

Expert Sleepers

forever

User manual

Version 1.0

Ae fond kiss, and then we sever;
Ae fareweel, and then forever!

- *Robert Burns, "Ae fond kiss"*

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Introduction

Congratulations on your purchase of an Expert Sleepers 'Forever'. Please read this user manual before operating your new module.

A note on navigating this manual

When one part of the manual refers to another, it may say something like “read the installation instructions below”. In such cases the word 'below' (or 'above') is a hyperlink, and can be clicked on. Try it.

Where to get help

Email, forum, and social media links can be found at the bottom of every page on our [website](#)¹. We also have a [Discord server](#)².

We prefer support requests to be made through the forum or Discord server, if possible – failing that, by email.

If you're lucky enough to have a local bricks and mortar modular store, please visit them, try things out, and get help there. And most of all, buy your modules from them too.

What is it?

“Forever” is an audio freeze/infinite sustain effect based on the "Temporal Freeze" algorithm on the [disting NT](#)³. It captures sound at a moment in time and sustains it indefinitely.

Three independent freeze voices each have their own gate input and toggle switch, and so can be triggered manually or by CVs from other modules.

Each voice can also overdub, layering up new source material into the frozen audio, and can play back detuned (defaulting to an octave down), adding weight and richness to the sound.

Getting started

First, carefully read the installation instructions below.

Take a glance at the quick reference page, below.

You may like to watch the videos on our YouTube channel [here](#)⁴.

If necessary, update the firmware – instructions are below.

1 <https://www.expert-sleepers.co.uk/>

2 <https://modwiggler.com/forum/viewtopic.php?t=287914>

3 <https://www.expert-sleepers.co.uk/distingNT.html>

4 <https://www.youtube.com/watch?v=yxKbuPnQcQI&list=PLG00F4K14Ym0>

Installation

House the module in a Eurorack case of your choosing. The power connector is 16-pin [Doepfer standard](http://www.doepfer.de/a100_man/a100t_e.htm)⁵. If using the power cable supplied with the module, the red edge of the cable is closest to the bottom edge of the PCB, and carries -12V. ("12V" and "RED STRIPE" are marked on the rear of the PCB itself next to this end of the connector.) Be sure to connect the other end of the power cable correctly, again so -12V corresponds to the red stripe on the cable.



Please observe ESD (electro-static discharge) precautions when handling the module (and indeed, any module).

Please do not operate the module without it being securely fastened in a case.

Physical dimensions

Forever is 8HP wide and 36mm deep.

Power requirements

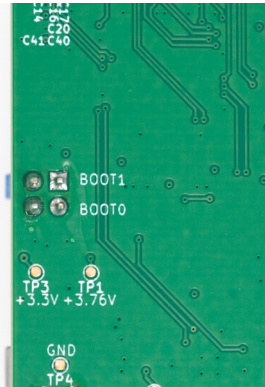
Forever draws 48mA on the +12V rail, and 8mA on the -12V rail.

It does not use the 5V rail.

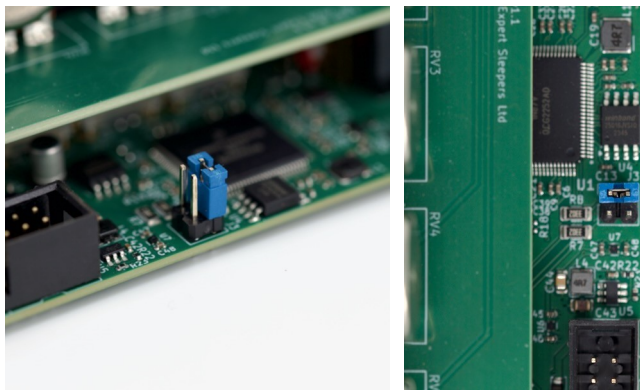
⁵ http://www.doepfer.de/a100_man/a100t_e.htm

Jumpers

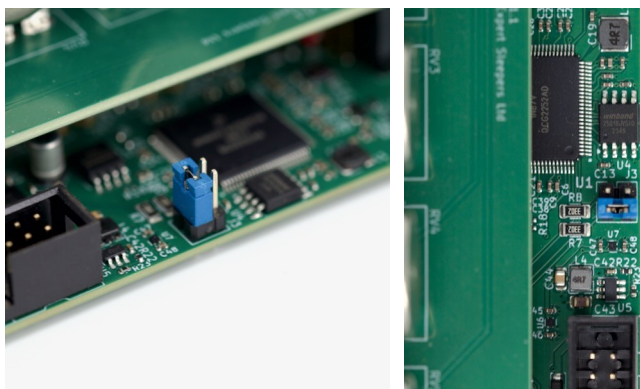
The jumper block labelled J3 can be used to force the module into serial bootloader mode, allowing firmware update over the USB port. There are two pairs of pins, labelled BOOT0 and BOOT1 on the back of the PCB.



In normal use, the jumper is across the BOOT1 pins. This is the position the jumper will be in when you receive the module.



If you need to update the module's firmware, move the jumper to the BOOT0 position to force it into bootloader mode. Note that you will have to return it to the BOOT1 position to boot normally after installing the new firmware. See below for a description of the firmware update procedure.



Please observe ESD (electro-static discharge) precautions when handling the module to move the jumper.

Inputs and outputs

All sockets are 3.5mm TS jacks. Do not use TRS cables.

Audio (in and out)

Forever's audio jack sockets are illuminated, lighting red for positive voltage and blue for negative voltage. (Audio-rate signals appear purple, since you see a rapid alternation of positive and negative.)

The audio inputs and outputs are AC-coupled.

The input can handle signals up to the full Eurorack range ($\pm 12V$); the output can deliver $\pm 11V$.

Freeze inputs

The three freeze inputs are simple logic inputs; they are either on or off. They light red when on.

A voltage of around 2V is required to turn the inputs on.

The knobs and the 'Shift' button

Forever has five knobs, which are used to control ten parameters in conjunction with the Shift button.

When Shift is not pressed, the knobs control the levels of the three freeze voices, the detune amount, and the wet/dry mix. These are labelled in normal text above the knobs.

When Shift is pressed, the knobs control the attack time, the release time, the layer time, the number of play heads, and the fade amount. These are labelled in *italics* below the knobs.

Soft takeover

Because each knob controls two parameters, the situation will inevitably arise where the knob position does not reflect the actual value of the parameter it's controlling.

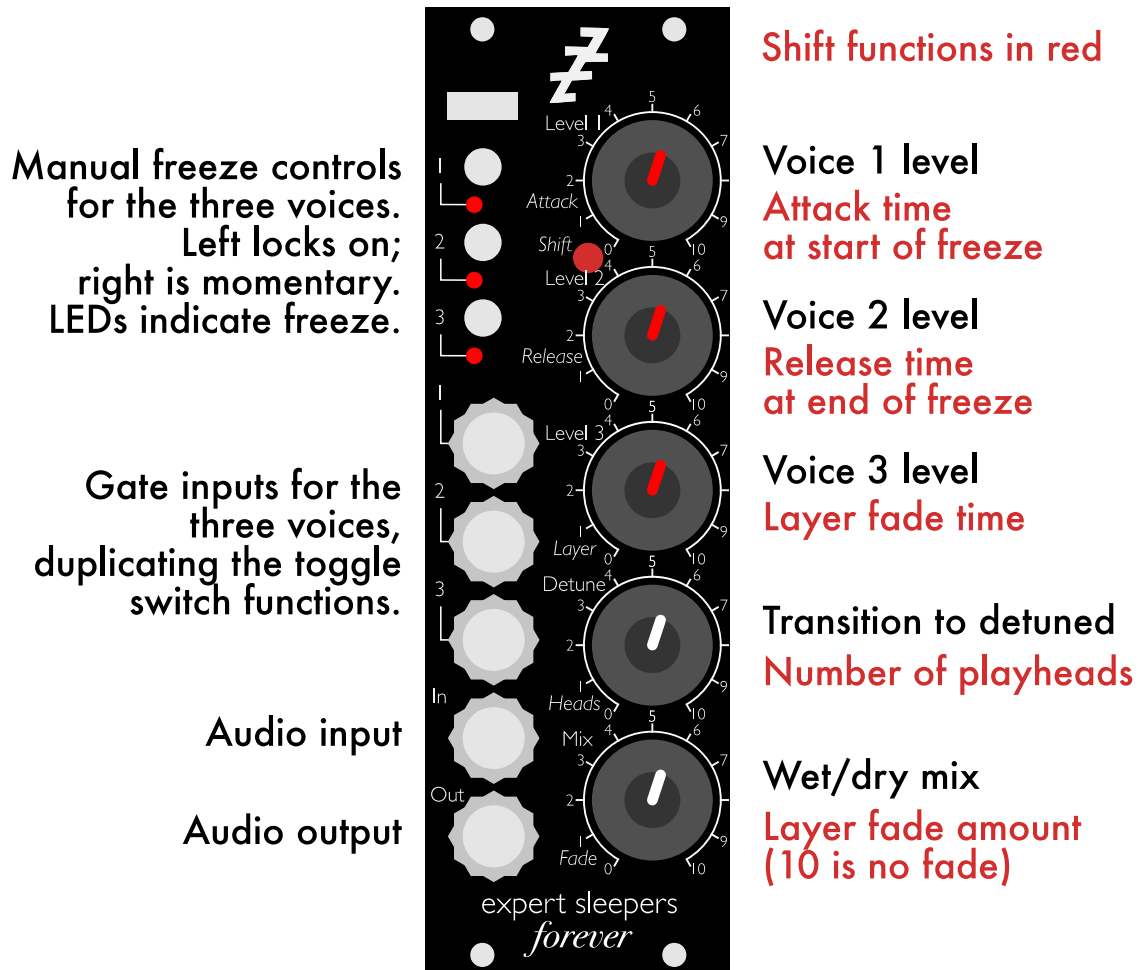
Say for example your Mix is at 5 (the 12 o'clock position), and you use Shift to change Fade to its maximum value. You release Shift, and the knob is now controlling Mix again – but the knob is at 10 while the value is actually at 5.

Forever uses a 'relative' soft takeover scheme to avoid sudden parameter jumps in these situations. Whatever the knob position and the parameter value, turning the knob clockwise will always increase the parameter value, and turning the knob counterclockwise will always decrease the value. As this happens the parameter plays 'catch up' so pretty soon they're back in sync again.

You may find it helpful to watch this in action using the web tool (see below), to get a feel for how it works.

Quick reference

This diagram attempts to sum up the whole module in a single page. Please read on for more detail.

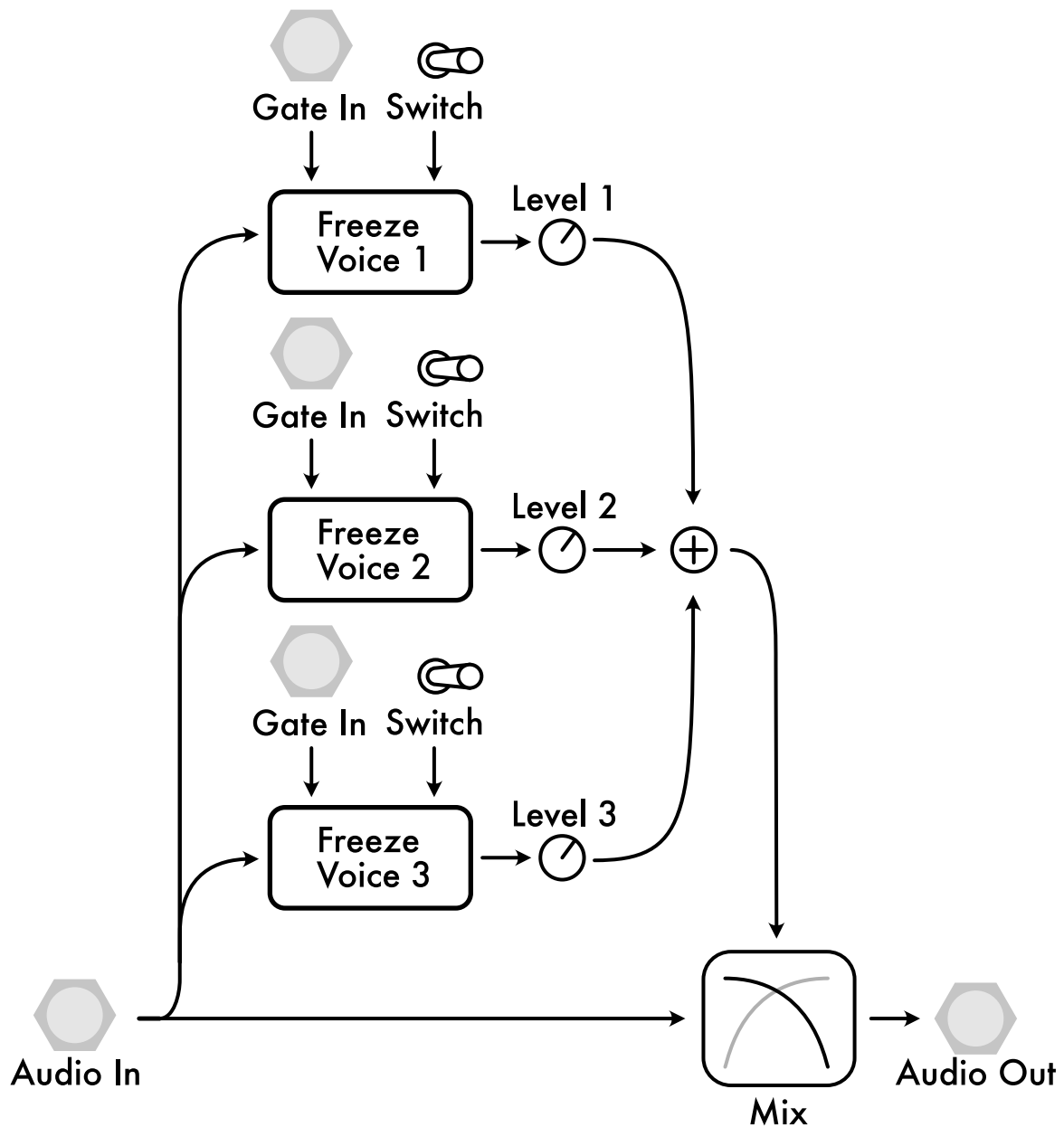


Gates or switches:

- Long gate freezes during gate and releases at end.
- Short gate activates freeze; subsequent short gates add layers.
Long gate to release.

So - switch left is ideal for "freeze while switch is on",
while switch right is ideal for "activate and layer".

Signal flow



The signal flow in Forever is very simple:

- There's a single audio input.
- The audio enters each Freeze Voice in parallel.
- The outputs from the three voices are mixed (according to the Level controls).
- The combined freeze voices are mixed with the audio input (according to the Mix control).
- The mixed audio is the output.

Freezing and layering

To freeze audio, activate one of the three voices. This can be done with its switch, or with its gate input. (Or with MIDI – more on that later.)

Note that to hear the frozen audio, the corresponding level control and the wet/dry mix control must both be turned up.

The three freeze voices are completely independent.

Freezing with the switch

The switches on Forever have three positions, with the centre being ‘Off’.

The left position is a locking toggle switch – if you move it left, it will stay there until you move it back to the centre.

The right position has a momentary action – if you move it right, it will return to the centre when you release it.

Moving the switch either way activates the freeze. The audio at the moment that you activate it is captured and sustained indefinitely. This frozen audio fades into the output mix according to the Attack and Level controls.

What happens next depends on how long you hold the switch away from the centre.

- A short hold activates the freeze and leaves it activated.
- A long hold activates the freeze and deactivates it when released.

So you can see that the left (toggle) position lends itself well to the use case of simply moving the switch left to freeze, leaving it there for as long as you want, and then returning to centre to release the freeze.

When a freeze is released it fades out according to the Release control.

To release a freeze when the switch is already in the centre, do a long hold (left or right, though right is probably easier).

You will see that the freeze LED, which lights to indicate an active freeze, flashes off briefly when the switch has been held long enough to count as a ‘long hold’.

Layering

When a freeze is active, another short hold on the switch activates a new layer.

A new moment of audio is captured, and this is crossfaded into the freeze according to the Layer and Fade controls. You can use this to build up ever more complex textures, or to replace one frozen sound with another, or anywhere in between.

Freezing & layering with the gate input

The gate inputs function exactly like the switches. A logic 'high' CV on the gate is treated like moving the switch. So, a long gate will activate the freeze and deactivate it when the gate goes low, and a short gate will activate the freeze and subsequently activate layering.

The controls in detail

Level 1-3

These control the output level of the three freeze voices before they are mixed. When fully counterclockwise, the level is zero and the voice is effectively muted.

Detune

Allows you to play the frozen audio at a different pitch, or even as chords.

The freeze playback consists of a number of ‘play heads’ (to use a tape metaphor). This number is set by the ‘Heads’ control and defaults to 4.

Each of these play heads can be assigned a detuned pitch (by default, an octave down), and then you can choose how many of the heads use their normal pitch or the detuned pitch. The ‘Detune’ knob allows you to smoothly change the number of detuned heads, crossfading each transition.

For example if the number of heads is 4, and the Detune knob is at 2.5, only the first head will use its detuned pitch; if the knob is at 5, two heads will use the detuned pitch. Between 2.5 and 5 the second head will crossfade between the two pitches.

The detuned pitch for each voice can be changed using one of the disting NT preset editing tools – see below.

Via the editing tools you can also access individual gain settings for each detuned head. The motivation for this is that heads detuned up in pitch have a tendency to stick out a bit, and need to be turned down, but you can of course use the gains however you like.

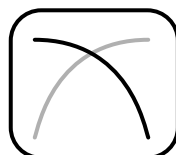
Mix

The wet/dry mix control – crossfades between the incoming dry audio and the output of the freeze voices.

By default the crossfader uses a ‘Transition’ curve – a DJ mixer-style transition where at the mid point both sources are at full volume. If you prefer a linear or equal-power response, you can change this using the disting NT preset editing tools – see below.



Linear



Equal power



Transition

Attack

Sets the fade-in time when a freeze is first activated.

The control is scaled exponentially from 10ms to 30s.

By default, if the gate is released during the attack, the attack ends and the envelope goes into release. Using the distinguishing NT preset editing tools (see below) you can select an alternative mode in which the envelope attack segment always completes, even if the gate is released during the attack, which is useful to trigger long swells from a short trigger pulse.

Release

Sets the fade-out time when a freeze ends.

The control is scaled exponentially from 10ms to 30s.

Layer

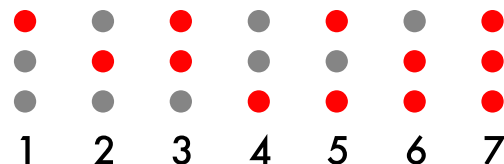
Sets the crossfade time when adding a new layer.

The control is scaled exponentially from 100ms to 10s.

Heads

Sets the number of play heads. Defaults to 4, with a range from 1 to 7. See the discussion of the Detune control, above.

When you adjust the Heads control, the three gate LEDs are used to show the selected number of heads in binary.



Fade

Sets the amount by which old material fades out when a new layer is added.

Fully clockwise corresponds to a 0dB fade – the new layer is added on top of the old, and the old stays at full level.

Fully counterclockwise means the new layer will completely replace the old.

If it helps to remember the difference between ‘Layer’ and ‘Fade’ – the shift function of the three red knobs all relate to **time**. So Layer is the layer transition **time** and Fade is the layer fade **amount**.

Using the web tool

A simple web tool is available, which communicates with a Forever module to show the value of all ten controls, and to allow simple interactions such as checking the firmware version.

Send to MIDI port:

Forever

 Listen on MIDI port:

Forever

 SysEx ID:

0

 Log: ☐

Connected

Level 1	0 dB	Attack	748ms
Level 2	0 dB	Release	1588ms
Level 3	0 dB	Layer	1721ms
Detune	0 %	Heads	4
Mix	47.8 %	Fade	-5.6 dB

Erase preset

Reboot

Check firmware and s/n

You can download the tool from our GitHub [here](https://github.com/expertsleepersltd/EMBF/releases)⁶.

To use the tool, connect the module to your computer via USB, and open the tool in a web browser that supports Web MIDI (e.g. Chrome or Opera). Select the module's MIDI ports in the 'Send to' and 'Listen on' drop-downs, if they're not selected automatically.

'Erase preset' restores the module's default configuration, and will undo any changes that you made in the disting NT tools.

'Reboot' does exactly that.

'Check firmware and s/n' reports the module's installed firmware version and serial number.

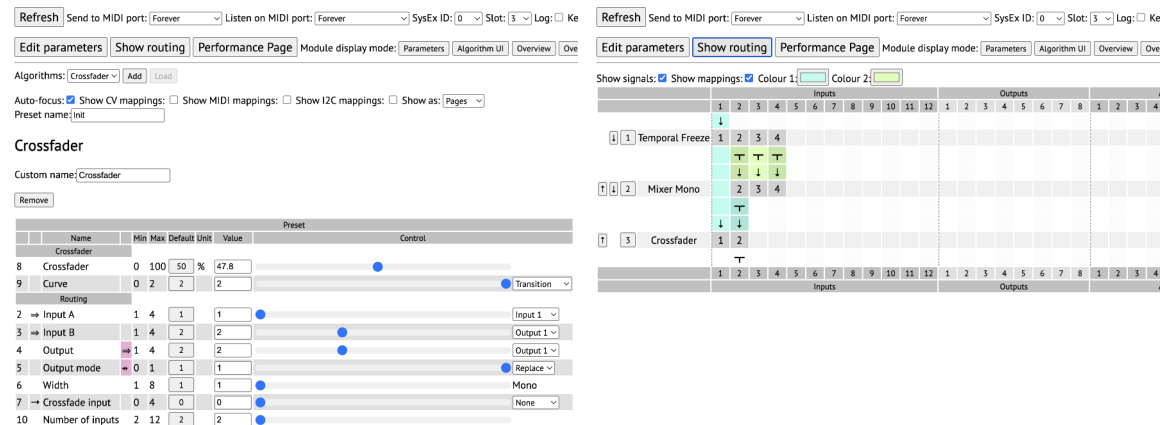
⁶ <https://github.com/expertsleepersltd/EMBF/releases>

Using the disting NT tools

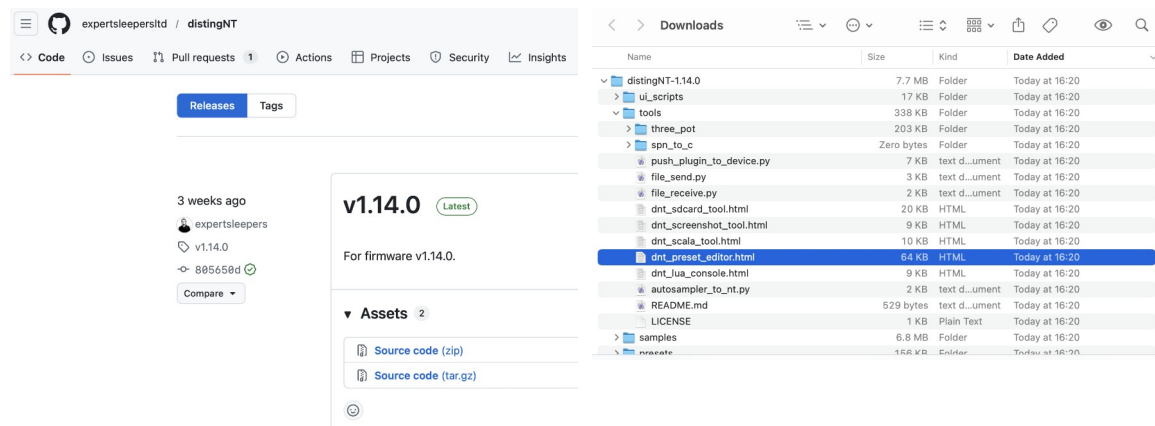
You can use any tool that works with a disting NT with a Forever, since they share the same underlying codebase and SysEx protocol. In particular, this includes the preset editor (provided by Expert Sleepers) and the NT Helper.

Preset editor

The preset editor is available from our GitHub repository ([here](https://github.com/expertsleepers/distingNT/releases)⁷).



You can install the tool by visiting the releases page of the GitHub repository [here](https://github.com/expertsleepers/distingNT/releases)⁸. Find the latest release (or the one that corresponds to the firmware version you're using) and click on the zip file to download it. In the zip you'll find a 'tools' folder, and in there 'dnt_preset_editor.html'. Drag this into a web browser that supports Web MIDI (e.g. Chrome or Opera).



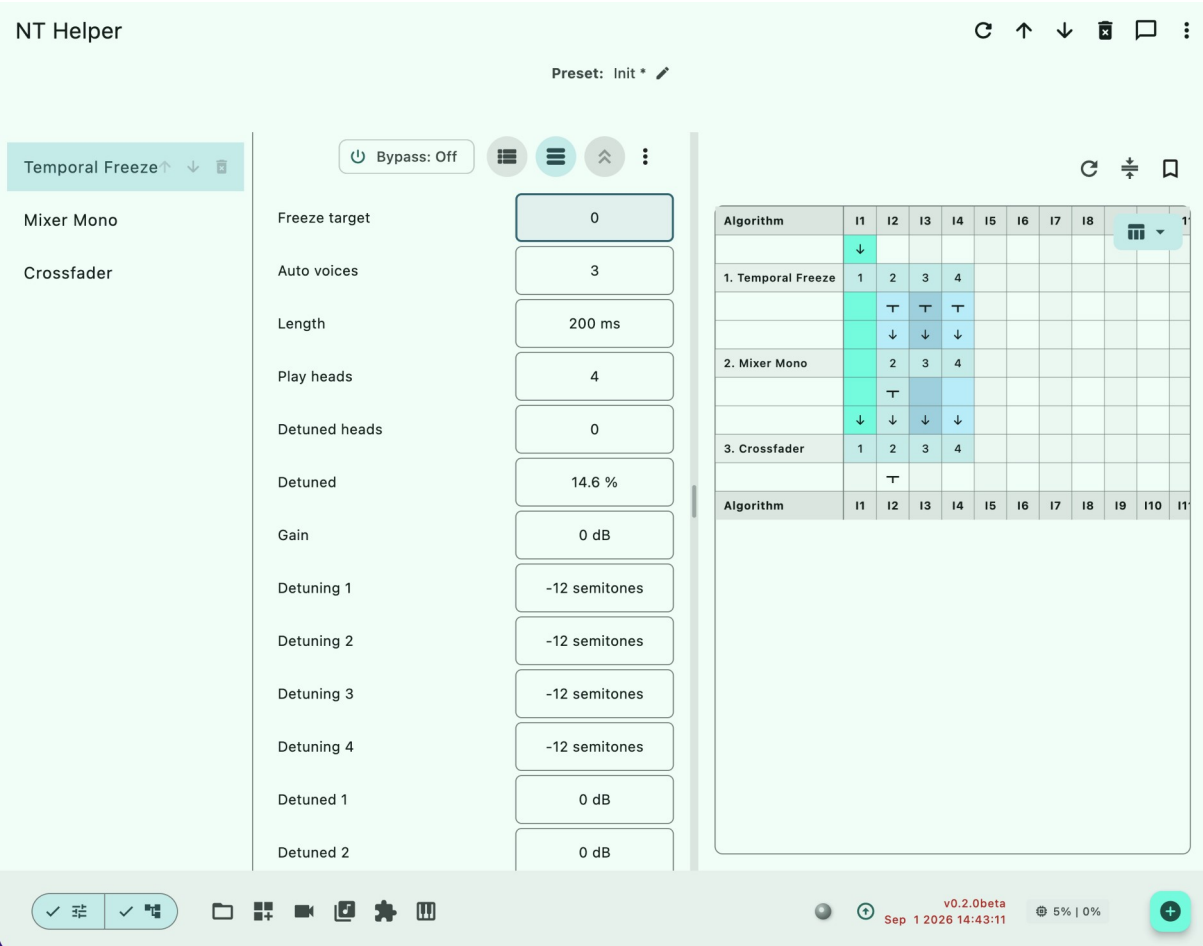
⁷ <https://github.com/expertsleepers/distingNT>

⁸ <https://github.com/expertsleepers/distingNT/releases>

NT Helper

There is also a third party tool called “NT Helper”, which was written by a user of the disting NT. It runs on Android, Windows, Linux, macOS, and iOS, and can be found [here](#)⁹.

Please note that this tool is supported by its author, not by Expert Sleepers. You can get support from the author via the Expert Sleepers [Discord server](#)¹⁰, in the #nt-helper-app channel.



9 <https://nosuch.dev/nt-helper/>

10 <https://modwiggler.com/forum/viewtopic.php?t=287914>

Things you may like to do via the disting NT tools

These are just some ideas. You can change anything you like.

1. Change the crossfader curve

As mentioned in the description of the Mix control. Navigate to slot 3, the Crossfader. Change parameter 9, 'Curve'.

Crossfader									
8	Crossfader	0	100	50	%	47.8			
9	Curve	0	2	2		2	Transition ▾		

2. Change the detuned pitches

As mentioned in the description of the Detune control. Navigate to slot 1, the Temporal Freeze. Change parameters 22-28.

Detuning									
22	Detuning 1	-24	24	-12	semitones	-12			
23	Detuning 2	-24	24	-12	semitones	-12			
24	Detuning 3	-24	24	-12	semitones	-12			
25	Detuning 4	-24	24	-12	semitones	-12			
26	Detuning 5	-24	24	-5	semitones	-5			
27	Detuning 6	-24	24	-24	semitones	-24			
28	Detuning 7	-24	24	7	semitones	7			

If you do this while you have audio frozen, and with the Detune knob turned up, you will be able to audition your chosen pitches in real time.

3. Change the short/long hold timings

You can change how long a hold is considered a 'long hold'. You can also select an alternative 'double tap' option. Navigate to slot 1, the Temporal Freeze. Change parameters 18-20.

Layer									
16	Layer fade	-40	0	0	dB	-5.6			
17	Layer time	0	1000	100		618	1721ms		
18	Pedal style	0	1	0		0	Long hold ▾		
19	Pedal hold time	0.1	5	0.3	s	0.3			
20	Double tap time	0.1	5	0.3	s	0.3			

4. Set up MIDI mappings

Every aspect of Forever's algorithms can be controlled via MIDI CCs. Please refer to the description of 'Mappings' in the disting NT user manual for more details.

MIDI SysEx reference

Forever supports a variety of functions via MIDI System Exclusive (SysEx) messages.

The protocol used by the Forever is fully compatible with that used by the disting NT, so that the tools built for the NT can be used to adjust parameters in the Forever's algorithms. Please refer to the disting NT user manual ([here](https://www.expert-sleepers.co.uk/distingNTfirmwareupdates.html)¹¹) for full documentation.

11 <https://www.expert-sleepers.co.uk/distingNTfirmwareupdates.html>

Updating the firmware

Forever's firmware is updated over its USB connection. You will need a computer and the appropriate USB cable to connect the module to it.

You can jump directly to any firmware version – you don't need to apply them incrementally. You can upgrade or downgrade at will.

There are a number of ways of updating the firmware. In all cases, you first need to:

- Download the firmware from our website [here](#)¹².

When downloading the firmware, do not let the browser automatically unzip the file (in Safari the option is “Open safe files after downloading” - that needs to be off). The tools require that you give them the original zip file.

- Put the Forever into bootloader mode, which you do via the jumper (see above).

Method 1: embf-flash

We provide a command line tool for updating the firmware, which builds for macOS, Linux, and Windows. You will find it in our GitHub [here](#)¹³.

You can build the tool from source yourself, or you can download a pre-built release from the releases page [here](#)¹⁴.

Instructions for building and running the tool are on the GitHub page.

Method 2: NXP GUI tool

If you wish, you can use the tool provided by the chip vendor NXP.

Download and install the correct version of the “MCUXpresso Secure Provisioning Tool”. It is available for macOS, Linux, and Windows. Note that various versions of the tool may be available. You need to use the correct version that matches the Forever firmware package that you want to install. The tool version for each firmware version is noted on the firmware download page.

Download the tool for your platform of choice from [this page](#)¹⁵. The NXP website requires you to sign up for an account to do so and asks for a surprising amount of information. You can of course just make this up if you prefer to remain anonymous.

Follow the documentation provided by NXP to import the zip and flash the firmware.

12 <https://expert-sleepers.co.uk/foreverfirmwareupdates.html>

13 <https://github.com/expertsleepersltd/embf-flash>

14 <https://github.com/expertsleepersltd/embf-flash/releases>

15 <https://www.nxp.com/design/design-center/software/development-software/mcuxpresso-software-and-tools/mcuxpresso-secure-provisioning-tool:MCUXPRESSO-SECURE-PROVISIONING>

Acknowledgments

Thanks to Neal Sanche (aka [thorinside](https://github.com/thorinside)¹⁶) for the firmware update tool.

¹⁶ <https://github.com/thorinside>