

# **Tasty Chips Electronics**

## **ECR-1 / ECR+ User manual**

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### **Document version**

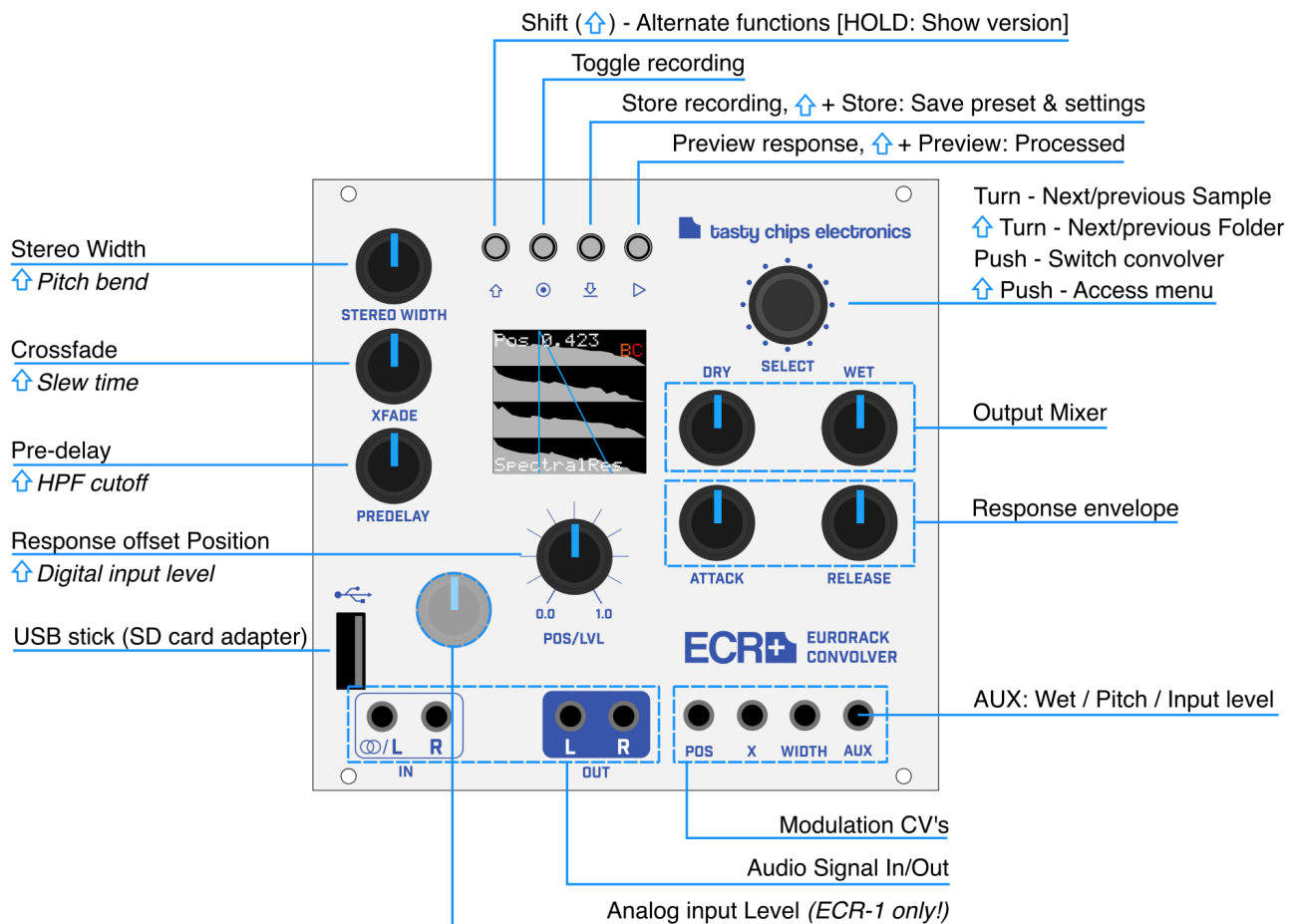
Document version 2.1.1

Applicable firmware version: 2.1.x

## Introduction

We originally designed this module to offer the Eurorack community access to long and lush natural stereo reverbs, and to allow tweaks in real-time with minimal delay. But it goes well beyond a mere reverb module.

The ECR series offers various modulation options: for instance, the position in the response sample, allowing for filter-like sweeps. Another example is modulating between two reverb spaces. It's even possible to pitch bend the response sample in real-time. Want to record your own response and use that right away? No problem. That's what a modular system is for, right?



## Contents of the box

- ECR module.
- Ribbon cable for power.
- USB stick. This comes pre-installed with a pack of unique response samples. Earlier units came with a USB-SD adapter.
- A bag of 4x M3 bolts and 4x M2.5 bolts.

## Warranty

The ECR-1 and ECR+ come with a 1 (one) year warranty on factory defects. Warranty is effective from the date of shipping of the unit.

“Factory defects” covers:

- Missing parts (see previous section)
- Broken parts (for instance: cracked screen, broken buttons, or knobs)
- Non-functional unit (“dead on arrival”)
- Semi-functional unit with serious defect (for instance: inability to access the SD card, mute audio inputs or outputs).

In case of such defects, you can reach us at [info@tastychips.nl](mailto:info@tastychips.nl), and claim your unit to be repaired. We’ll contact you with all the necessary information for return shipping and will refund all postage costs incurred. Please understand that shipping and repairs may take several weeks depending on the severity of the defect and your location in the world.

We’ll first attempt to repair your unit. If, and only if, the unit is damaged beyond repair, we’ll send a new unit.

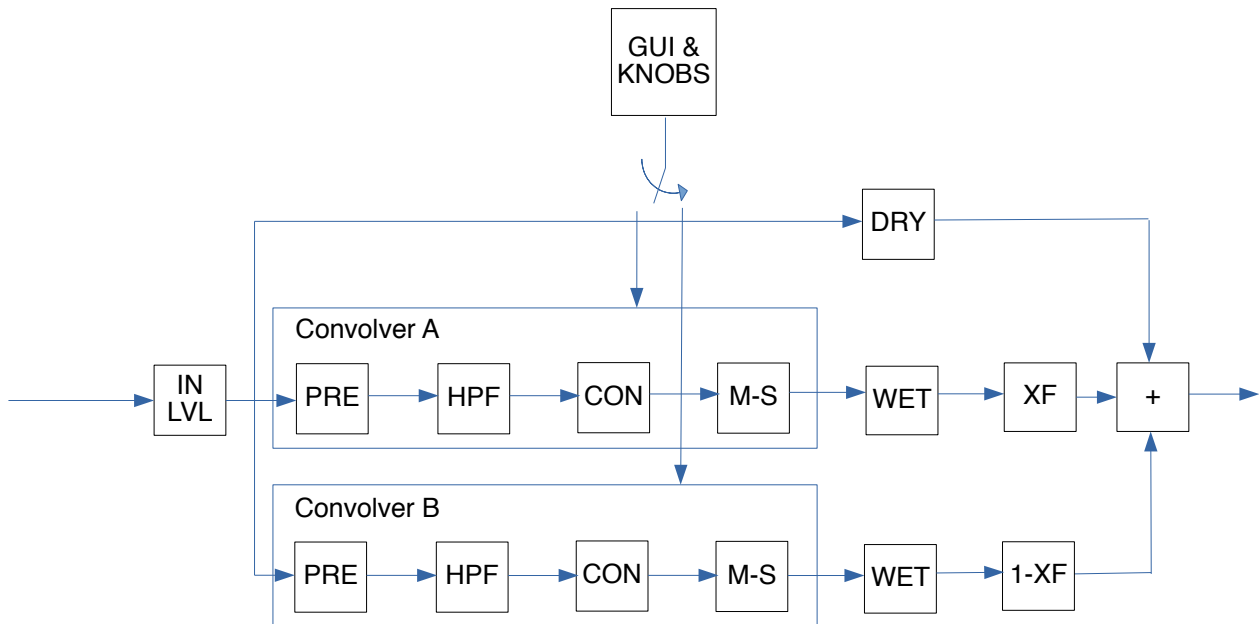
## Installation

1. Power down your rack.
2. Optional: remove the bit of anti-static foam from the back of the module. For the ECR+ it’s better just to leave it on!
3. Use the included power cable to connect the ECR to your bus board. Don’t worry, the connection is impossible to get wrong, because the ECR is fitted with a shrouded IDC header. This makes sure the orientation of the power cable is OK. And even if you still manage to mix up the orientation on your bus board, the ECR has protection diodes to guard against polarity inversion. It will not be damaged by it.
4. Screw the module onto your rack casing’s rails.
5. Power up and wait a few seconds until the display is initialized.

## Getting started

1. Hook up audio output cables.
2. Press Play ► to test the output of the selected response.
3. Press Play ► again to stop the test.
4. Hook up the audio input. Either try the stereo input and hook this up to your phone or laptop, or use both inputs in mono mode and connect them to your modular sources.
5. Make sure the Predelay is completely 0, Xfade is completely left or completely right, and Wet is maximized. The Pos knob should be 0. The Attack knob should be 0, and Release should be maximized, enabling the full response to be used.
6. Adjust the “Input level” knob until the red “C” clipping indicator only seldomly appears.
7. Enjoy the reverberated sound!
8. Turn the Select knob right to try the next response.

## Signal path



As you can see the two internal convolvers both have their own processing chain: PRE for predelay, a high-pass filter, followed by M-S (Mid-Side aka stereo width on the front panel).

Predelay is typically used to delay reverberation, resulting in a more spacious experience. The room seems to grow, so to say.

Mid-Side is used to exaggerate or diminish stereo effects in the input signal. It may be used to turn it completely mono, or exaggerate and boost the volume. NOTE: Since firmware 2.1 Mid-Side is placed at the end of the convolver chain. This means that even with mono input you can still widen the stereo image, if your response is stereo.

The high-pass filter is typically employed to keep bass and sub-bass from blowing up. Combining a bass-heavy input with a bass-heavy response sample often calls for such a feature.

The actual convolution is followed by wet attenuation. Finally, the convolver outputs are crossfaded and summed with the dry signal. Not shown in the figure is the autogain correction, but this takes place after summation of the wet signals.

**Note that only one convolver is controlled by the knobs and buttons at any one time.**

## Audio inputs

The leftmost audio input accepts stereo (TRS minijack) and mono (TS minijack). If used with a TS minijack, it functions as the left input exclusively. The rightmost audio input is mono (TS minijack) only. If a TRS stereo minijack is used on the left input, the right input should be left unplugged.

Note: In realistic reverb samples or resonator samples the left and right channels are similar. But if you create your own response sample files you can make left and right channels completely different, resulting in a dual mono setup.

## Setting the audio input level

### ECR-1:

A single knob at the bottom left sets the input level. Turn it down, and the ECR-1 will accept Doepfer audio levels. Turn it up and it will accept studio audio levels or headphone audio levels. This is an analog control and cannot be modulated or saved.

### ECR+:

The ECR+ audio input uses Doepfer levels [-5V..+5V]. Use these levels to maximize signal-to-noise (SNR). It will also accept line level input, but the signal-to-noise ratio will be ~10 dB lower. This is often still ok, because of the high dynamic range of the ECR+ circuitry.

The ECR+ only has a digital input gain control. Hold down Shift ↑ and turn Pos at the same time. This controls the digital input level. Turned down completely, this will mute all input. This setting is digital and can be modulated and saved. This control is also available on ECR-1 with firmware 2.0.

## Configuring the output mixer

The knobs “Dry” and “Wet” control the output mix. These are digital controls, and their values are displayed on the display. They range from -100 dB attenuation up to 0 dB. Dry and wet are global controls that work on both internal convolutions.

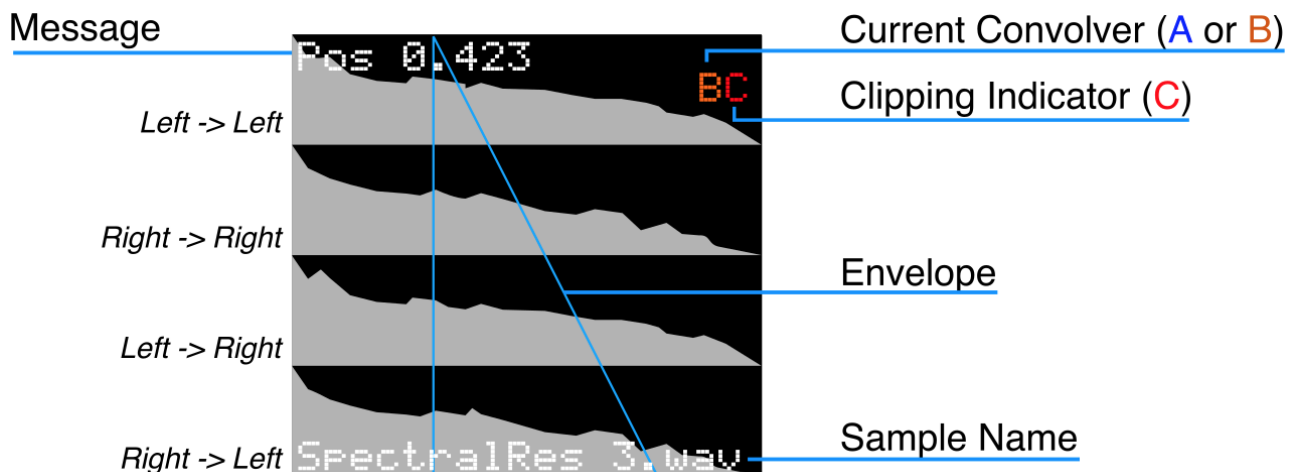
## Understanding the display

After startup the ECR will show the “main” screen: mainly sample waveforms and control values.

The display shows the response sample in an understandable way, along with its name at the bottom, and an action message at the top. Such an action may be “WET -6.0DB”, “ATTACK 0.500s”, “CONVOLVER A”. So either value updates, or discrete actions.

The display shows either convolver A or convolver B. You can see a blue “A” or an orange “B” near the upper right corner of the screen. Push the Select knob to toggle between the two. This also toggles which convolver is controlled by the knobs.

The display shows up to 4 sample channels. Everything you need for true stereo reverbs. From top to bottom, these are:



So, if a plain stereo sample is loaded instead of a 4 channel sample, only the upper two channels are visible. Why these 4 channels? This is for the so-called stereo matrix. The left input can also influence the right output.

The samples are always displayed at full length, and cannot be zoomed in. The amplitude is logarithmic so that details in the reverb tail may be better visible. Between the channels the difference in amplitude is exaggerated. This quickly tells you if the response is off-center.

The overlaid blue lines show the AR (Attack-Release) envelope.

Near the upper-right corner of the screen you may see a red “C” which appears from time to time. This indicates the total wet signal is clipping or almost clipping. The ECR then automatically limits the gain, although it’s best to turn down the gain knob your self in most cases.

On the bottom of the display the current sample filename is displayed.

## Using the envelope controls

An attack-release type envelope allows attenuation of parts of the response sample. The start position (time) of this envelope can also be set using the “Pos” knob. Setting the position will completely skip over any sample data that comes before this position in the response sample. The combination of these three knobs allows you to precisely focus on any specific part of the response, for instance the tail, or only the early reflections. The position control has a precision of 1024 steps. The attack and release knobs have the same resolution, and using their exponential control curve you can achieve very short attacks or releases and still accurately control them. The attack and release time are displayed on screen down to milliseconds.

The applied envelope attenuates the response in places. To have no attenuation at all (to actually disable the envelope’s function): turn attack and pos to 0, and turn release to its maximum. Note that the ECR-1 uses normalization after applying the envelope. This will preserve signal power, however it can also significantly boost the wet signal. You can compensate by turning down the wet knob.

Note that when attack is non-zero, you may experience a gap in the audio. Each time the envelope is changed the convolver recomputes and restarts. Since a longer attack will result in low volume, you may hear short gaps in the output as you continue to change the envelope. This can be compensated by increasing Slew.

## Recording responses

Press record ●. This starts the recording process. The convolution engine will be disabled while recording and only dry output is heard. The recording stops when record is pressed again, or when it has recorded 20 seconds. You can now use the recording as if it were a response, apply the envelope, position, and modulation. Madness will ensue. When a USB stick or the furnished MicroSD card with the USB adapter is inserted, you can press store 📁. Otherwise the button will pulse two times to indicate no storage medium is present. When storing the recording is automatically assigned a filename `recXXXXXX.wav` and it can be found by using the “select” knob in the top right.

**WARNING: DO NOT REMOVE STORAGE MEDIUM WHEN STORING RECORDING. PLEASE WAIT A FEW SECONDS BEFORE DOING SO. IF YOU DO NOT, DATA LOSS MAY OCCUR.**

## Using the remaining parameters

Predelay: 0-2.0s in with an exponential control curve. Using this often influences the perception of the size of a reverberating space. For instance, you can make a short reverb of a small room appear bigger by turning this up a little. Adjustment of this control causes the convolver to recompute its data. This may take a short while. Also note that the convolver restarts after adjustment and it starts with playing back the delay!

Stereo width: This is a Mid-Side matrix control that either turns the input into mono (turn it down to 0), or exaggerates the stereo effect (turn it completely right). The center keeps the stereo input audio signal exactly as it is.

Pitch [ $\hat{u}$ +Stereo width]: Hold down shift and turn the stereo width knob to pitch bend the response. Completely left means -2 octaves, completely right means +2 octaves. Center keeps the response the same pitch.

**Highpass filter cutoff [ $\hat{u}$ +Predelay]:** To keep the convolution from blowing up you can cut away some sub-bass from the audio input.

Xfade (crossfade): Crossfade between convolver **A** (left on the knob, 7 ‘o clock) convolver **B** (right on the knob, 5 ‘o clock). Please read the section “Using the dual convolvers”.

**Slew time [ $\hat{u}$ +Xfade]:** *recomputation slew time controls the crossfading time between newly computed response and old response. Such a cross fade occurs when a new impulse response is offered to the convolver. For instance when a new response is selected by turning the select knob, or when the envelope or envelope position is changed. A short slew time sounds more choppy, but you’ll hear the new response earlier. A larger slew is especially useful with longer envelope attack.*

## Control voltages

Insert Doepfer level CV sources to modulate some of the ECR's parameters.

0V: or disconnected, no modulation,

+5V: maximum positive modulation,

-5V: maximum negative modulation.

Modulation clips the affected control its minimum and maximum. That means it will never exceed beyond the levels you can manually set it to by using the knob.

“Pos”: Modulates the position knob. This control forces a re-computation of the envelope and hence also a re-computation of the response. There will be a lag depending on the size of the envelope, exactly like with the Pos knob itself. If the envelope is small enough, and you apply a CV envelope waveform, this allows for smooth sweeps over your response.

“X”: Xfade, or crossfade. -5V will crossfade completely to convolver A. +5V will crossfade completely to convolver B. this is a direct control that takes effect in about 10ms.

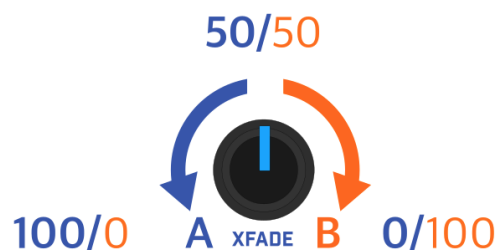
“Width”: Modulates stereo width. -5V will force the input signal to mono. +5V will exaggerate the stereo effect. This is a direct control that takes effect in about 10ms.

“Aux”: This modulates either Wet, Pitch (TUNE in the menu) or input level. The destination is configured in the menu.

## Using the dual convolvers

The ECR runs two internal convolvers simultaneously. There's one in the foreground, which is directly controlled by the knobs, and there's one in the background. The background convolver cannot be controlled by the knobs, but can hold another response sample and it has its own (static) settings such as another envelope, filter settings and pitch. It can also be modulated by the CV inputs if you choose. For this see the System Menu chapter. The Xfade (crossfade) knob creates a mix between the two convolvers.

- 1) Set up your foreground convolver using the “select knob” to choose a response, and turn the other knobs (except crossfade!) until you have a satisfying convolution.
- 2) Now press “select”. This switches the foreground convolver into the background. The display will let you know: “CONVOLVER B”
- 3) Turn xfade to the left a bit to hear the convolver A.
- 4) Select a nice new response sample for convolver B by turning “select”, and set the parameter knobs to your liking.
- 5) Wiggle X-fade. If you're using reverb responses, you are now traveling between spaces!



- 6) Optional: hook up a CV to the X(fade) modulation input to automate this travel in a pattern of your liking. A simple sine wave is already quite convincing.



## Choosing samples

The ECR offers a file chooser to help you browse through vast libraries of samples and settings. We designed it to work as quickly and intuitively as possible. All samples and settings are present in one big flat list, through which you can quickly scroll back and forth. No diving into directories, no choosing of data types to load. Turn the Select knob to enter the file chooser screen. Turn a bit more to start choosing another sample. See Figure 1.

The ECR's USB A port allows you to use the furnished USB stick or in early models the furnished Micro SD card (via the USB-SD adapter). It also comes pre-formatted and with loads of original responses recorded by the Tasty Chips Team. There are only 8 samples in the ECR's internal flash memory.

Once this USB drive/SD card is inserted the ECR will automatically register all the .wav files in the root directory, and in the folders in the root directory. Note that it does not scan any deeper than 1 level! This means that folders in folders are skipped! This may change in later firmwares. It slurps up all the sample file names and compiles them into a big list you can scroll through.

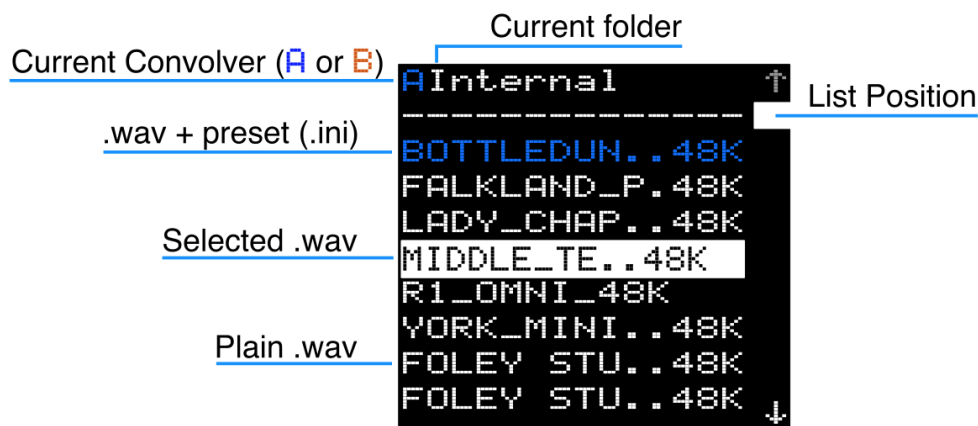
It may take a few seconds before the ECR has correctly mounted and processed all the files. The list is updated live on screen when it's ready. Browse a bit to the right and after the 8<sup>th</sup> response, you're browsing the external medium.

Of course you are free to remove and add .wav files at your leisure, using your PC. Since there are a lot of responses on the USB drive/SD card, you may want to hold down Shift [ ⬆ ] when turning the Select knob. This jumps from folder to folder instead of from file to file.

While browsing, the ECR shows the current folder at the top of the screen. This helps you to distinguish if samples are in internal memory or are external. Browsing automatically loads and activates new samples. When Play ► is active, you can easily preview sounds this way. In the top left corner it also shows A or B to tell the user which convolver's sample and/or preset we're loading.

When you have selected a sample you like, return to the main screen by pushing Select, or wait for 4 seconds if you have the AUTO EXIT feature enabled in the menu.

Some files are shown in blue. This means they're accompanied by an .ini file, with patch data inside. You should explicitly push and hold the Select knob to load it. These patch .ini files are created when you save your system presets.



The ECR accepts USB sticks other than the one we've supplied, but your mileage may vary. Some (cheap) USB sticks are very slow. Only FAT, ExFat, and Linux Ext filesystems are properly supported.

**WARNING: DO NOT REMOVE STORAGE MEDIUM WHEN STORING RECORDING. PLEASE WAIT A FEW SECONDS BEFORE DOING SO. IF YOU DO NOT, DATA LOSS MAY OCCUR.**

## Presets and system settings

Firmware 2.0 and up offers presets. This means knob settings are stored along with the chosen sample. Choose a sample and the knob settings will also be loaded. Additionally, the system menu settings are saved as well. Just press Shift [ ↑ ] + Store **U** . This saves both the system settings and the presets, as well as the currently used presets. NOTE: system settings are saved to USB! Every time you plug in a USB stick the ECR will load these system settings, and you will lose your current tweaks. We may add the ability to store settings internally, but this will require rigorous testing.

Important: some seconds after startup and every time you plug in a USB stick, the ECR will search for system settings data. If it finds it, it will immediately load the system settings and default presets! This was one of the most requested features from users of the original 1.x firmware. To inform the user it will display a "READING USB . ." popup, followed by "READ PRESET . ." popup if system settings&presets are found.

Both the system settings data file and the preset data files can be found on the USB stick. You can easily remove and edit them on your PC, since they are just ordinary text files.

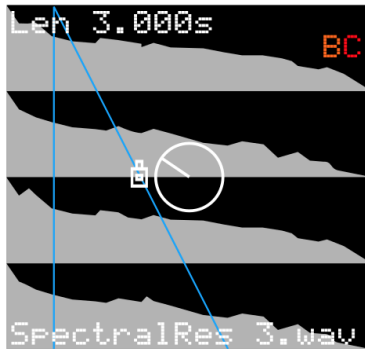
After having stored system settings, the chosen sample files will be accompanied by preset .ini files. In the filechooser, these are highlighted in blue instead of white. To not only load the sample, but also the patch data contained in the .ini file, press and hold the Select knob. A "READ PATCH . ." popup will be shown and the preset data will be loaded. This means the envelope, filter, mid-side, etc settings are loaded along with the sample.

## System menu

Enter the system menu by holding down Shift [ ↑ ] and pressing Select. Here you'll find the following:

- DIRECT SHIFT: toggle this so you don't have to keep shift pressed. Often beneficial, because it frees up one hand for wiggling.
- CHOOSER: toggle the file chooser screen on/off. Without the file chooser you can still browse. You'll see the waveforms immediately, but you won't see the next or previous filenames, nor your position in the list.
- AUTO EXIT: leave the file chooser after 4 seconds. Can speed up your workflow. When this is OFF you will need to press the Select knob to leave the file chooser.
- CV MAP: map the CV inputs to convolver **A**, **B** or both (**AB**).
- AUX: Which destination should the Aux CV control: WET, TUNE (aka Pitch), or INL (Input Level).
- SVR: Screensaver time: 0 s, 30 s, 2 minutes, or 5 minutes. The screensaver will go to half brightness after this time, and then wait 5 more seconds before going black. 0 seconds mode is especially there for the ECR-1. The screensaver will reduce noise on the audio input. In this mode the screensaver will kick in almost instantly but will still leave enough time to display things without flickering. On the ECR+ this mode has no real use, except if you don't like the display.

- PICKUPS: Enable or disable potentiometer pickups. With pickups enabled the potentiometers will only respond if you turn them to the displayed position. When it is locked, a small lock icon will be displayed and the current internal setting of the potentiometer will be displayed in the center of the screen. Turn to this point to unlock!



- CONV B: enable/disable convolver B. Less power consumption, and better chances for lower latency. May disappear in new firmwares as it was primarily a development feature.

- POTSCAL: Diagnostic/expert function for when potentiometer calibration is off. Blows up the scale to correct for bad calibration. You lose 10% resolution, but it shouldn't matter.

- EXIT: Exit the menu.

Note that these system settings will be saved when you press Shift [ ↑ ] + Store ⏻ . This shortcut is available in any screen.

## Further functionality

Hold down Shift [ ↑ ] for 5 seconds to show the firmware version. This firmware is now also shown at the top of the menu.

## Features

- Long true-stereo natural reverbs (23s max).
- Dual simultaneous reverbs (foreground and background), with their own presets.
- Multi-channel display with envelope and parameter-value overlays, and a clipping indicator.
- Predictive gain control (to preemptively stop the output from blowing up).
- Stereo or dual-mono input, accepts line level or Doepfer Eurorack level. Adjustable using gain control knob.
- Separate dry and wet knobs.
- Attack-Release Envelope with direct controls (2 knobs).
- Cross fade knob (cross fades between the foreground and background response)
- Pre-delay up to 2 seconds.
- Rotary encoder to quickly select responses (internal presets and the ones present on USB/SD).
- High-pass (12 dB/oct) filter with adjustable cutoff.
- Real-time pitch adjustment of response (-2 .. +2 octave).

- Dual mono (stereo pair) output.
- Record responses to USB. 23 s max.
- Use responses from USB.
- 4 modulation CV's:
  - Response sample position
  - Crossfade
  - Stereo width
  - Aux: Wet, Pitch & input level.
- Audition feature to quickly evaluate responses.
- High quality ALPS potentiometers.

## **Specifications**

- 48 kHz stereo input
  - ECR+ : 114 dB input and output SNR
- 1.5" true color 128×128 pixel OLED
- USB2.0 port with USB stick included.
- Saves samples as 32 bit float stereo WAV files.
- 10 bit resolution and ~50 Hz refresh on potentiometer action.
- +12V, -12V powered (5V busboard line not used)
- Scratch proof and solvent proof anodized front plate.

## **Measurements**

ECR-1:

- 130 mm / 25.6 HP wide
- approx 5cm deep (counting from the front plate)

ECR+:

- 131.9 mm / 26 HP wide
- approx 3cm deep (counting from the front plate)

## **Power consumption**

ECR-1:

+12V: 180 mA (idle) – 400 mA (longest reverbs and continuously modulating)

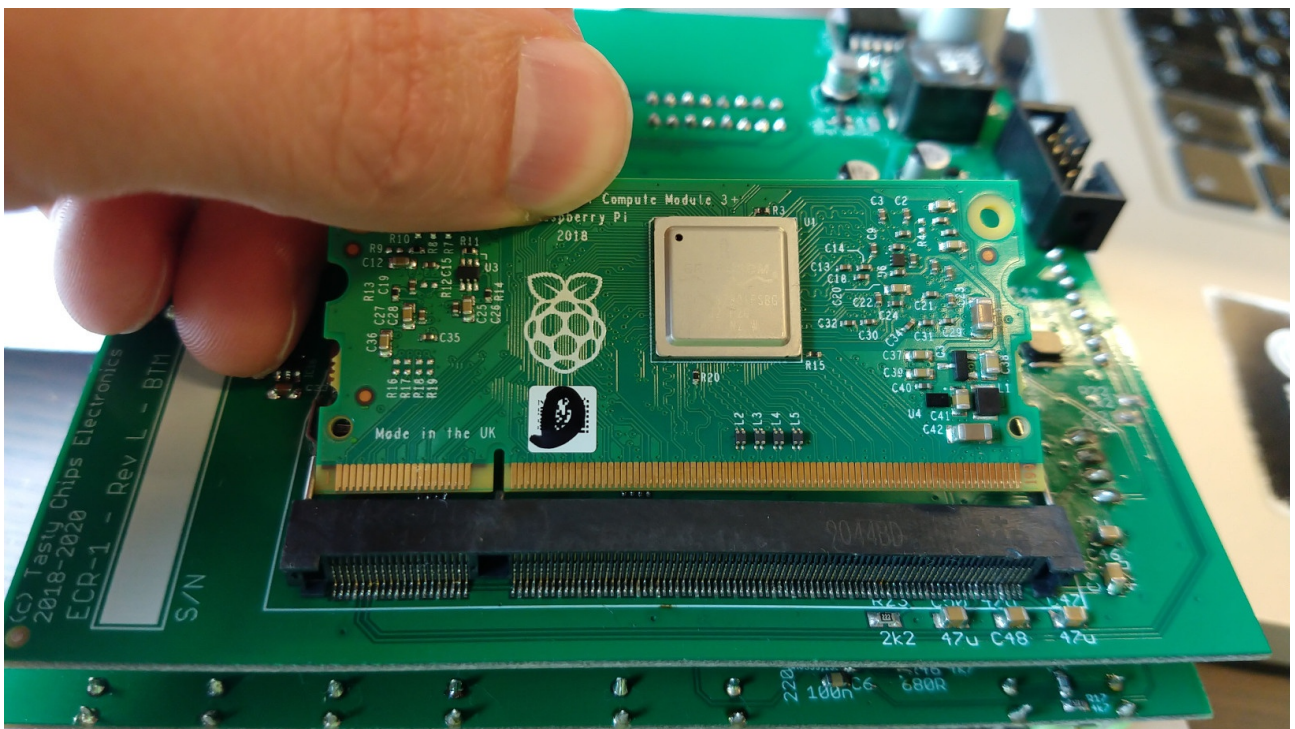
-12V: 21 mA

ECR+:

+12V: 180 mA (idle) – 300 mA (longest reverbs and continuously modulating)

-12V: 30 mA

## Firmware upgrades



*Illustration 2: Replacing the DIMM compute module on the back of the ECR-1.*

The ECR-1 can receive firmware upgrades or even alternative firmwares by replacing the DIMM (the Raspberry CM3 module) on the back of the unit. Firmware 2.0.0 is the last release that will be distributed this way. From firmware 2.0.0 onwards the ECR-1, and ECR+ accept firmware updates via USB. These update files are freely downloadable from our site <https://www.tastychips.nl/ecr-support/>

## Firmware updates via USB

1. Download the firmware zip file from our site <https://www.tastychips.nl/ecr-support/>

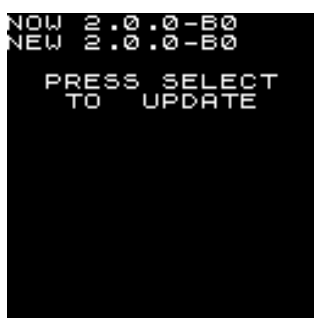
Make sure this is the correct firmware for your hardware! The ECR-1 has `ecr1_fw_x.y.z.zip`, the ECR+ has `ecrplus_fw_x.y.z.zip`.

2. Copy the file to the root of the USB stick.

3. Safely eject the stick from your PC, and insert it into your ECR's USB port. Wait a few seconds..

4. The ECR will now enter its update screen, waiting for you to press Select. If you don't press it, it will return to the main screen and resume normal operation after about 20 seconds.

5. The ECR will install and automatically restart. This shouldn't take more than 2 seconds. Note: the ECR will remove the zip file from the stick, to not get stuck in a loop (!).



## Troubleshooting

The ECR-1 receives a full functional test when leaving the factory. The v2.0.0 firmware has been meticulously tested for stability over a 24 hour period with all kinds of inputs and control changes. However, in the rare case of a crash or hang, or any other strange glitch, please contact us at [info@tastychips.nl](mailto:info@tastychips.nl).

Things to keep in mind:

- Always turn the unit off for at least 10 seconds before powering back up again. Otherwise it might start up with unresponsive controls.

- The ECR can be quickly reset without powering down your rack. Hold down the 4 buttons:

[Shift ⬆, Record ●, Store ⏸, Play ▶] for 4 seconds. The screen will black out for a while, but the main screen will quickly re-appear.

## Firmware installation failsafe

By powering off during USB firmware update (even if this only lasts less than a second), it could be that the firmware becomes corrupted. In this case the 2.x firmware employs a failsafe mechanism where it tries to first start up the old firmware, and if that's also corrupted, it will try and find an unzipped firmware on your USB stick. Although we've never encountered such a situation, the failsafe mechanism has been tested. Should you encounter this you can recognize it by the screen staying black, no matter which knobs you turn or which buttons you push, and this persisting after a cold restart (10 seconds power off).

1. Download the latest firmware zip from <https://www.tastychips.nl/ecr-support/> to your USB stick. Make sure this is the correct firmware for your hardware! The ECR-1 has `ecr1_fw_x.y.z.zip`, the ECR+ has `ecrplus_fw_x.y.z.zip`.
2. Unzip it and make sure all files are present in the *root* of your USB stick.
3. Also make sure the original firmware zip is still on the stick. The ECR will use it to try and install the firmware again.
4. While the ECR is powered, insert the stick. It should now run the firmware from the USB stick.
5. Wait until you see the update screen and follow the instructions.

## Credits

The internal samples are creative commons (CC BY-SA 3.0) <https://creativecommons.org/licenses/by-sa/3.0/> licensed responses that were available from `openairlib.net`. They're all resampled to 48 kHz: the ECR's native sample rate.

Falkland Palace Bottle Dungeon:

Falkland Palace Royal Tennis Court:

Hamilton Mausoleum:

R1 Nuclear Reactor Hall: Audiolab, University of York,

Terry's Factory Warehouse: Audiolab, University of York,

York minster: Audiolab, University of York,

Lady Chapel, St Albans Cathedral:

Dr. Damian T. Murphy

Dr. Damian T. Murphy

Dr. Damian T. Murphy

Dr. Damian T. Murphy

Dr. Damian T. Murphy

Damian T. Murphy

Audiolab, University of York

*Marcin Gorzel*

*Gavin Kearney*

*Aglaia Foteinou*

*Sorrel Hoare*

*Simon Shelley*

1<sup>st</sup> Baptist Church,

Central Hall Uni NY(centre) (stalls),

Adam Townsell

Alexander Vilkaitis

Ilias Antonopoulos

Joska De Langen

Xuan Liu

Andrew Chadwick

Simon Shelley

Aglaia Foteinou

Simon Shelley

Adam Townsell

St Georges (close) (far) (medium)

St Patrick Church (s1r1), (s2r2), (s3r3): Audiolab, University of York,

Aglaia Foteinou

Dr. Damian T. Murphy

Middle tunnel:

?Author unknown, Please contact us!

Everything else: Copyright (c) Tasty Chips Electronics 2018-2021

## **Contact**

info@tastychips.nl