TEMPERA

Quickstart Guide

Released December 19, 2023 (version 1.3).
The most recent version is available at www.playtempera.com.

CONTENTS

1 INTRODUCTION

Tempera is a multi-sample, 16-voice polyphonic granular synthesizer.

You can think of it as 8 parallel stereo tape tracks, laid in columns next to each other, forming a kind of 2D tape surface. Your fingers then become little generators (aka *Emitters*) of one or many tape heads (aka *Grains*) riding across the surface.

This main control interface – the touchgrid – is a fully polyphonic touch sensitive surface, on which emitters are laid, which in turn produce streams of grains.

In order for Tempera to make sound, it needs to have both at least one placed emitter, and at least one voice (note) played.

Getting started:

1. Plug the power supply into the wall
2. Turn Tempera on and wait for it too start up
3. On the touchgrid, place a note at the left highlighted column
4. Try placing and removing some emitters by interacting with the touchgrid

Tip

You can play a note from the internal overlay keyboard, or from an external MIDI keyboard connected via MIDI TRS or USB

Each of the 4 main knobs' function is determined by menu navigation and associated with the display below it. There are 2 buttons for each display which are context-dependent.

The **Round button** serves several purposes:

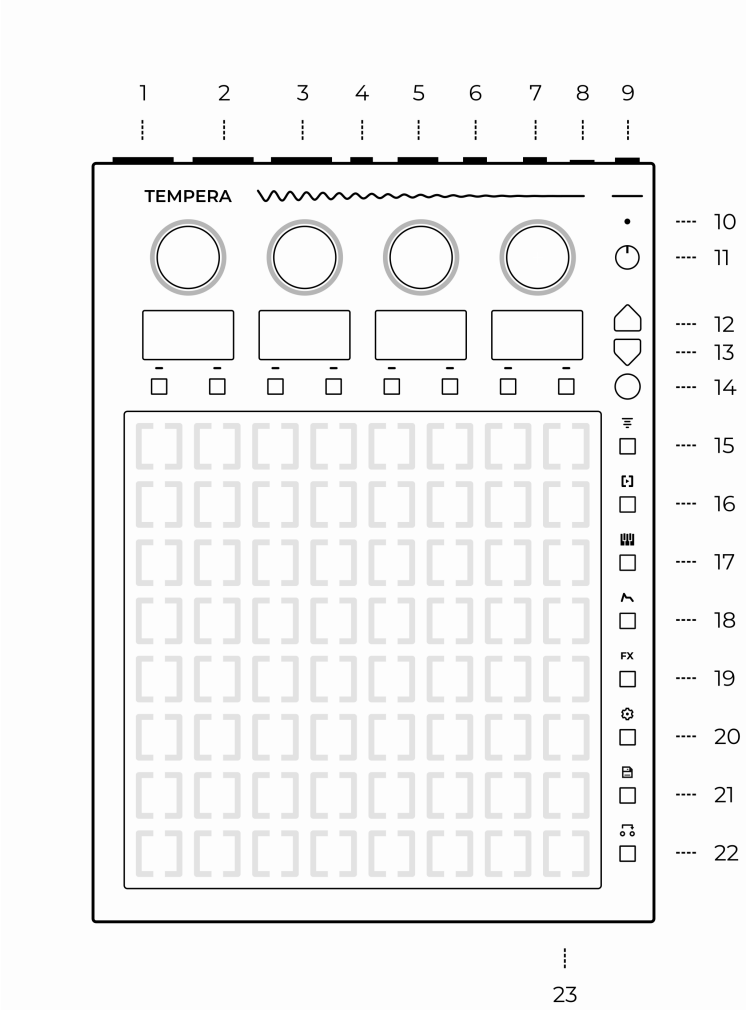
1. Hold it to reveal an alternate context for buttons below the displays
2. Hold it while turning a knob to move through the parameter faster
3. When recording, press it to stop recording

The column of buttons to the right of the touchgrid are navigation buttons that take you to various places inside Tempera, and the **Up** and **Down** arrows navigate across the menu pages. There are little dots on the right-most display showing the current page out of a total.

Tip

Certain actions, like saving and loading canvases or detecting pitch on a sample are performed in the background. When the background task is busy, the knobs will light in a moving wave. This is always initiated by you and never spontaneously on its own. Tempera is fully usable during that time, however do not turn off the power when saving canvases or samples.

2 LAYOUT



1. 6.35mm mono left audio or stereo headphones output – careful, the outputs can be very hot (up to 13dBu or 10Vpp)
2. 6.35mm mono right audio output
3. 6.35mm stereo audio input
4. USB host
5. USB device
6. TRS MIDI in
7. TRS MIDI out
8. Power input (12V/2.5A DC center positive) – please use the provided power supply for best performance
9. Power switch
10. Onboard microphone
11. Volume knob
12. Page up
13. Page down
14. Context switch
15. Sample layout
16. Emitter setup
17. Overlay keyboard
18. Modulators
19. Effects
20. Settings
21. Save and load canvas
22. Custom macros
23. SD card slot

3 CANVAS

A full patch for Tempera is called a *canvas*. It contains 8 audio samples, all emitters' and modulators' configuration, as well as optionally pre-placed emitters.

Tempera comes with a suite of canvases designed specifically for it, with its unique workflow.

When you load a canvas, try playing a note to get an idea of what it is, and then modify it to your liking. Some canvases are melodic, other are percussive, and the rest are anything in between.

After you explore the built-in canvases, it's time to make your own!

Tip

- When you make your own canvas, save it directly onto an SD card and share it around!
- Try combining samples from different canvases!

4 TRACK LAYOUT

Each column on Tempera's touchgrid represents a track, from top to bottom.

The tracks' names and volumes are shown on the displays above them, grouped in two.

Turning the corresponding knob tweaks the volume of the selected track.

Each display has two context actions:

- **Switch** which of the two tracks is selected
- **Edit** the selected track sample

Holding the **Round button** reveals alternate context:

- **Rec** arm a track for recording. Recording begins the moment input audio crosses the *Threshold* set in **Settings**. When recording, pressing the **Round button** stops recording.

When editing a track, you are presented with these actions:

- **Load** a sample from the sample browser
- **Rename** the sample
- **Detect** the pitch of the sample. It is possible to enter the note/frequency manually by turning the knob (turn faster by holding the round button)
- **Note** snaps the frequency to the note (i.e. 441.3125Hz becomes 440Hz)
- **Trim** the sample in the **Waveform preview**
- **Delete** the track contents
- **Play** to play preview the track
- **Export** the track to a file

Holding the **Round button** reveals alternate context:

- **BPM** toggles the sample's *original* tuning representation between Hz and BPM.
- **Copy** the track into the clipboard buffer
- **Paste** a track from the clipboard buffer
- **< Swap** the track to the left
- **Swap >** the track to the right

5 LOADING A SAMPLE

Tempera supports many common audio formats as samples, stores them internally as 16-bit 48kHz, and and processes them with 32-bit floating point math.

To load a sample into a track:

1. Go to **Track layout**
2. Choose the track you want to load a sample into and press **Edit**
3. Press **Load** to go to the file browser
4. Choose a sample and press **Load**
5. Adjust the **Start** and **End** points and press **Load**
6. The sample is now loaded into the track, on't forget to adjust its **Original tuning**

When adjusting the start and end points, the waveform is shown across all 4 displays, with little vertical bars hinting at where the cell boundaries will be. On this page you can:

- Turn the first and last knobs to adjust the start and end points
- **Listen** to the whole sample or just its tail
- **Normalize** it, and **Trim** everything before or after the start and end points, respectively.

Tip

While Tempera will accept and play any audio, here are a few general recommendations for making your own samples:

- Maximum track duration is about 11s
- If you're making a harmonic sound (such as a synth waveform), try keeping the base sample to lower a lower tuning, such as 110Hz or 220Hz.
- When making sequenced sounds, it's nice if the audio sample is neatly divisible in 8 equal length slices. This will make it gel well with the touchgrid cells.
- When making a sample with an embedded melody that's meant to be played with a keyboard, it's usually a good choice to have the melody run in "safe" notes, such as octaves and fifths. For a bonus challenge: try making a sample melody more with timbre and less with pitch.

6 EMITTERS

An emitter can be placed on a cell on the touchgrid, from where it will start emitting a stream of grains. All placed emitters are activated per each voice. Each emitter can be one of 4 color-coded configurations.

Tempera will not make sound unless there is an emitter placed and a voice is played.

Turning the corresponding knob tweaks the volume of the emitter and each display corresponds to one emitter:

- **Edit** the emitter configuration
- **Select** the emitter for placing

Holding the **Round button** reveals alternate context:

- **Clear** all placed emitters
- **Pause** / **Unpause** emitter grain generation

Emitters have many parameters that determine their behavior in time an space. Some parameters can be modulated, and some can be added an optional **Jitter**.

- **Grain size** is how long each grain is, measured in grid cells
- **Grain time** changes the grain length to a note *duration* in time signature
- **Grain density** determines how many grains are generated. A density of 1 means that there will be one grain played shoulder to shoulder.
- **Quantize** determines how much are grains emitted based on size-density, or based on **Note**
- **Note** sets the time signature at which new grains are emitted

- **Spray X** and **Y** sets amount of randomness in grain spawning horizontally (across tracks) and vertically (along a track)
- **Align** makes the emitted grain always start at the beginning of a cell. When not set, grains can be emitted from positions in between.
  Setting this can be useful for percussion tracks, where there's likely a transient at beginning of each cell
- **Fade in** and **out** of emitted grains after the emitter is placed or removed
- **Grain fade** is the amplitude envelope of each grain. Low value makes sharp transient grains, high value makes each grain have a smooth fade in and fade out
- **Channel** sets the MIDI channel at which the emitter is responsive
- **Grain pan** (either in **L/R** or **M/S**)
- **Tune spread** to give each grain a random tuning variation, in range of +- 1 octave. Apply gently for a thickening detune.
- **Octave** transposition of generated grains
- **Lock** the placed emitter to prevent it from being replaced by another
- **Name** of the emitter
- **Placement** changes the touchgrid behavior
  - **Instant**: touch to place, release to remove
  - **Toggle**: touch to toggle
  - **Latch**: once all fingers are removed, all emitters are cleared at next placement

Tip

- Set **Grain density** to below 1 and try playing with super short **Grain size**.
- Press the **Emitters** [:] button twice to edit the last edited emitter.
- Once a grain is generated and already in flight, it will stop either when it runs its course, or if the *voice* playing it is released.

7 OVERLAY KEYBOARD

It's recommended to use a MIDI keyboard connected to Tempera, however an overlay keyboard can be brought up, which will occupy some potion of the touchgrid.

The overlay keyboard section has these options:

- **Transpose** the overlay keyboard by semitones
- **Channel** sets which MIDI channel does the overlay keyboard play at
- **Play mode** determines what arrangement of notes does the grid follow:
  - **Strings IV**: each cell column is like a guitar string, tuned a fourth above the previous
  - **Strings V**: each cell column is like a mandolin string, tuned a fifth above the previous
  - **Scale maj**: each column is an octave, each cell is a tone in a major scale
  - **Scale min**: each column is an octave, each cell is a tone in a minor scale
- **Overlay** selects which portion of the touchgrid the overlay keyboard will occupy with two context options:
  - **Clear** all held notes
  - **Hold** keys on the virtual keyboard (like a sustain pedal)

Since each emitter can be assigned a separate MIDI channel, it is also possible to choose which MIDI channels are sent into the effects chain with **Effects send**.

Tip

- Set various emitters to different MIDI channels to achieve multi-timbrality.
- Setting your percussive emitters to a separate MIDI channel can be useful.

8 MODULATORS

The first page is dedicated to the ADSR amplitude envelope.

The following pages are dedicated to each of the 5 per-voice modulators. These can be of different shape, destination, speed and scaling.

- **Target/Size** switches between adjusting modulation target and modulation size.
- **Speed** of the LFO with an optional tempo **Sync** and **Phase** offset
- **+-** sets if the modulation wave is unipolar or bipolar

When a parameter is modulated, a small vertical line will appear over it for each voice played.

Tip

- **AD** and **AR** are two-stage simplified variants of the full ADSR envelope – attack-decay and attack-release.
- You can freely grain-scrub through a sample by modulating **Emitter Relative Y** with e.g. the Modwheel. Make sure you have enough grain density.

9 EFFECTS FX

Tempera has a carefully crafted effects suite: **Chorus**, **Delay** and **Reverb**. Apply them with a light touch!

All effects are processed in the order they are listed in the menus and are applied on the master. Except the **Filter** which is processed per-voice.

Filter parameters:

- **Cutoff** frequency
- **Emphasis** aka filter resonance
- **Type** of the filter: **LP12**, **BP12**, **HP12**, **LP24** and **Formant**
- Adjustable **Key tracking**

Chorus parameters:

- **Depth** of modulation
- modulation **Speed**
- **Flange** sets the amount of feedback
- amount of wet signal **Mix**

Delay parameters:

- **Feedback** with optional stereo ping **Pong**
- **Time** with optional time signature **Sync**
- **Color** adjusts the a bandpass filter frequency
- amount of wet signal **Mix**

Reverb parameters:

- **Size** of the reverb. Setting this to 1 will essentially freeze
- **Color** adjusts a smooth bandpass filter frequency
- **Damp** high frequencies from bouncing
- amount of wet signal **Mix**

10 MACROS

Each canvas requires fast access to a different set of parameters. To make this happen, you can bind most parameters anywhere in the menus to a slot in the **Macros** page.

When you then navigate into **Macros**, all the parameters will be laid out for convenience during a performance.

For example, you might want to have these parameters handy:

- **Filter cutoff**
- a **Modulator speed**
- an **Emitter grain size**
- a different **Emitter grain density**

To assign the **Filter cutoff** to macro slot:

1. Find the **Filter cutoff** on the first page of **Effects** section
2. Hold the **Macros** button and keep holding
3. Turn the **Filter cutoff** knob a little bit
4. Release the **Macros** button
5. Select which macro slot to place at

Macro assignments are saved along with the canvas.

11 RECORDING

You can record audio into a track from one of several audio sources, including on-device resampling (record Tempera's output).

Follow this example procedure to fill a track with recorded audio:

1. Set your desired audio input source in **Settings**
2. Make sure the meter is moving when audio streams in and adjust the gain
3. Adjust recording **Threshold**, once a track is armed and audio input goes above this threshold, Tempera will start recording
4. While in **Track Layout**, hold the **Round button** and press one of the context buttons to arm the chosen track
5. Release the **Round button** at which point the track is waiting for audio input
6. Play audio into Tempera. If the audio input is set to **Internal mic**, the displays will go blank for the duration of recording to eliminate interference
7. Press the **Round button** to stop recording
8. Your audio is now recorded in the track
9. Go into **Track layout**, **Edit** and **Trim** the newly recorded track to your preference

Tip

- Try recording random sounds around you with the internal microphone! Mangling them with granular processing will reveal so many facets of our environment.
- Have you recorded an interesting and unusual sample? Share it with others and see it used in a completely different way!

12 EXTERNAL STORAGE

Tempera has a total internal memory of 8GB, and some of it is used for the firmware and built-in samples and canvases. The lossless internal conversion to FLAC happens seamlessly and more than doubles the amount of samples that will fit.

If you're a sample collector and this is not enough room, you can attach a micro SD card at the front, or a USB flashdrive at the back. On your external storage medium, create two folders, one named "samples" and another "programs" and place your samples and canvases there.

12.1 Firmware upgrade

After downloading a Tempera firmware file, place it onto a USB flashdrive or SD card (formatted with FAT32). When Tempera is off, insert it, and turn Tempera on while holding the **Round button**.

Tempera will then load the firmware upgrade file and provide further instructions on the displays.

Don't turn off the power before the firmware update is finished.

13 MIDI INPUT

It is possible to control many of Tempera's internal parameters by MIDI CC.

Table 1: Control Change (CC) parameters

CC	Parameter
10	Active emitter
11	–
12	–
13	Amp attack
14	Amp decay
15	Amp sustain
16	Amp release
17	Reverb size
18	Reverb color
19	Reverb mix
20	Delay mix
21	Delay feedback
22	Delay time
23	Delay color
24	Filter cutoff
25	Filter resonance
26	Chorus depth

continues on next page

Table 1 – continued from previous page

CC	Parameter
27	Chorus speed
28	Chorus flange
29	Chorus mix
30	Track 1 amp
31	Track 2 amp
32	–
33	Track 3 amp
34	Track 4 amp
35	Track 5 amp
36	Track 6 amp
37	Track 7 amp
38	–
39	Track 8 amp
40	Emitter 1 volume
41	Emitter 1 grain size
42	Emitter 1 grain size time
43	Emitter 1 grain density
44	Emitter 1 grain fade
45	Emitter 1 grain pan
46	Emitter 1 tune spread
47	Emitter 1 octave
48	Emitter 1 spray X
49	Emitter 1 spray Y

continues on next page

Table 1 – continued from previous page

CC	Parameter
50	Emitter 2 volume
51	Emitter 2 grain size
52	Emitter 2 grain size time
53	Emitter 2 grain density
54	Emitter 2 grain fade
55	Emitter 2 grain pan
56	Emitter 2 tune spread
57	Emitter 2 octave
58	Emitter 2 spray X
59	Emitter 2 spray Y
60	Emitter 3 volume
61	Emitter 3 grain size
62	Emitter 3 grain size time
63	Emitter 3 grain density
64	–
65	Emitter 3 grain fade
66	–
67	Emitter 3 grain pan
68	Emitter 3 tune spread
69	Emitter 3 octave
70	Emitter 3 spray X
71	–
72	Emitter 3 spray Y

continues on next page

Table 1 – continued from previous page

CC	Parameter
73	Emitter 4 volume
74	–
75	Emitter 4 grain size
76	Emitter 4 grain size time
77	Emitter 4 grain density
78	Emitter 4 grain fade
79	Emitter 4 grain pan
80	Emitter 4 tune spread
81	Emitter 4 octave
82	Emitter 4 spray X
83	Emitter 4 spray Y
84	Modulator 1 parameter 1
85	Modulator 1 parameter 2
86	Modulator 1 amount
87	Modulator 2 parameter 1
88	Modulator 2 parameter 2
89	Modulator 2 amount
90	Modulator 3 parameter 1
91	Modulator 3 parameter 2
92	Modulator 3 amount
93	Modulator 4 parameter 1
94	Modulator 4 parameter 2
95	Modulator 4 amount

continues on next page

Table 1 – continued from previous page

CC	Parameter
96	Modulator 5 parameter 1
97	Modulator 5 parameter 2
98	Modulator 5 amount

Emitters are numbered starting at top left, column by column. To place or remove emitters:

- First set the **Active emitter** by sending CC10 with value between 0 and 3. Value of 0 is the first (blue) emitter.
- Send CC11 with value between 0 and 63 to place an emitter
- send CC12 with value between 0 and 63 to remove an emitter

For example, to place emitter 1 on the first cell of first track:

- Send CC10 with value 0 to set the active emitter to 1
- Send CC11 with value of 0 to place the emitter

Or remove emitter 2 from the second cell of the second track

- Send CC10 with value 1 to set the active emitter to 2
- Send CC12 with value 20 to remove the emitter

14 SPECIFICATIONS

- 32-bit internal processing
- 16-voice polyphony with per-voice filters
- Headphone amplifier
- 12V/2.5A DC power supply (5.5/2.1mm, center-positive)
- Dual 6.35 mm jacks for audio output, up to 10Vpp or 13dBu (either headphone or separate left + right channels)
- 6.35 mm stereo jack for audio input, up to 5.9Vpp or 8.6dBu (line in or instrument switchable)
- Internal microphone
- MIDI TRS input and output ports (Type A and B switchable in configuration)
- USB MIDI host and device ports (both capable of input and output)
- Micro SD card slot and USB flash drive support for storage and data transfer
- Firmware easily upgradable with a USB flash drive or micro SD card
- VESA-compatible mounting holes on the rear panel (100×100mm spacing, M4 screws. Absolute maximum thread depth inside Tempera is 5mm)

14.1 Health and Safety

Use common sense when handling Tempera. Standard guidelines for handling electronic devices apply, which, among others, are:

- Use only the supplied power supply (PSU-02)
- Do not expose the machine to any liquids or excessive levels of humidity
- Do not use screws longer than 5mm for the rear panel mounting holes

Tip

Found a bug or something is not working as you expect? Reach out to us at *makers@beetlecrab.audio* or on our Discord server.