subdivision clock rates via project transport
- Four Modulation Tables. A novel modulation source. Trigger a Modulation Table at project clock subdivisions for complex evolving modulation sources. Create Modulation Tables with Meta Functions free Wave Weld device. Forty eight modulation table presets are included
- Two pseudo 3D Perlin Noise sources, for unique random modulation sources
- Four Interpolation sources. A novel modulation source. Interpolate between any two modulation sources within the Modular Junction to create unique shapes via linear, cosine, cubic and spline algorithms

Section 2: System Requirements

The Modular Junction is a Max for Live device and therefore a version of Ableton Live Suite or Live Standard with the Max For Live extension is needed. It is recommended that Ableton Live version 11.2 and above is used, on Macintosh and PC. An installation of Max version 8.1.0 (i.e. bundled version) is required but a full license of Max is not needed to use the Modular Junction. You will need approximately 20MB of free hard disk space.

The Modular Junction ships with three devices:

Modular Junction MIDI FX

A Max For Live MIDI FX designed to be used with any Ableton Instrument (i.e. Wavetable or Operator) or any third party VST / AU virtual instrument plug-in.

Modular Junction Audio FX

A Max For Live Audio Effect designed to be used with any Ableton Audio Effects device (i.e. Hybrid Reverb or Echo) or any third party VST / AU audio effect plug-in.

Modular Junction CV Instrument

A Max For Live Instrument designed to be used with any CV based hardware instrument, such as a Eurorack or 5U modular synthesizer, via a DC coupled audio interface.

Section 3: Installation

The Modular Junction is supplied via a zip archive. Its easy to install the Modular Junction.

Unzip the contents of the zip archive and double click on the resulting file entitled 'Modular Junction by Meta Function.alp'.

This will install the pack into the location of your packs as defined in the Live Preferences.

Updates

Periodic updates will be issued subject to bug fixing. Please see Section 20: Change Log in this User Manual for details about version revisions.

Section 3: Installation continued

In Use

After installation, simply navigate to your Packs within Live's Browser to locate the desired Device and drag and drop it onto a Track.

Modular Junction MIDI FX

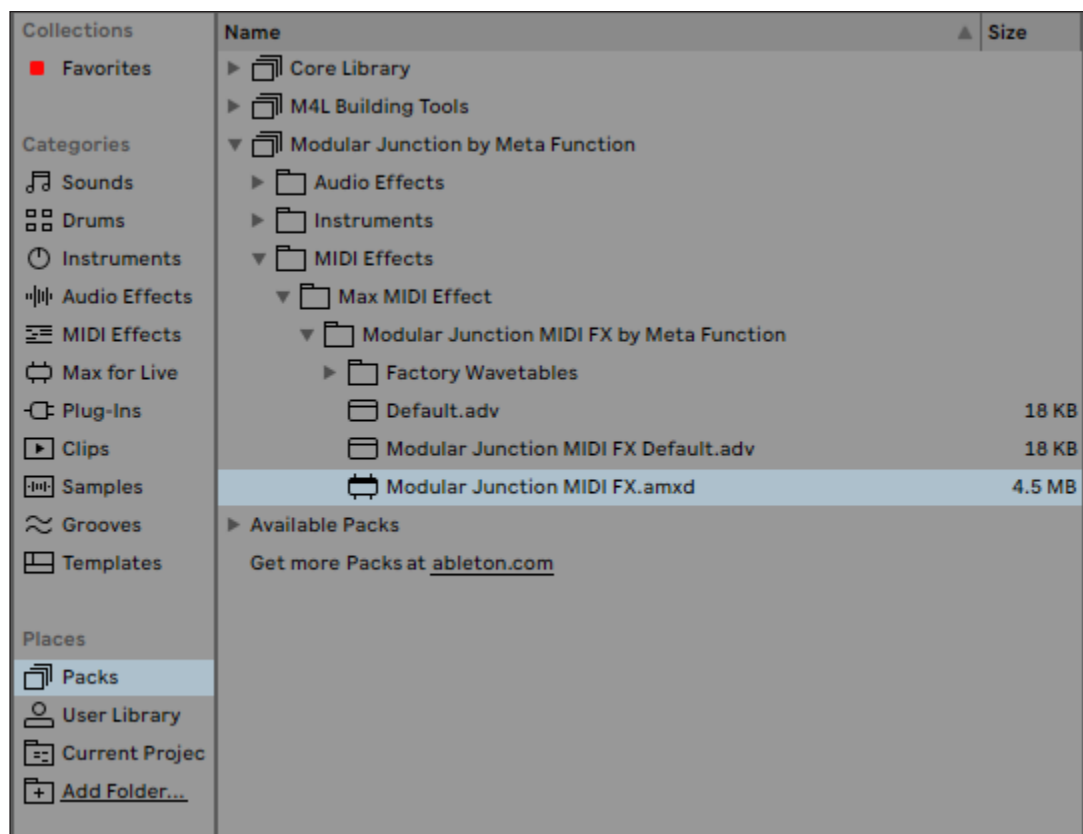
Location: Packs > Modular Junction by Meta Function > MIDI Effects > Max MIDI Effect > Modular Junction MIDI FX by Meta Function > Modular Junction MIDI FX.amxd

Modular Junction Audio FX

Location: Packs > Modular Junction by Meta Function > Audio Effects > Max Audio Effects > Modular Junction Audio FX by Meta Function > Modular Junction Audio FX.amxd

Modular Junction CV Instrument

Location: Packs > Modular Junction by Meta Function > Instruments > Max Instruments > Modular Junction CV Instrument by Meta Function > Modular Junction CV Instrument.amxd



The Modular Junction ships with a collection of Rack Presets. These are designed to provide novel and unique presets for Ableton's Devices (i.e. Wavetable, Operator, Hybrid Reverb, Echo etc). The Presets are organized by Device and Preset category. For more information about the Modular Junction's presets please see Section 17: Patch Storage and Automation.

Section 4: Technical Support

For any technical support inquiries, the Meta team can be contacted via email. Please forward a description of your problem alongside computer specs, operating system used and version numbers of Live and Max that you are using:

info@metafunction.co.uk

A member of the Meta team will contact you shortly afterwards. Please be patient. Meta is a small team.

Section 5: The Modular Junction Architecture

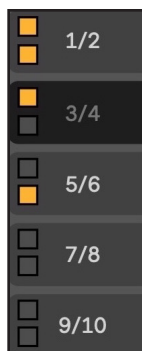
The Modular Junction utilities various algorithmic techniques to generate modulation sources. Via the Modular Junction MIDI FX, these sources can be mapped to any Ableton or third party Instrument. Via the Modular Junction Audio FX, these sources can be mapped to any Ableton or third party Audio Effect. Via the Modular Junction CV Instrument, these sources can be patched into any suitable CV input in a hardware modular synthesizer via a DC coupled audio interface. Each version of the Modular Junction is similar and is split into sections: the Modulation Routing section, the Parameter Mapping section and the Modulation Editor section.

Section 6: The Modulation Routing Section



The Modulation Routing Section provides control over the modulation sources, the signal strength and depth. Acting in a similar manner to the master section of a synth, it supports flexible adaption of the modulation sources.

Modulation Slot



This control allows you to select a pair from the ten possible modulation slots. Each slot can be enabled / disabled via the square button, allowing you to A/B the results of the modulation source.

Section 6: The Modulation Routing Section (continued)

Source



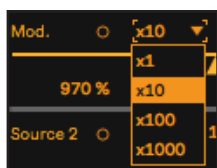
Via the drop down menu, any of the thirty four available modulation sources can be assignable to the modulation slot. Clicking the round button will open the editor window and display the parameters for the selected modulation source.

Amount



The modulation signal's amount can be set via the slider in either a positive or negative direction. The amount value can reset to zero via the round button, or by double clicking on the slider.

Width



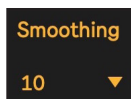
The Width menu controls the strength of the modulation signal. The options allow boosting the modulation signal to a maximum range of +/- 1000%. This can be useful for mapping appropriate values to certain software devices and external CV destinations.

Tech Note



Use of the Width menu can allow for extreme or subtle modulations. For example, when set to x1 the modulation signal might be more suitable for oscillator pitch modulation, whilst when set to x10 the modulation signal might be more suitable for filter cutoff frequency modulation

Smoothing



The Smoothing control allows you to add a few milliseconds of smoothing to the modulation signal. This is useful to smooth out any discontinuities that may be present in the modulation signal which may be audible when the signal is mapped or routed to a parameter or CV destination.

DSP Advice



Using higher smoothing settings will result in the Modular Junction using less CPU load.

Section 6: The Modulation Routing Section (continued)

Depth



The Depth control sets the position of the mapped Destination parameter (see below). This allows you to set the mapped parameter to a desired starting position at which point the modulation will occur.

Tech Note



Use of the Depth control allows you to define a start point for the mapped parameter's modulation. For example, a synth's cutoff frequency could be set via the Depth control to 500Hz, with the modulation source applied to modulate the parameter up/down to a desired position.

Depth Width



The Depth Width button controls the strength of the depth parameter. This boosts the depth amount signal by 100%. This can be useful for mapping appropriate values to certain software devices and external CV destinations.

Destination



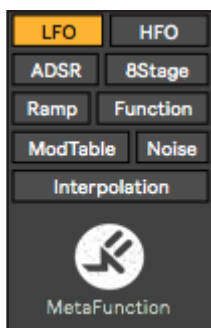
This control is used to map the modulation source to a desired parameter of any Ableton or third party device. Click the destination button and then click on the desired parameter to map (i.e. Wavetable's Osc 1 Position). Each Modulation Slot can be mapped to up to four parameter's.

Reset



The Reset button will reset the mapping assigned to any of the four Modulation Slot's.

Editor Tabs



Clicking on any of the Editor Tabs will open the corresponding Modulation Sources editor in a floating window, which can be positioned anywhere on the screen via drag and drop.

Section 7: The Modulation Sources



The Modular Junction features a very comprehensive selection of modulation sources. Here a myriad of sonic timbres can be created via mapping any of the thirty four modulation sources to Ableton or third party device parameter's or external CV hardware. The modulation sources are a core feature of the Modular Junction and it's where the majority of it's modular synthesis power lies.

Tech Note



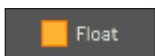
The modulation sources allow for some complex routing and sonic manipulation possibilities. It is advised that you explore it possibilities in depth. See Section 18: Work-flow Tips for more details.

DSP Advice



Note: Each modulation source used consumes CPU resources from your system. Using multiple sources at once can drain CPU on some systems. See Section 18: Work-flow Tips for details.

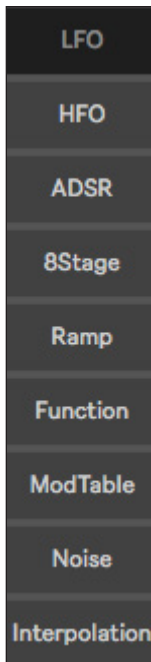
Float Button



The float button toggles the editor in and out of floating mode. A floating window permanently stays on top of all other windows. Float is the default mode the editor window opens in.

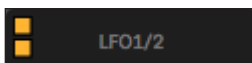
Section 7: The Modulation Sources continued

Sources



The Modular Junction features nine different types of modulation sources that feature a range of customizable parameters which can be freely mapped via the Destination control (see above) to the parameter's of any Ableton or third party device, or patched into any suitable CV input in a hardware modular synthesizer via a DC coupled audio interface.

Sources On/Off



Each modulation source features an On / Off button that enables / disables it from functioning.



Alternatively, each modulation source has a second On / Off button that enables / disables it from functioning.

DSP Advice



Note: Each modulation source used consumes CPU resources from your system. Using multiple sources at once can drain CPU on some systems. Disable sources that you are not using. See Section 18: Work-flow Tips for details.

Section 8: The LFO Sources



The Modular Junction has four independent Low Frequency Oscillators (LFOs) derived from a custom algorithm written in C. These allow for complex modulations. Each LFO shares a similar set of controls and is accessible via its own tab.

Waveshape



For each LFO, a drop down menu allows the user to select from seven possible waveshapes.

Sine

The sine waveshape is great for steady modulations that arc smoothly. Often applied to tuning, pan and amplitude destinations.

Saw Up

The saw up waveshape produces a rising sawtooth shape that is great for modulations that ramp up then collapse instantly. Often used for complex modulations.

Saw Down

The saw down waveshape produces a falling sawtooth shape that is great for modulations that ramp down then restart instantly. Often used for complex modulations.

Pulse

The pulse waveshape produces a binary like square wave modulation that is of an on / off nature. Often used for complex modulations.

Tri

The triangle waveshape is great for steady modulations that arc in a ramp fashion. Often applied to tuning, pan and amplitude destinations.

Section 8: The LFO Sources continued

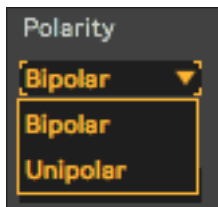
S&H

The sample and hold waveshape produces a random signal, similar to a binary signal crossed with white noise. Often used for complex modulations.

Exponential

The exponential waveshape produces a near instantaneous attack with an exponential decay. Often used for complex modulations.

Polarity



Each LFO features a polarity control to adapt its output.

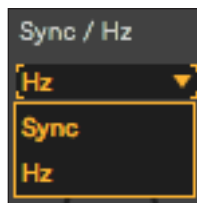
Bipolar

In Bipolar mode the LFOs output values cover the range -1 to 1. The scope reflects this range. This is the typical range used by most modulation sources within synthesis.

Unipolar

In Unipolar mode the LFOs output values cover the range 0 to 1. The scope reflects this range. This allows the creation of unusual modulation sources.

Sync / Hz



Each LFO has a freely assignable Sync / Hz control which can be set via a drop down menu. Sync locks the LFO rate to the tempo of the Live set. For the LFO sync function to work Live's transport must be running. Hz runs the LFO in cycles per second.

Rate Sync



Sync options are subdivision dependent or bar dependent.

Rate Hz



Hz runs the LFO's freely with rates ranging from 0.01 Hz to 30 Hz - well up into the audio range.

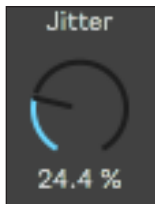
Hold



The Hold control freezes the output of the LFO to the instantaneous sample value present in the modulation signal when the control was clicked.

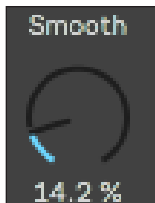
Section 8: The LFO Sources continued

Jitter



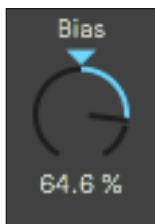
The Jitter feature applies a randomization algorithm (similar to a S&H) to the LFO's output. This can add some chaos to the LFOs waveshape and is particularly useful when used in combination with the smooth control.

Smooth



The Smooth feature applies a smoothing algorithm (similar to a lowpass filter) to the LFO's output. This can remove some jagged edges from the LFOs waveshape and is particularly useful when used in combination with the jitter control.

Bias



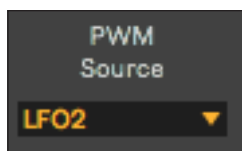
The Bias control shifts the center point of calculation of the LFO's output. It acts as an additional polarity control of the LFOs output. It is particularly useful to constrain the amount of LFO modulation applied to a destination.

PW



The PW control adapts the pulse width of the LFO's pulse wave. This adapts the duty cycle (symmetry) of the pulse wave and can be used to produce interesting shapes within the modulation signal. The PW control only works when the pulse waveshape is selected. A value of 50 represent a perfect square wave.

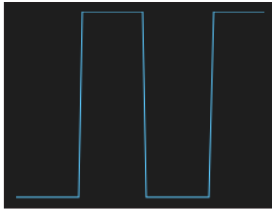
PMW Source



The PW Source selects the signal to modulate the pulse width of the LFO's pulse wave, which can be used to produce interesting shapes within the modulation signal. The PW control only works when the pulse waveshape is selected. Every modulation source within the Modular Junction is available as a PWM Source, however the source must be enabled (i.e. active) for the PWM to work.

Section 8: The LFO Sources continued

Scope



The Scope displays the output of the LFO with the X axis representing time and the Y axis representing amplitude. The Scope's range is -1 to 1, as per typical digital audio signals.

Scope Buffer Size

Scope Buffer Size 256 ▼

The Scope Buffer Size allows you to adjust the number of samples the Scope displays in one frame. For example, a Scope Buffer Size setting of 256 displays a slower moving scope than a buffer size of 32.

Signal Rate Output

Signal Rate Output 0.9708

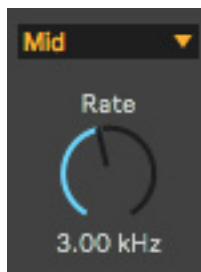
The Signal Rate Output displays the audio rate of the LFO. When the LFO is set to bipolar mode, it covers the range -1 to 1. When the LFO is set to unipolar mode, it covers the range 0 to 1. As the LFOs Rate increases the Signal Rate Output fluctuates faster. This control can be used to judge the peak and troughs of the LFO's rate.

Section 9: The HFO Sources



The Modular Junction has four independent High Frequency Oscillators (HFOs), derived from a custom algorithm written in C. Unlike LFOs, HFOs operate within the traditional audio range (i.e. 30Hz to 20kHz). These allows for complex modulations beyond the scope of normal synthesis. The HFOs can work well with certain type of synthesis parameters to give an effect similar to Frequency Modulation (i.e. Filter Cutoff Frequency FM). Each HFO shares a similar set of controls and is accessible via it owns tab. The HFOs share similar parameters with the LFOs (see above), with the exception of the parameters described below.

Rate



The HFO's rate can be set to three modes:

All

The rate can be set any where between 30Hz and 20kHz.

Low

The rate can be set any where between 30Hz and 500Hz.

Mid

The rate can be set any where between 500Hz and 6kHz.

High

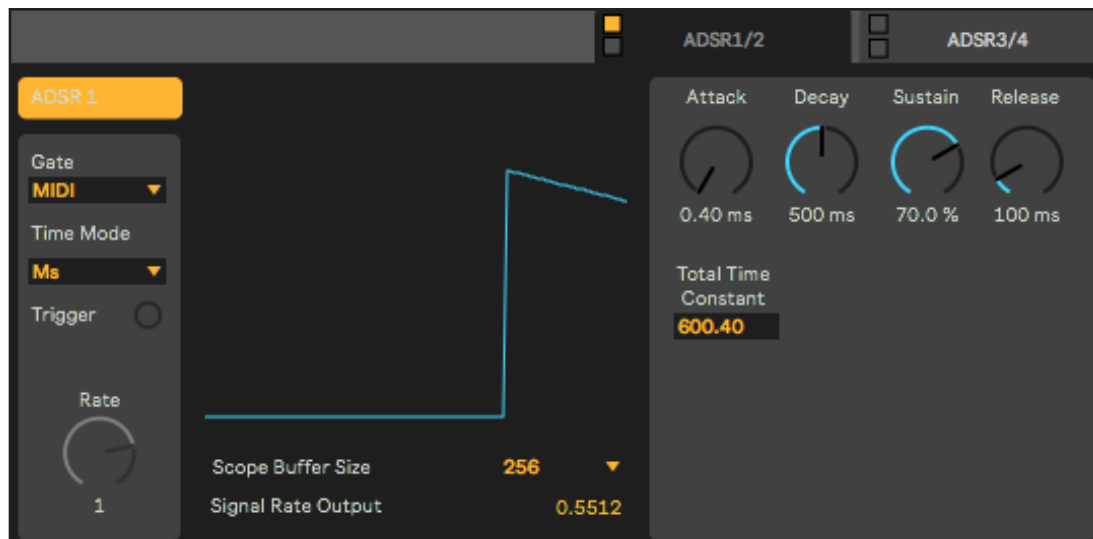
The rate can be set any where between 6kHz and 20kHz.

Tech Note



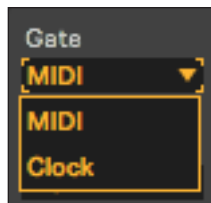
The HFO sources can create very rapid modulation sources (i.e. up to 20,000 cycles per second). For this reason there may be occasions that the HFO seems to stop outputting a signal. This is a known bug in Max. Simply tweak the HFOs Rate control slightly to re-trigger the modulation source. Depending on the HFOs parameter settings and the destination they are mapped / patched to, higher smoothing values (i.e. >100 ms) may provide less chaotic results in the modulation. See Smoothing in Section 6: The Modulation Routing Section. Note: the HFO sources are not bandlimited and are not designed to be used as audio oscillators.

Section 10: The ADSR Sources



The Modular Junction has four independent ADSR envelopes. These allows for traditional time constant modulations. Each ADSR shares a similar set of controls and is accessible via it owns tab.

Gate



For each ADSR, a drop down menu allows the user to select from two possible trigger modes.

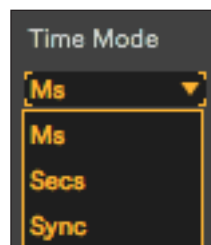
MIDI

In MIDI mode the ADSR is triggered by incoming MIDI notes.

Clock

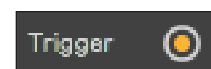
In Clock mode, the ADSR is triggered at a BPM subdivision related to the tempo of the Live set (see below). For Clock Gate mode to work Live's transport must be running.

Time Mode



Time Mode constraints the ranges of the ADSR dials time constants (i.e. the Attack dial is in Ms when Time Mode is set to Ms, the Attack dial is in Secs when the Time Mode is set to Secs etc). Sync mode allows the ADSR's time constants to be set to a BPM subdivision related to the tempo of the Live set. For Sync Time Mode to work Live's transport must be running.

Trigger



When the ADSR is triggered, either in MIDI Gate or Clock Gate mode, this LED will blink.

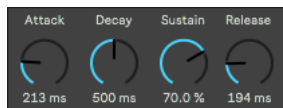
Section 10: The ADSR Sources continued

Rate



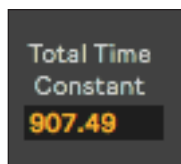
The Rate control selects the subdivision at which the ADSR is triggered when in Clock Gate mode. The Rate is a BPM subdivision related to the tempo of the Live set. For the Rate control to be active in Clock Gate mode, Live's transport must be running.

Time Constants



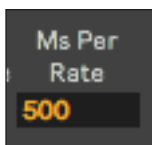
Each ADSR features four stages: Attack, Decay, Sustain and Release. Attack, Decay and Release can be measured in different Time Modes (i.e. Ms, Secs or Sync - see above) and Sustain is measured in level %. Note: when the ADSR is set to Clock Gate mode, the Release portion of the ADSR is deactivated.

Total Time Constants



The ADSR's Total Time Constants is displayed in this panel. It is the sum of every time stage of the ADSR in Ms.

Ms Per Rate



When in Clock Gate mode the Ms Per Rate panel is displayed. It shows the number of Ms between each BPM subdivision trigger controlled by the Rate control (see above). For example, if the tempo of the Live set is 120bpm and the Rate control is to 1/4 (a crochet), the Ms Per Rate will display 500 Ms ($60000 / 120 = 500$).

Exceeds Clock Rate



When in Clock Gate mode the Exceeds Clock Rate panel is displayed. It is possible for the ADSR's Total Time Constants to be to be higher value than the Ms Per Rate value. If this happens the Exceeds Clock Rate LED will be active (i.e. yellow).

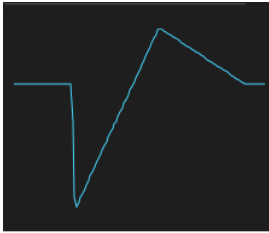
Tech Note



When the Exceeds Clock Rate LED is active it is possible that not every portion of the ADSR's time constants will be reached, as the total time constants actually exceeds the maximum amount allowed by the Rate control. However, this can result in some interesting rhythmic modulation sources.

Section 10: The ADSR Sources continued

Scope



The Scope displays the output of the ADSR with the X axis representing time and the Y axis representing amplitude. The Scope's range is 0 - 1, as per typical digital envelope values.

Scope Buffer Size

Scope Buffer Size 256 ▼

The Scope Buffer Size allows you to adjust the number of samples the Scope displays in one frame. For example, a Scope Buffer Size setting of 256 displays a slower moving scope than a buffer size of 32.

Signal Rate Output

Signal Rate Output 0.9708

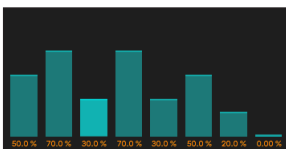
The Signal Rate Output displays the audio rate of the ADSR. As the ADSR's signal increases the Signal Rate Output fluctuates faster. This control can be used to judge the peak and troughs of the ADSR's contour.

Section 11: The 8 Stage Sources



The Modular Junction has four independent 8 Stage envelopes. These allows for novel time constant modulations, similar to those available in the Waldorf Microwave series of synths. Each 8 Stage shares a similar set of controls and is accessible via it owns tab. The 8 Stages share similar parameters with the ADSRs (see above), with the exception of the parameters described below.

Level Sliders



The Level Sliders provide control over the peak level (measured in %) of each time constant within the 8 Stage's contour.

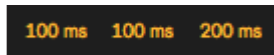
Curves



The Curve controls allows you to adjust the curve response (i.e. exponential, logarithmic or linear) of each time constant within the 8 Stage's contour.

Section 11: The 8 Stage Sources continued

Time Constants



Each of the 8 Stages Time Constants can be measured in different Time Modes (i.e. Ms, Secs or Sync - see above), depending on the Clock Gate mode setting.

Resets



The Reset buttons allow you to reset every Level, Time or All (i.e. both) parameters in the 8 Stage.

Break Points



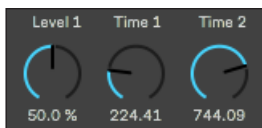
Whenever any of the 8 Stage's Break Points are reached (i.e. the time constant reaches maximum) the Break Point LED is illuminated (i.e. turns yellow). The Break Point LEDs are only displayed when the 8 Stage is operating in Clock Gate mode (see above).

Section 12: The Ramp Sources



The Modular Junction has four independent Ramp envelopes. These allows for traditional AR based time constant modulations. Each Ramp shares a similar set of controls and is accessible via it owns tab. The Ramps share similar parameters with the ADSRs (see above), with the exception of the parameters described below.

Time Constants



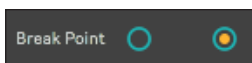
Each of the Ramps Time Constants can be measured in different Time Modes (i.e. Ms, Secs or Sync - see above), depending on the Clock Gate mode setting. As an AR contour only features one maximum level, there is only one Level control that provides control over the Ramps peak level (measured in %).

Curves



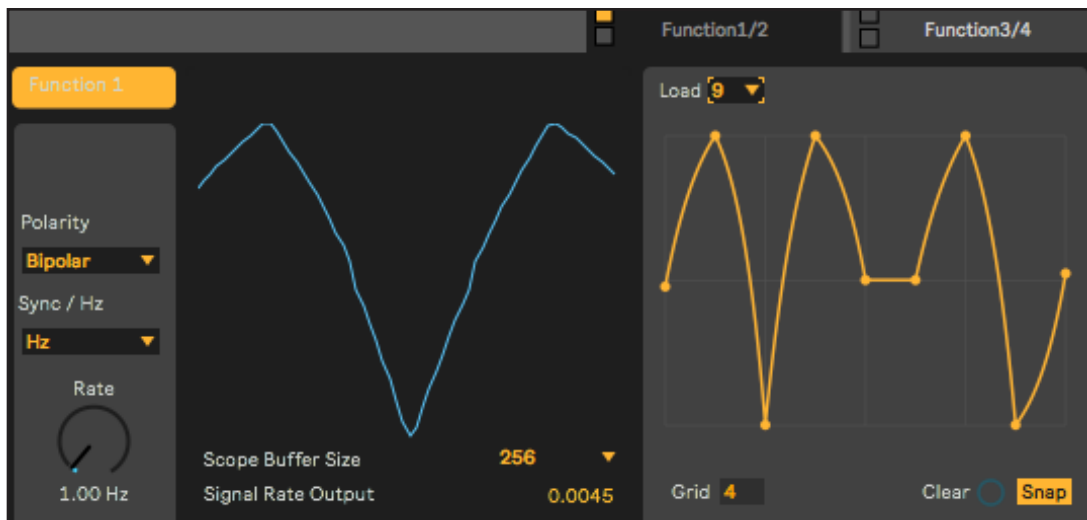
The Curve controls allows you to adjust the curve response of each time constant within the Ramp's contour. Values between 0 and -1 produce logarithmic curves while values between 0 and + 1 produce exponential curves.

Break Points



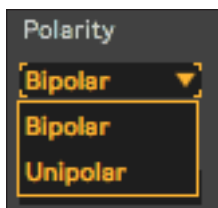
Whenever any of the Ramp's Break Points are reached (i.e. the time constant reaches maximum) the Break Point LED is illuminated (i.e. turns yellow). The Break Point LEDs are only displayed when the Ramp is operating in Clock Gate mode (see ADSR above).

Section 13: The Function Sources



The Modular Junction has four independent Function sources. These allows for custom time constant curves that can be draw by the user, or loaded via a collection of presets. Each Function shares a similar set of controls and is accessible via it owns tab.

Polarity



Each Function features a polarity control to adapt its output.

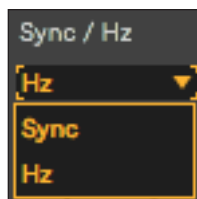
Bipolar

In Bipolar mode the Functions output values cover the range -1 to 1. The scope reflects this range. This is the typical range used by most modulation sources within synthesis.

Unipolar

In Unipolar mode the Functions output values cover the range 0 to 1. The scope reflects this range. This allows the creation of unusual modulation sources.

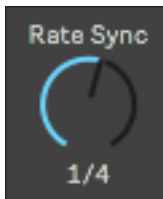
Sync / Hz



Each Function has a freely assignable Sync / Hz control which can be set via a drop down menu. Sync locks the Function rate to the tempo of the Live set. For the Function sync function to work Live's transport must be running. Hz runs the Function in cycles per second.

Section 13: The Function Sources continued

Rate Sync



Sync options are subdivision dependent or bar dependent.

Rate Hz



Hz runs the Function's freely with rates ranging from 0.01 Hz to 30 Hz - well up into the audio range.

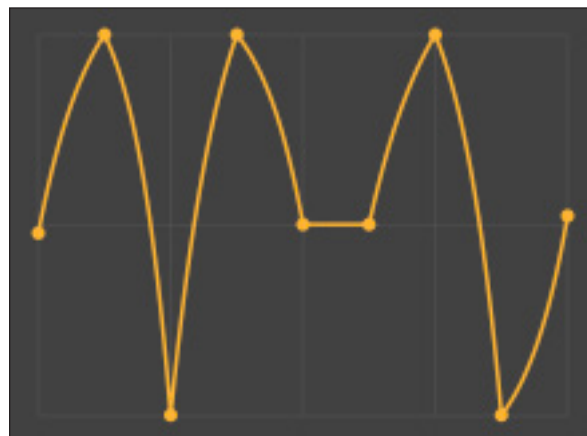
Load



This control loads allows you to load one of sixteen curve presets into the Function.

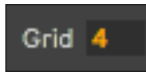
Graph

The Graph allows you to draw custom Function curves that will create the modulation signal within the source. Simply click to create break points in the curve.



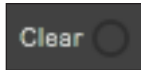
Section 13: The Function Sources continued

Grid



The Grid control sets the resolution of the snap value when creating or editing break points within the Function's curve.

Clear



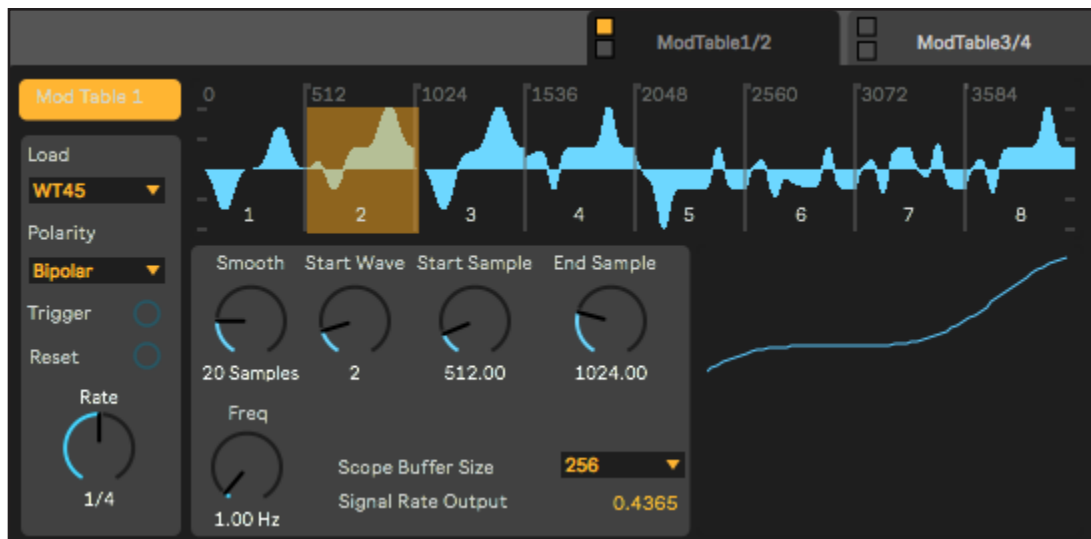
The Clear button deletes all current break points within the Function's curve.

Snap



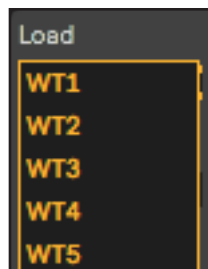
When the Snap button is active, creating or editing a break point will snap to the nearest defined Grid size (see above).

Section 14: The Mod Table Sources

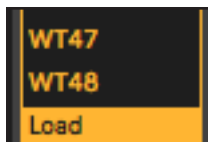


The Modular Junction has four independent Modulation Tables, a novel modulation source. Each Modulation Table can be triggered to run at a BPM subdivision related to the tempo of the Live set, providing complex evolving modulation sources. Think of Modulation Tables as a wavetable based LFO modulation source comprised of eight wave slots (i.e. eight waveshapes in sequence). Create Modulation Tables with Meta Function's free Wave Weld device (see www.MetaFunction.co.uk). Forty eight modulation table presets are included. For the Modulation Tables to work Live's transport must be running. Each Modulation Table shares a similar set of controls and is accessible via it owns tab.

ModTable Load



This control loads this control allows you to load one of forty eight wavetables into the Modulation Table. These ship with the Modular Junction and were algorithmically generated via the Wave Weld device.

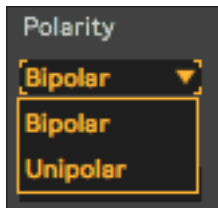


Custom Load

The Load option allows you to load a custom wavetable into the Modulation Table. The wavetable must be a 16 bit integer .WAV file that is 4096 samples in length. They can be created by Meta Function's free Max For Live device, the Wave Weld - an algorithmic wavetable generator. This device allows you to generate bespoke wavetable via a myriad of functions. Visit www.MetaFunction.co.uk for details.

Section 14: The Mod Table Sources continued

Polarity



Each Modulation Table features a polarity control to adapt its output.

Bipolar

In Bipolar mode the Modulation Tables output values cover the range -1 to 1. The scope reflects this range. This is the typical range used by most modulation sources within synthesis.

Unipolar

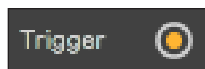
In Unipolar mode the Modulation Tables output values cover the range 0 to 1. The scope reflects this range. This allows the creation of unusual modulation sources.

Rate



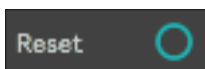
Each Modulation Table is synchronized and locks to the tempo of the Live set. For the Modulation Tables to run Live's transport must be running. Sync options are subdivision dependent or bar dependent, set by the Rate control.

Trigger



When each Wave Slot (see Start Wave below) in the Modulation Table is triggered this LED will blink.

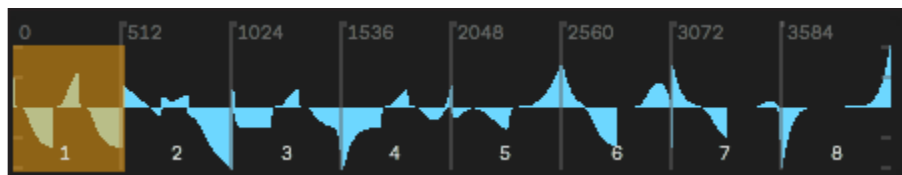
Reset



The Reset button resets the Modulation Table's Start Wave back to one (see below). This can be used to reset the Modulation Table to run from the beginning of the wavetable. For example, you may wish to reset the Modulation Table to the beginning of the wavetable when restarting Live's transport.

Waveform Display

The Waveform Display shows the resulting waveshape in each wave slot across the Modulation Table's wavetable. Each wave is numbered 1 - 8 in bold white type across the bottom. Sample number positions are labeled in gray type across the top.



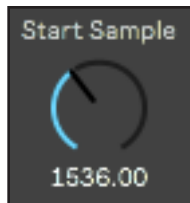
Section 14: The Mod Table Sources continued

Start Wave



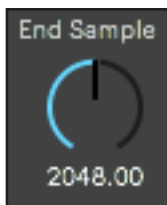
The Start Wave control allows you to adjust the starting wave slot - the start position of the wavetable loaded into the Modulation Table. As each Modulation Table needs wavetables created in the Wave Weld in increments of 512 samples, the control jumps in increments of 512 samples.

Start Sample



The Start Sample control displays the current sample value of the start position in the Modulation Table. Note: this control is used to display information and can not be adjusted by the user.

End Sample



The End Sample control displays the current sample value of the end position in the Modulation Table. Note: this control is used to display information and can not be adjusted by the user.

Frequency



The Frequency control sets the speed in Hz that each wave slot oscillators within the Modulation Table. Rates range from 0.01 Hz to 30 Hz - well up into the audio range.

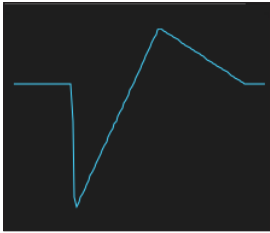
Smooth



When running the Modulation Table at high Frequency rates (see above) some discontinuities could potentially occur in the modulation signal. The Smooth parameter applies a smoothing algorithm (similar to a lowpass filter) to the edge of each wave slot. This can remove some jagged edges from the Modulation Table's output.

Section 14: The Mod Table Sources continued

Scope



The Scope displays the output of the Modulation Table with the X axis representing time and the Y axis representing amplitude. The Scope's range is -1 to 1, as per typical digital audio signals.

Scope Buffer Size

Scope Buffer Size 256 ▼

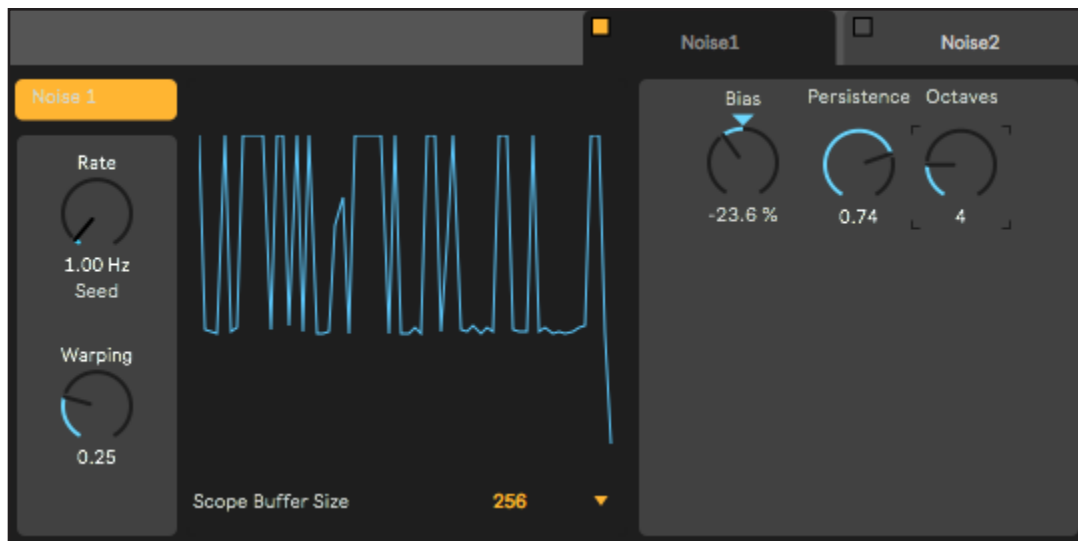
The Scope Buffer Size allows you to adjust the number of samples the Scope displays in one frame. For example, a Scope Buffer Size setting of 256 displays a slower moving scope than a buffer size of 32.

Signal Rate Output

Signal Rate Output -0.481

The Signal Rate Output displays the audio rate of the Modulation Table. As the Modulation Table's signal increases the Signal Rate Output fluctuates faster. This control can be used to judge the peak and troughs of the Modulation Table's contour.

Section 15: The Noise Sources



The Modular Junction has two independent Noise sources. These are based on a custom Perlin Noise algorithm written in C and provide a pseudo random modulation source. Each Noise source shares a similar set of controls and is accessible via its own tab.

Rate



The Rate control allows adaptation of the speed that the seed is generated within the random number generator used in the Noise source.

Warping



The Warping control allows adapt the range of each instantaneous sample value generated by the random number generator used in the Noise source. In combination with the Persistence control (see below) higher values create samples covering the range -1 to 1.

Bias



The Bias control shifts the center point of calculation within the random number generator used in the Noise source output. It acts as an adjustable polarity control of the Noise sources output. It is particularly useful to adapt the median point of the modulation signal.

Section 15: The Noise Sources continued

Persistence



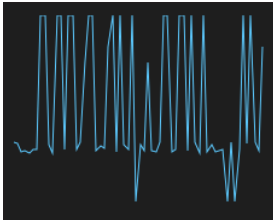
The Persistence control allows adapts the range of each instantaneous sample value generated by the random number generator used in the Noise source. In combination with the Warping control (see above) higher values create samples covering the range -1 to 1.

Octaves



The Octave control provides more octaves of Perlin noise. Higher values create a more stochastic output in the modulation signal.

Scope



The Scope displays the output of the Noise source with the X axis representing time and the Y axis representing amplitude. The Scope's range is -1 to 1, as per typical digital audio signals.

Scope Buffer Size



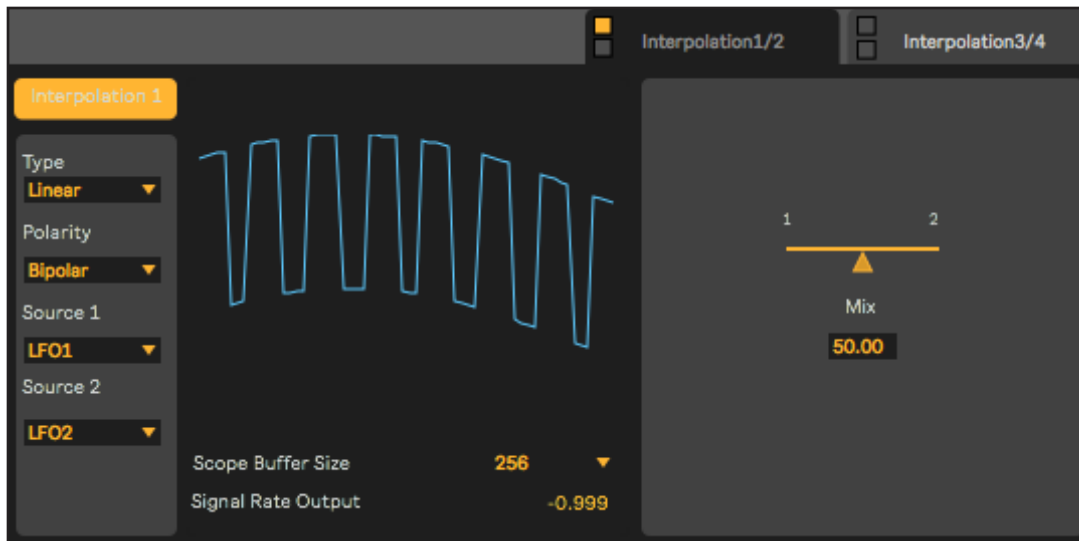
The Scope Buffer Size allows you to adjust the number of samples the Scope displays in one frame. For example, a Scope Buffer Size setting of 256 displays a slower moving scope than a buffer size of 32.

Tech Note



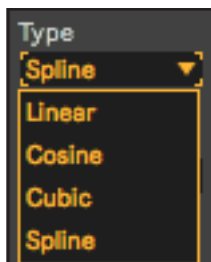
The Noise sources can create a range of random based modulation sources. Depending on their parameter settings and the destination they are mapped / patched to, higher smoothing values (i.e. >100 ms) may provide less chaotic results in the modulation. See Smoothing in Section 6: The Modulation Routing Section.

Section 16: The Interpolation Sources



The Modular Junction has four independent Interpolation sources, a novel modulation source. These are based on a custom algorithm written in C and provide a way to create new signals based on any modulation sources available in the Modular Junction. For example, a slow sine wave source in LFO 1 can be interpolated with a fast pulse wave source in LFO 2 to create a unique curve (see image above). Four Interpolation types are available. Each Interpolation source shares a similar set of controls and is accessible via its own tab.

Type



The Type control defines the type of interpolation used that has an effect on the smoothness of the function outputted by the algorithm. Changing the Type can reduce the amount of discontinuities present in the interpolation algorithm. This can be a subtle effect and can be more noticeable with high frequency sources. For more information about interpolation techniques see <http://paulbourke.net/miscellaneous/interpolation>.

Linear

In Linear mode the interpolation function uses straight line segments to construct the data points between the selected modulation sources (see below). Linear mode is the fastest and most CPU efficient type available, but results in discontinuities at each point.

Cosine

In Cosine mode the interpolation function provides a smooth transition to construct the data points between the selected modulation sources (see below). Cosine mode is slower than Linear mode and uses more CPU resources.

Cubic

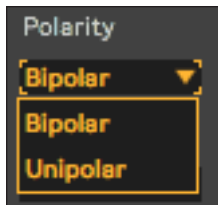
In Cubic mode the interpolation function provides a true continuity to construct the data points between the selected modulation sources (see below). Cubic mode is slower than Cosine mode and uses more CPU resources.

Section 16: The Interpolation Sources continued

Spline

In Spline mode the interpolation function provides the smoothest interpolated curve to construct the data points between the selected modulation sources (see below). Spline mode is slower than Cubic mode and uses the most CPU resources of all the Types available. Spline mode uses an method known as Breeuwsma Catmull-Rom spline interpolation.

Polarity



Each Interpolation source features a polarity control to adapt its output.

Bipolar

In Bipolar mode the Interpolation source output values cover the range -1 to 1. The scope reflects this range. This is the typical range used by most modulation sources within synthesis.

Unipolar

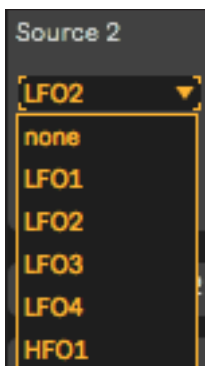
In Unipolar mode the Interpolation source output values cover the range 0 to 1. The scope reflects this range. This allows the creation of unusual modulation sources.

Source 1



The Source 1 control allows you to set the modulation source for the data points for the first calculation in the algorithm. Every modulation source within the Modular Junction is available as Source 1, however the source must be enabled (i.e. active) for the Interpolation to work.

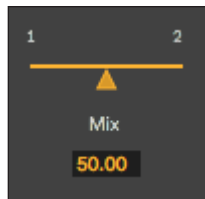
Source 2



The Source 2 control allows you to set the modulation source for the data points for the second calculation in the algorithm. Every modulation source within the Modular Junction is available as Source 2, however the source must be enabled (i.e. active) for the Interpolation to work.

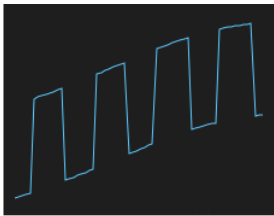
Section 16: The Interpolation Sources continued

Amount



The Amount control allows you to bend between the Interpolation sources to create custom curves. The slider or the number box can both be used to control the Amount. 0% = Source 1, 50% = Max Interpolation, 100% = Source 2.

Scope



The Scope displays the output of the Interpolation source with the X axis representing time and the Y axis representing amplitude. The Scope's range is -1 to 1, as per typical digital audio signals.

Scope Buffer Size

Scope Buffer Size 256 ▼

The Scope Buffer Size allows you to adjust the number of samples the Scope displays in one frame. For example, a Scope Buffer Size setting of 256 displays a slower moving scope than a buffer size of 32.

Signal Rate Output

Signal Rate Output 0.9708

The Signal Rate Output displays the audio rate of the Interpolation source. When the Interpolation source is set to bipolar mode, it covers the range -1 to 1. When the Interpolation source is set to unipolar mode, it covers the range 0 to 1. As the Interpolation source's signal rate increases the Signal Rate Output fluctuates faster. This control can be used to judge the peak and troughs of the Interpolation source rate.

Section 17: Patch Storage, Automation and Integration with Push

Patches

The Modular Junction utilities Live's comprehensive storage system for saving patches (also known as presets). This system allows you to load patches from your hard disk via Live's Hot Swap mode. You can also create, store and later recall your own patches via your User Library. The Modular Junction ships with many patches created by Meta's team of leading sound designers. Like most Live Devices, these are organized into the following folders, categorized by Device and Sound Type.

Presets are located in the following locations:

Modular Junction MIDI FX

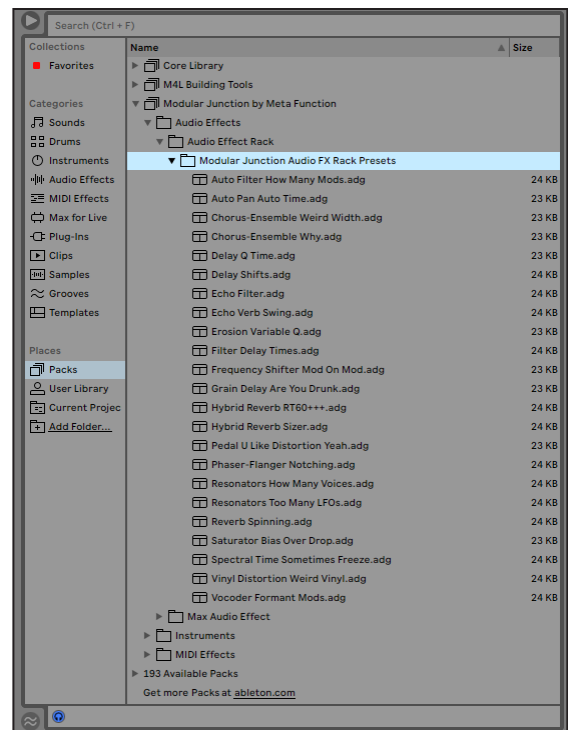
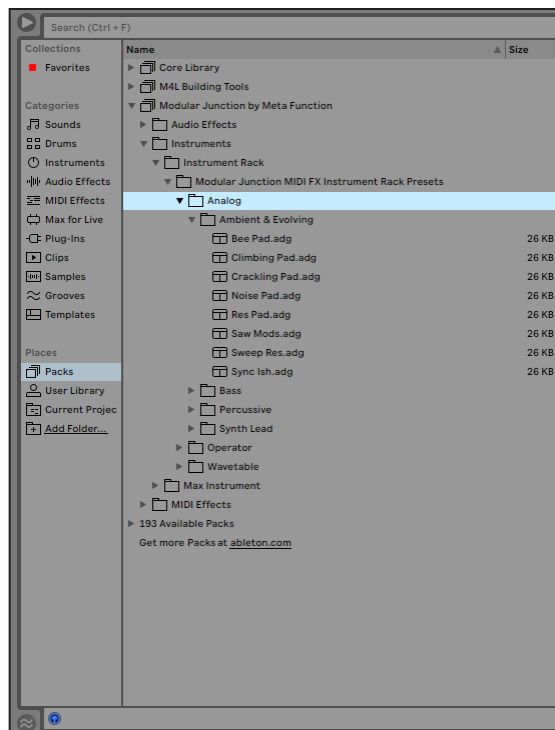
Location: Packs > Modular Junction by Meta Function > Instruments > Instrument Racks > Modular Junction MIDI FX Instrument Rack Presets.

Presets for Analog, Operator and Wavetable are located in named folders.

Modular Junction Audio FX

Location: Packs > Modular Junction by Meta Function > Audio Effects > Audio Effect Rack > Modular Junction Audio FX Rack Presets

Audio FX presets feature the Ableton device in the preset filename.



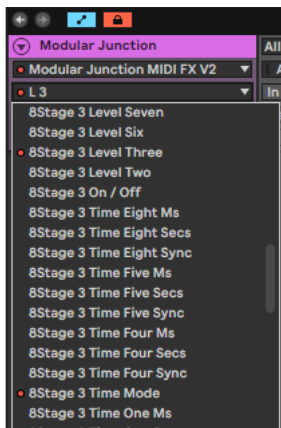
Within the device's folder is a preset named 'Default.adv'. If you ever want to reset the Modular Junction back to its original blank state just load this patch. See pages 274 - 276, 63 and 56 of the Live User Manual for more information about Live Device Presets, Hot Swap mode and your User Library.

Section 17: Patch Storage, Automation and Integration with Push continued

Automation

The Modular Junction's main parameters can be controlled via Live's MIDI and Key Remote Control system and automated via Live's Automation Envelopes or Arrangement / Session View Automation techniques. Please refer to pages 623, 46 and 315 for more information about Live's MIDI and Key Remote Control system, Automation Envelopes, Recording Automation in Arrangement View and Recording Automation in Session View. Alternatively, the Modular Junction can be placed inside a Rack and Macro Controls can be utilized to control and automation several parameters at once. Please refer to pages 295 and 308 for more information about Live's Rack's and Macro Controls.

Automation Parameters



All of the Modular Junction's automatable parameters are visible inside Live's Automation Control Chooser. The labels of automated controls have a red LED. This applies to all aspects of Live's Automation system (i.e. Clip View Automation Envelopes, Recording Automation in Arrangement View and Recording Automation in Session View). Ensure that Live's Automation Mode is active (the blue icon) when attempting to utilize automation curves.

Section 17: Patch Storage, Automation and Integration with Push continued

Integration with Push

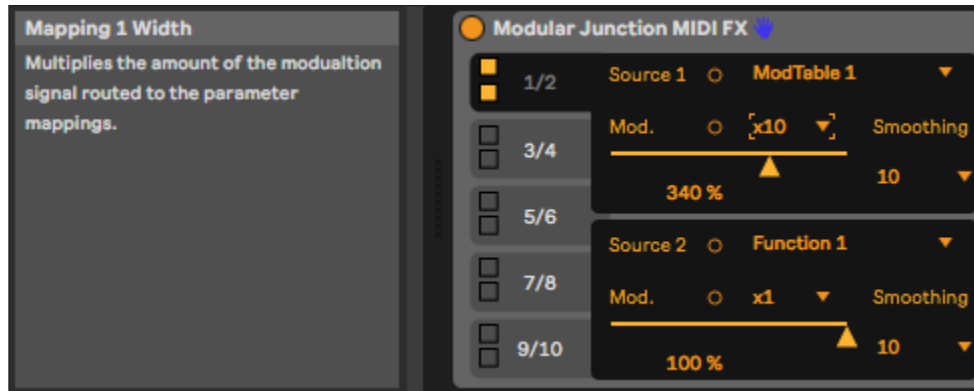
The Modular Junction features cohesive integration with Ableton's Push. All Modular Junction presets are available to load from Push via the 'Browse' button and are located within the 'Max for Live' sub-folder. The most important parameters map to Push's eight encoders, accessible from Push's 'Device' button. Once Push is connected Parameters are mapped into ten banks accessible from Push's 'Selection Control' buttons:

Bank	Parameters
1	Slot 1 On/Off, Slot 1 Depth, Slot 1 Depth Width, Slot 1 Width, Slot 1 Amount, Slot 1 Smoothing, Slot 1 Source
2	Slot 2 On/Off, Slot 2 Depth, Slot 2 Depth Width, Slot 2 Width, Slot 2 Amount, Slot 2 Smoothing, Slot 2 Source
3	Slot 3 On/Off, Slot 3 Depth, Slot 3 Depth Width, Slot 3 Width, Slot 3 Amount, Slot 3 Smoothing, Slot 3 Source
4	Slot 4 On/Off, Slot 4 Depth, Slot 4 Depth Width, Slot 4 Width, Slot 4 Amount, Slot 4 Smoothing, Slot 4 Source
5	Slot 5 On/Off, Slot 5 Depth, Slot 5 Depth Width, Slot 5 Width, Slot 5 Amount, Slot 5 Smoothing, Slot 5 Source
6	Slot 6 On/Off, Slot 6 Depth, Slot 6 Depth Width, Slot 6 Width, Slot 6 Amount, Slot 6 Smoothing, Slot 6 Source
7	Slot 7 On/Off, Slot 7 Depth, Slot 7 Depth Width, Slot 7 Width, Slot 7 Amount, Slot 7 Smoothing, Slot 7 Source
8	Slot 8 On/Off, Slot 8 Depth, Slot 8 Depth Width, Slot 8 Width, Slot 8 Amount, Slot 8 Smoothing, Slot 8 Source
9	Slot 9 On/Off, Slot 9 Depth, Slot 9 Depth Width, Slot 9 Width, Slot 9 Amount, Slot 9 Smoothing, Slot 9 Source
10	Slot 10 On/Off, Slot 10 Depth, Slot 10 Depth Width, Slot 10 Width, Slot 10 Amount, Slot 10 Smoothing, Slot 10 Source

Section 18: Work Flow Tips

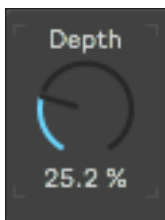
Info View

Information about every parameter and control within the Modular Junction can be displayed with Live's Info View. Simply expand the Info View and hover your mouse over a control and a description of that controls function will be displayed within the Info View:



Programming the Modular Junction

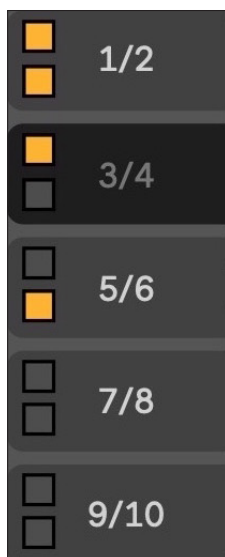
The Modular Junction is a complex device. Below is a way you can speed up your programming or adjust parameters by a fine level of resolution.



Select Parameter and use arrows keys

A quick way to adjust parameters with a fine resolution is to click on the parameter. A dark gray box will appear around the parameter. You can then use the up/down arrows keys to adjust the parameter at a fine resolution.

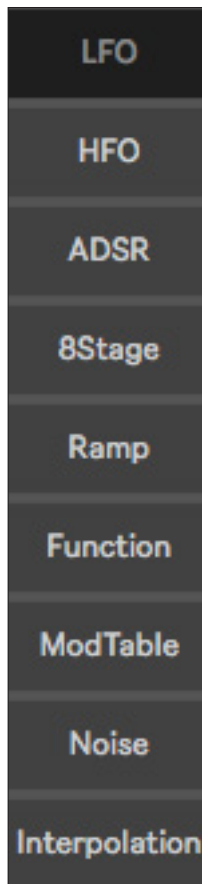
Modulation Slots



The more Modulation Slots you use in your patch, the more CPU resources are needed!

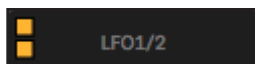
Section 18: Work Flow Tips continued

Modulation Sources



The more Modulation Sources you use in your patch, the more CPU resources are needed!

On / Off



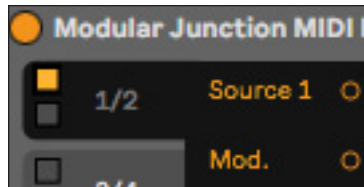
Only enable sections of the Modular Junction that you intend to use in your patch. Most sections of the Modular Junction feature an On / off control. Once yellow, the section is active. When a section is in-active it consumes no DSP cycles to maximize CPU efficiency.

Section 18: Work Flow Tips

Mapping the Modular Junction to parameters

Mapping the Modular Junction sources to parameters in software devices is simple. Just follow these steps:

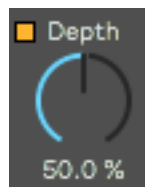
Enable the mod slot you wish to use via the square button:



Click the destination button and then click on the desired parameter to map. Each Modulation Slot can be mapped to up to four parameter's. In this example we have mapped the destination to Operator's Time parameter:



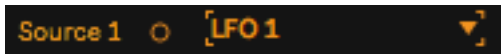
Set the mapped parameter to a desired starting position at which point the modulation will occur. If necessary, use the Depth Width button to control the strength of the depth parameter. This boosts the depth amount signal by 100%. This can be useful for mapping appropriate values to certain software devices and external CV destinations. In this example, Operator's Time parameter needs the Depth Width button active to provide depth between 0 -100 as apposed to 0 - 1:



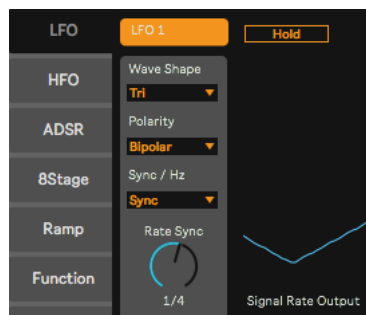
Section 18: Work Flow Tips

Mapping the Modular Junction to parameters continued

Via the drop down menu, assign the desired modulation source to the modulation slot. Clicking the round button will open the editor window and display the parameters for the selected modulation source, or alternatively clicking on any of the Editor Tabs will open the corresponding Modulation Sources editor in a floating window, which can be positioned anywhere on the screen via drag and drop:



Next, activate the modulation source via the On/Off button that enables / disables it from functioning:



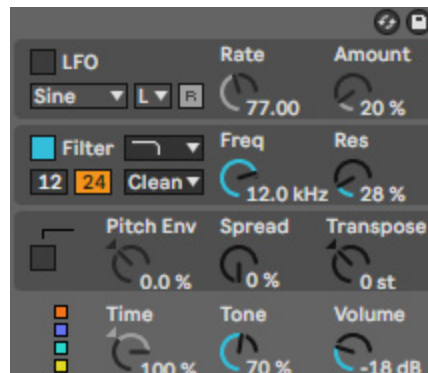
Adjust the modulation signal's amount via the slider in either a positive or negative direction. Adjust the Width menu to taste. The options allow boosting the modulation signal to a maximum range of +/- 1000%. This can be useful for mapping appropriate values to certain software devices and external CV destinations. In this example, Operator's Time parameter needs the Width menu set to x1000 to provide suitable depth scaling:



Section 18: Work Flow Tips

Mapping the Modular Junction to parameters continued

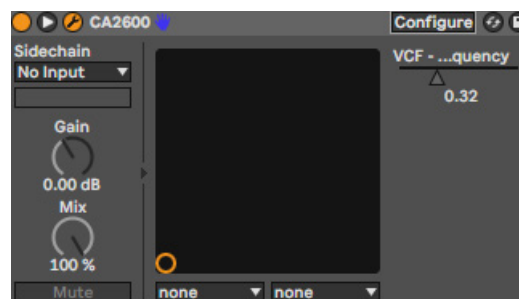
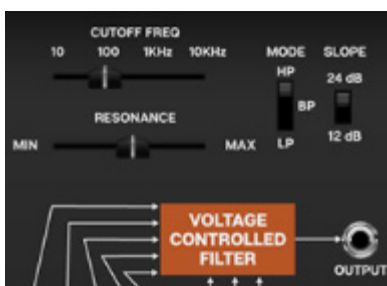
The mapping parameter should now be modulated via the source. The parameter should be gray to indicate that the parameter is under control via the Live Object Model. In this example, Operator's Time parameter has been modulated:



Mapping third party AU / VST devices may involve a few additional steps. In this example we will map the VCF Cutoff Frequency in Cherry Audio's awesome CA2600 plug-in (an emulation of the ARP 2600). Unfold the device's parameters via the triangle and click the Config button:



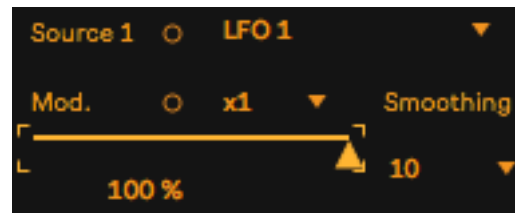
This should open the plug-in's main interface. Simply click on the desired parameter to map. This should add the parameter to the plug-in's Panel in the Device view. Next, click the Config button to deactivate configuration:



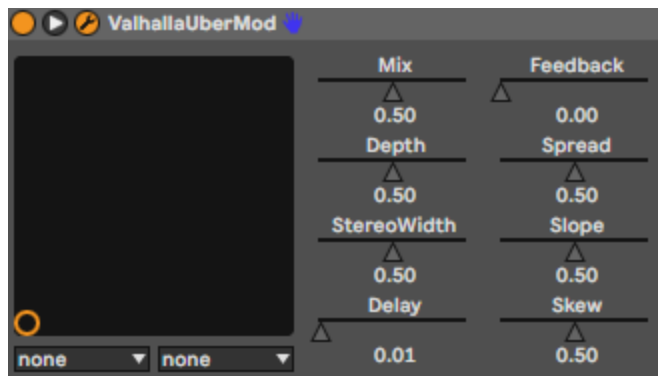
Section 18: Work Flow Tips

Mapping the Modular Junction to parameters continued

Set the mapped parameter to a desired starting position at which point the modulation will occur via the Depth control and assign the desired modulation sources to the modulation slot. Don't forget to activate the modulation source via the On/Off button in the floating editor:



Some third party AU / VST devices have their parameters pre-configured. Just unfold the device's parameters via the triangle and map the desired parameter to the desired mod slot. In the below example we have mapped the Depth parameter of Valhalla DSP's Valhalla Uber Mod to Mod Slot 1. No configuration was required:

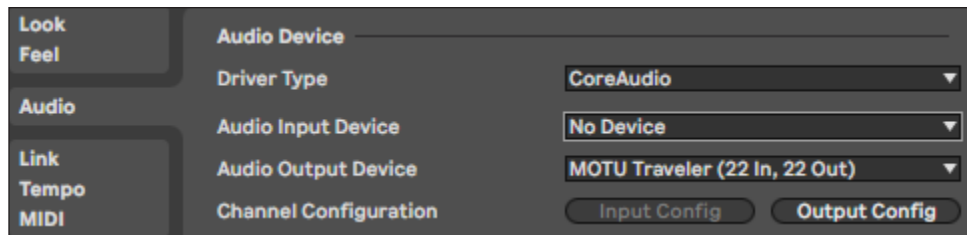


Section 18: Work Flow Tips

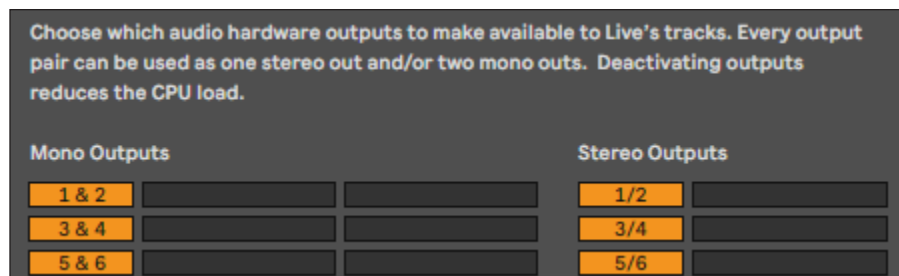
Using the Modular Junction CV Instrument to control external CV hardware

To send CV signals to external CV compatible hardware (i.e. Eurorack or 5U modular systems) a DC coupled audio interface is needed. For more info visit <https://help.ableton.com/hc/en-us/articles/360004966139-CV-Tools-Overview-Technical-FAQ>.

Inside Live's Audio Preferences ensure that your audio interface is selected as the active Audio Output Device:

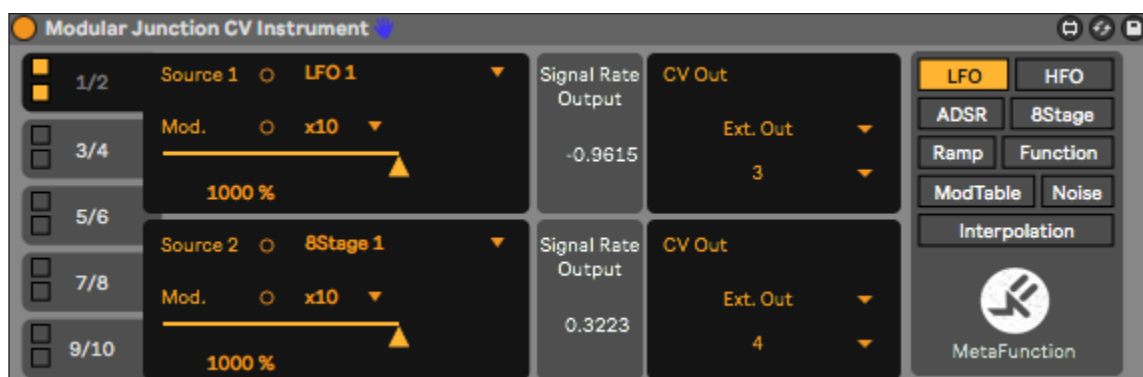


Also ensure that any outputs you wish to use are enabled via the Output Config window:



The Modular Junction CV Instrument is just capable of sending CV modulation signals and not MIDI notes. MIDI notes can be sent to your external CV hardware via a traditional MIDI Interface or via Ableton's CV Tools CV Instrument running on a separate track. For more info visit <https://www.ableton.com/en/packs/cv-tools/>.

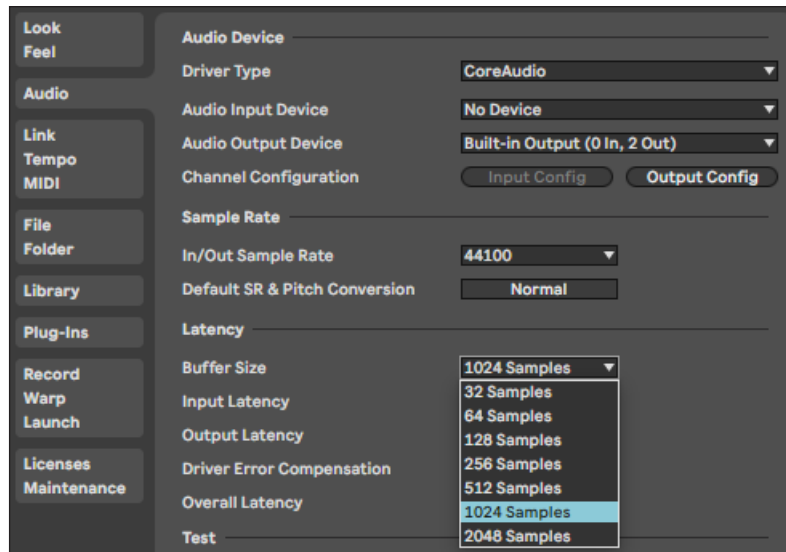
Finally, simply route your modulation signals out of the Modular Junction via the CV Out section:



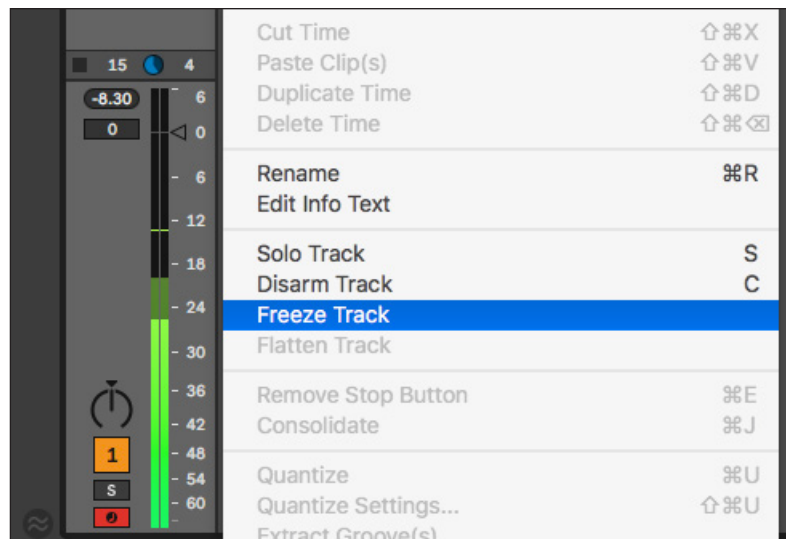
Section 18: Work Flow Tips continued

Managing CPU

The Modular Junction is a heavy device and can use considerable CPU resources. Considering raising Live's Buffer Size inside Preferences > Audio Tab > Buffer Size to a higher number. The higher the number, the less CPU resources the Modular Junction will use but at the expense of I/O latency:



Alternatively, once the Modular Junction has been set accordingly consider Freezing the track. This reduces CPU load. Please refer to pages 765 for more information about Live's Track Freeze feature.



Section 19: EULA

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Section 20: Change Log

V 1.0 Initial stable release