

# SUBTRACTION ENGINE

MANUAL + USER GUIDE

# Subtraction Engine

## Obligatory Legal Stuff

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# Subtraction Engine

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## Change Log

### v1.7

- Added a output mode option to either Mute disabled notes by default — or instead now send deactivated MIDI notes anywhere else in your set via the included X-Relay utility

### v1.6

- Added a new play direction slider that you can click and drag to select between the default forward, reverse, circular, or randomized playback options

### v1.5

- Added a new toggle that allows you to switch from the default legacy Random behavior, in which the randomization sliders would simply indicate the likelihood of randomization, to a new Weighted behavior in which the randomization sliders correspond instead to a step's likelihood of being randomized to On (at higher values) or Off (at lower values)
- Bug fixes and optimizations

### v1.2

- Added Cycle Reset option to reset polymetric masking at intervals measured in bars
- Updated GUI for consistency with other Manifest Audio devices
- Bug fixes and optimizations

### v1.1

- Bug fixes and optimizations

# Subtraction Engine

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## Important Info

Subtraction Engine is a MIDI effect, which means it *cannot* be used on audio tracks, and *must* be placed *before* instruments so it can process the MIDI notes being fed into them.

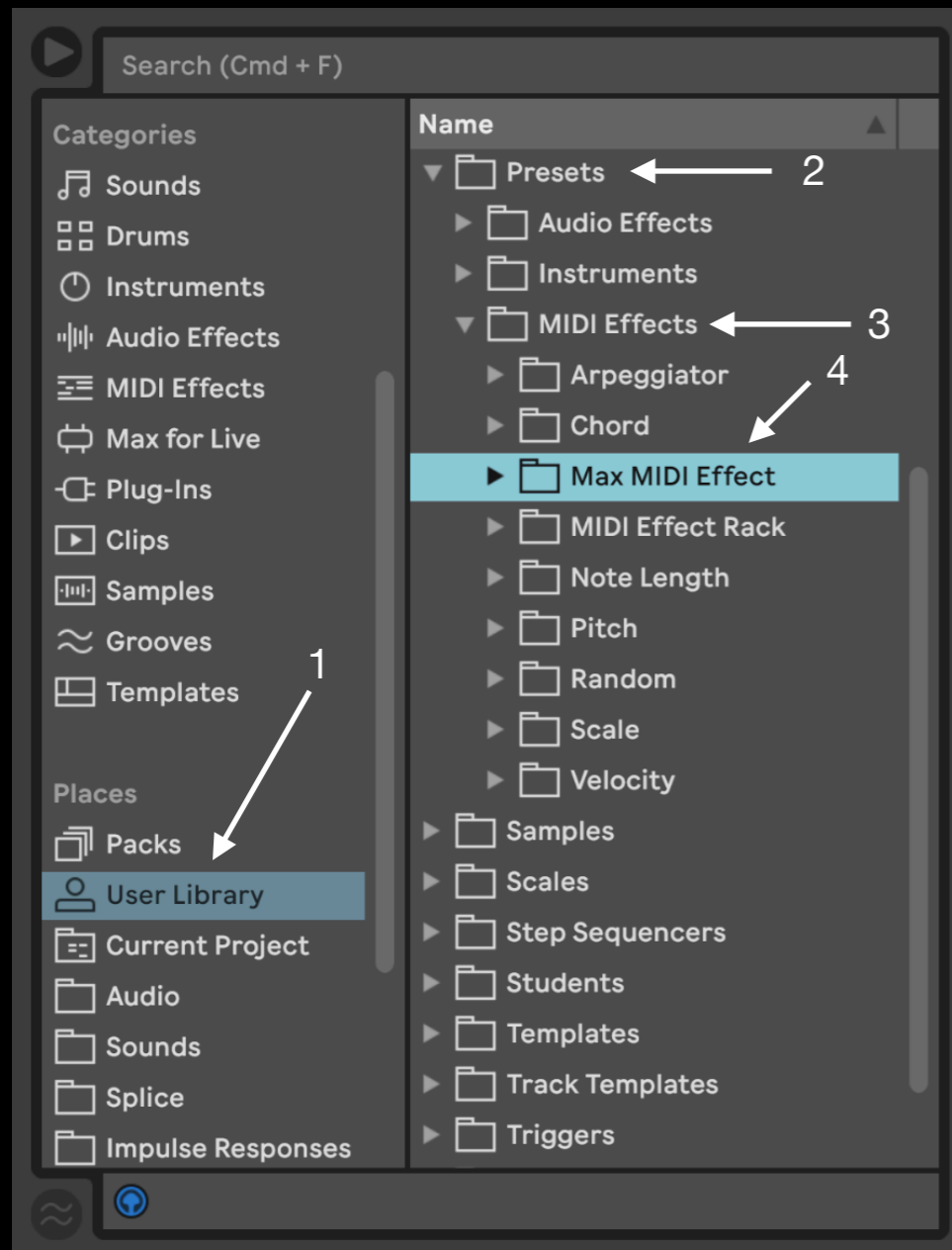
It also does not generate MIDI notes on its own, so be sure to trigger a MIDI Clip on the MIDI track where you've placed it — or add generative MIDI devices prior to it — so it can process MIDI information.

Finally, this device requires Live Suite with Max for Live installed. We strongly recommend Live 9.5 or higher with Max 8 or higher.

# Subtraction Engine

## Installation Instructions

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To install Subtraction Engine, first open Live. Then navigate to the Subtraction Engine folder accompanying this PDF from the ZIP archive it arrived in.

Open Live's browser and drag the entire Subtraction Engine folder onto any appropriate location within Live's User Library. Feel free to select any location you want, but User Library (1) > Presets (2) > MIDI Effects (3) > Max MIDI Effect (4) would be ideal for Live's native folder structure.

You could alternatively move it anywhere on your hard drive, but placing it within Live's User Library ensures the Max for Live file is ingested to Live's Max for Live browser Category for easy future access.

After navigating to the Subtraction Engine folder within Live's browser, open Presets, then MIDI Effects to access the 16 .adv presets that come with the device, or open the Max MIDI Effect folder contained within Presets to access the default MFA Subtraction Engine.amxd Max for Live MIDI Effect device.

You may wish to add these to an appropriate Collection in Live's browser, or add the containing folder to your Live browser's Places. Experiment with the .adv presets, or drag the .amxd in to start fresh.

If you've placed the folder in Live's User Library, you should also find the MFA Subtraction Engine default Max for Live Device in the Max MIDI Effect folder of Live's Max for Live browser category.

# Subtraction Engine

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## Device Overview

Less is more: addition by subtraction is the name of the game.

Subtraction Engine is designed to mute steps of incoming MIDI drums, melodies, and harmonies in real-time to create variations, build tension, or experiment with different expressions of pre-programmed rhythmic and musical phrases.

The large Dice button randomises all eligible Step states to instantly produce new variations on a MIDI sequence. The Global Probability Amount slider governs the chance of Step states flipping for all Steps simultaneously — but Step Probabilities can also be set individually. By reducing a Step's Probability to 0% you can Lock it, excluding it from randomisation for highly programmable control.

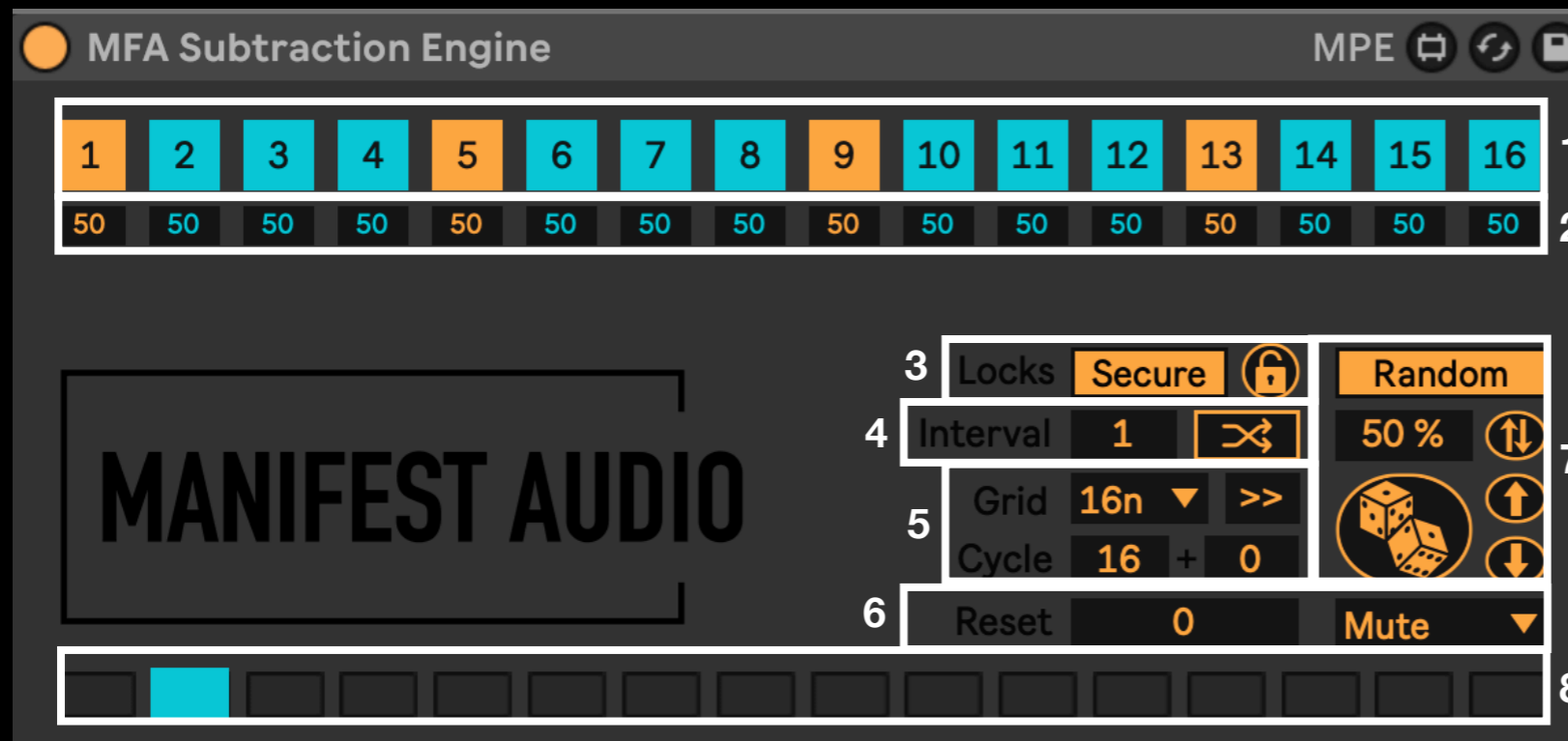
Clicking the Manual toggle to switch into Auto Dice mode allows you to create infinitely evolving permutations of any MIDI fed into Subtraction Engine, randomising all unlocked steps at the specified Interval, set in bars. This could be used to generate new melodic riffs at, for example, Intervals of 2 or 4, or for creating continuous variations on percussion patterns — with Locked Steps perpetually exempt.

Experiment, have fun, and capture your results to new MIDI or Audio Clips by recording them to other tracks in Live.

# Subtraction Engine

## Visual Guide

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1 · Step Toggles determine whether or not MIDI notes that fall on these steps will be triggered. Orange toggles simply indicate downbeats for easier orientation at a glance.

2 · Step Probability sliders determine the chance that a Step Toggle's state will be flipped at the next randomisation trigger; setting a Step Probability to 0% will Lock it, meaning it will never randomise and instead remain in its manually programmed state, whether On or Off.

3 · In default Secure mode, Global Randomisation does not affect Locked Steps; toggled into Force mode, the Global Randomisation Amount will override step locks. Unlock toggles current Locks off; in the event all steps are locked, the Unlock toggle goes orange to invite unlocking.

4 · The Interval slider determines the interval, in bars, at which randomisations will be triggered in Auto Dice mode; click the shuffle arrows to toggle in or out of Auto Dice mode.

5 · Grid Resolution determines the metrical resolution of the grid; however, it is limited to 16 steps: setting it to 32n will only process 1/2 bar of MIDI, while setting it to 8n will process 2 bars of MIDI in 1/8th note chunks. At the default Cycle setting of 16, the pattern will play all steps, starting at 1. Shorten the Cycle below 16 for polyrhythmic masking of ongoing note patterns, and adjust the Offset to shift the starting step. You can also choose from forward, reverse, elliptical, or random step direction.

6 · Reset polyrhythmic patterns in intervals measured in bars; 0 never resets. In default Mute mode, deactivated steps will not output MIDI at all; select a Relay channel to instead send deactivated notes to a Relay conduit for reception by an instance of the X-Relay device included with Utility Boost.

7 · In default Random mode, percentage determines the likelihood of randomisation; in Weighted mode, probabilities determine the likelihood of steps randomising to On at higher values, or Off at lower values. The Global Randomisation Amount slider controls the probabilities of all Steps simultaneously; the Dice button triggers randomisation of all eligible, unlocked (greater than 0%) steps. In Auto Dice mode, randomisations automatically occur at each bar Interval set by the slider at left, easily creating automatic permutations. Click the Dice to randomise at any time. The Steps On (arrow up) button toggles all Steps On at once; Steps Off (arrow down) does the opposite. In between, Invert (two arrows) flips all unlocked steps to their opposite state.

8 · The playhead indicator shows where Live's Transport playhead corresponds to the 16-step cycle.

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## Detailed Usage

Each of Subtraction Engine's 16 Step Toggles can be assigned to QWERTY Keys or a MIDI interface via Live's Key and MIDI mapping modes for hands-on control. In a live performance, this would allow you to easily switch notes in a MIDI pattern on or off. The device is already configured for use with Push, where all parameters should automatically appear with default mappings.

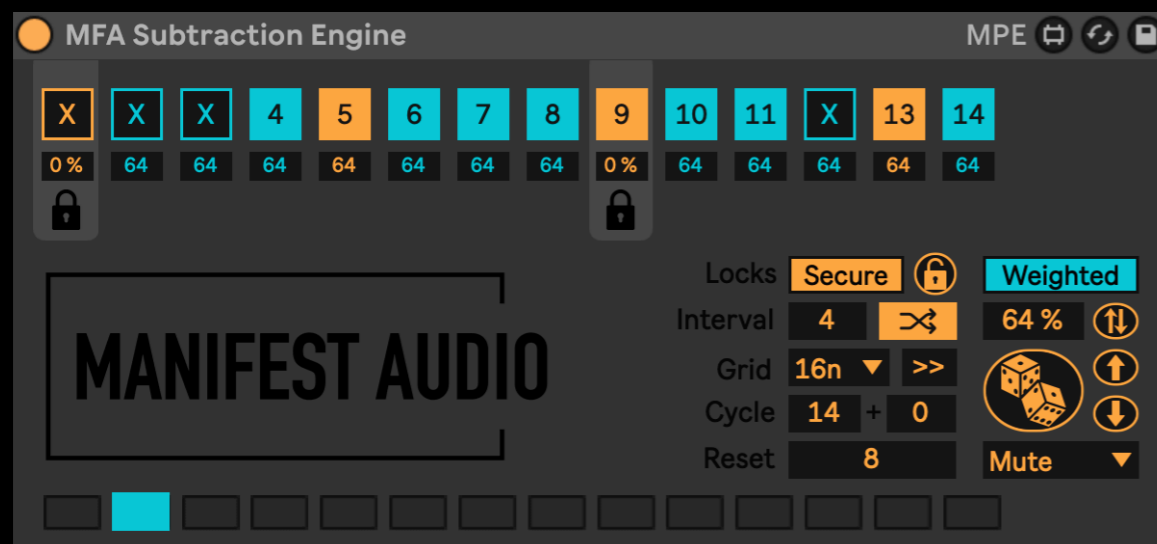
The Global Randomisation Amount slider increases or reduces the randomisation probability of all steps simultaneously. However, below each Step Toggle is a dedicated Probability slider to program different chances of randomisation for each Step independently.

Higher probabilities do not equate to the likelihood of a Step remaining On — it determines the chance that a Step's current state will be flipped. Steps set to 0% Probability are Locked, which means they ignore incoming randomisation, remaining strictly in their current state — which can of course still be changed manually. Setting a Step to 50% gives it an equal chance of being flipped or remaining the same.

While the Dice button allows for randomisation of all eligible Step states, it can be used in conjunction with the Steps On and Steps Off buttons to rapidly switch between randomised patterns, full expression of all incoming notes with Steps On, and all notes effectively muted with Steps Off. These both work along with the Secure or Override setting, so in Secure mode, Locked steps remain in their current state to preserve patterns while turning all other Steps On or Off. Try this in real-time for dynamic performance.

The Cycle and Offset values add further potential for compelling pattern variations. Shorten the Cycle length to an uneven number with certain steps off to create a cyclic, polyrhythmic mask of musical patterns that would otherwise simply be expressed at a standard phrase length: 4, 8, 16, etc. This has a unique capability to expose patterns "within patterns". Shift the relative first step position by adjusting the Offset numerical slider that follows the plus sign.

In default Manual mode, Steps are only randomised when hitting the Dice button — but Auto Dice mode opens up generative possibilities. You can still click the Dice button while waiting for the next Interval in Auto Dice mode, but MIDI mapping, Key mappings, and automation are not available in this mode; to re-enable these functions, simply switch back to Manual control.



← In this instance, Auto Dice is enabled, so eligible Steps will be randomised at the specified Interval: every 4 bars. Steps 1 and 9 are both Locked, so they will ignore Auto Dice randomisation every 4 bars; Steps 1 will remain Off, while Step 9 will stay On. Here in Weighted mode, most Steps are set to the Global Probability with 64% chance of randomisation to On every 4 bars — but Steps 8 and 16, at 36% are less likely to randomise to On and will more likely be randomised to Off. The Grid is on. The last two steps are greyed out to reflect they are not included in the Cycle — but nonetheless remain editable. 16n and the Cycle is set to 14 steps, so it will loop every 14 16th notes. With Reset at 8, this pattern of 14 16th note steps will reset every eight bars.



# Subtraction Engine

## Example Configurations

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MFA Subtraction Engine MPE

1	2	3	4	5	6	7	8	9	10	X	12	13	14	X	16
0%	65	25	65	0%	65	65	65	0%	65	50	65	0%	65	65	96
🔒				🔒				🔒				🔒			

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Locks: **Secure** 🔒 **Random**

Interval: 2 🎲 65% ⬆️⬆️

Grid: 16n ▾ >> 🎲 ⬆️

Cycle: 16 + 0 ⬆️

Reset: 8 Mute ▾

← In this scenario, Auto Dice is enabled, so eligible Steps will be randomised at the specified Interval: every 2 bars. Steps 1, 5, 13, and 15 are all Locked, so they will ignore Auto Dice randomisation every 2 bars; Steps 1, 5, and 13 will remain On, while Step 15 will stay Off. Most Steps are set to the Global Probability with 65% chance of randomisation every 2 bars — but Steps 3, at 25%, and 11, at 50%, are less likely to randomise, while Steps 7, at 86%, and 16, at 96%, are more likely to be randomised at the 2 bar Auto Dice Interval.

MFA Subtraction Engine MPE

1	2	3	4	5	6	7	8	9	10	X	12	13	14	X	16
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒	🔒

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Locks: **Secure** 🔒 **Weighted**

Interval: 1 🎲 0% ⬆️⬆️

Grid: 16n ▾ >> 🎲 ⬆️

Cycle: 16 + 0 ⬆️

Reset: 8 Mute ▾

← This is an example of what happens if the Global Randomisation slider is set to 0%, intentionally or otherwise, in the default Secure mode. By effectively Locking all steps, randomisation functions have no effect on any Steps: they remain in their current state until manually changed, with all Steps On except for 11 and 15 in this example. The Dice button is greyed out to indicate no randomisation is currently possible while the Unlock toggle goes orange to indicate the easiest solution. Clicking Unlock will switch all percentages to 1% or the Global Amount, whichever is higher. Switching from Secure to Override allows the Global Randomisation slider value to take priority over Locks, effectively unlocking Steps that were previously locked. Experiment with both modes to get a feel for them.

# Subtraction Engine

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## FAQ

### ***Subtraction Engine isn't doing anything — what's wrong?***

This device does not generate MIDI, it only processes MIDI, so be sure MIDI is being fed into it from a Clip or a generative MIDI effect. Make sure the device is on. Then, by default, all Steps will be on as well; try turning some Steps Off to hear it take effect — or just click the Dice button to randomly generate a mute pattern.

### ***What if I don't want certain steps randomised?***

Simply reduce a Step's Probability slider value to 0% to exempt it from randomisation, whether it be manual Dice randomisation, or Auto Dice Interval randomisation.

### ***All Steps are Locked — how do I unlock them?***

In Secure mode, the Dice button, the Unlock button goes orange — just click it to revert to normal behaviour with all Step Probabilities set to 1% or the value of the Global Randomisation slider, if you change it before clicking Unlock. Alternatively, you can also unlock steps by increasing their individual Probability sliders one by one. In Override mode, simply bring the Global Randomisation Amount slider up to a non-zero value (1% or higher) and Steps will automatically unlock, as Override mode is designed to ignore step Lock functions.

### ***Why is the Global Randomisation Probability slider unlocking all my steps?***

This is the designated behaviour in Override mode, in which Step Locks are meant to be overridden by the Global Randomisation Amount slider. To adjust the Global Randomisation Amount slider without overriding Step Locks, toggle the Override button back to Secure mode.

### ***Steps are greyed out and the loop seems off — why?***

If the Cycle value is below 16, only steps up to the maximum Cycle value will play before looping; steps outside the Cycle appear greyed out but remain available for editing. This allows for polyrhythmic step exposure to create dynamic patterns from simple ones.

### ***Steps aren't randomising at the Interval I specified.***

To automatically generate new Step toggle states at specific Intervals, make sure you enable Auto Dice mode by toggling the button that says Manual.

### ***When I click the Steps On or Steps Off buttons, why do certain Steps remain in their previous state?***

In Secure mode, Locked Steps set to 0% will ignore the Steps On and Steps Off buttons so as to retain certain patterns while changing the state of unlocked Steps for dynamic playability. To deactivate Step Locks with these buttons, click the Secure toggle and switch to Override mode to force Locked Steps Off or On along with the unlocked Steps.

### ***Step Mute patterns aren't saving with my Live Set — why?***

In Auto Dice mode, unlocked Step states are hidden from Live to avoid a known conflict between Live and Max. Simply disable Auto Dice mode to enable specific patterns to be stored with your Live Set.

*Thank you for supporting us by purchasing this device — we hope it inspires your creativity!*

For more information, video tutorials, and other devices, please visit us online at: **manifest.audio**



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