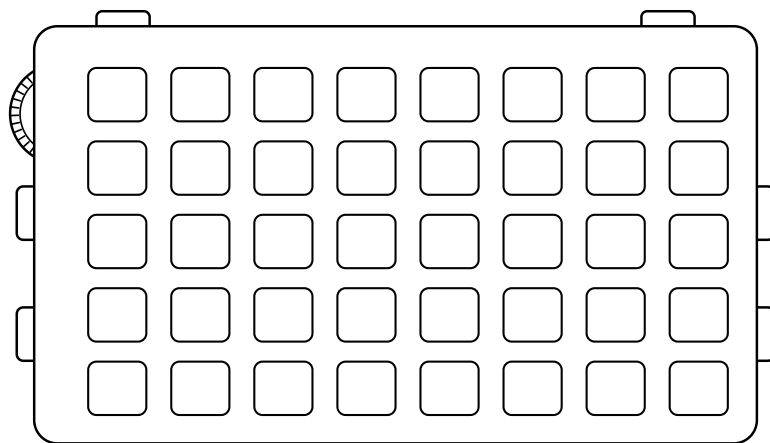


User Manual

Firmware 0.50.5

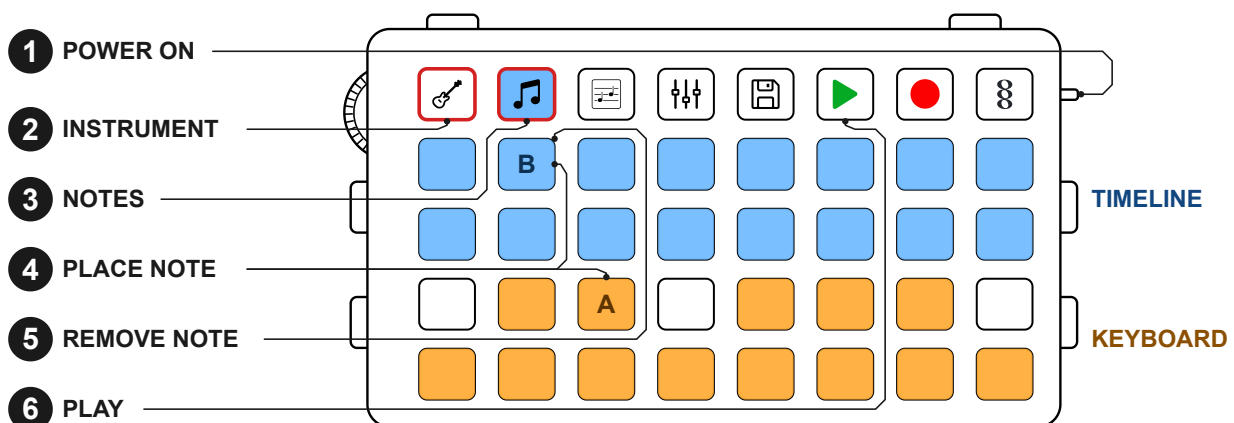
28 September 2026



Disclaimer - This manual is a work in progress. If you find points that are wrong or hard to follow, make sure to let me know!

Quick Start

1. **Power on.** The power switch is on the top right. The first time, MILO talks you through these steps itself – see [Interactive Tutorials](#).
2. In the **Instrument View** 🎸 **pick an instrument.** The first and second row show tonal instruments (warm colors) and the third and fourth row show percussive instruments (cool colors). Press one to hear a preview.
3. **Press the Notes button** 🎵 to jump to the **Notes View**. This view is used to compose melodies. The first and second row represent a timeline, where notes are placed. The third and fourth row are a keyboard where you can play notes.
4. **Place a note in the timeline**, by holding a key on the soft keyboard (A), and then while still holding it, tap a step in the timeline (B).
5. **Remove a note from the timeline**: double-click the note you want to remove in the timeline (B).
6. **Press the Play button** ▶ to start playback. The timeline shows a moving white playhead. Press it again to stop, hold it to jump back to bar one.
7. **Go back to the Instrument View** 🎸 to add more instruments and build up your loop



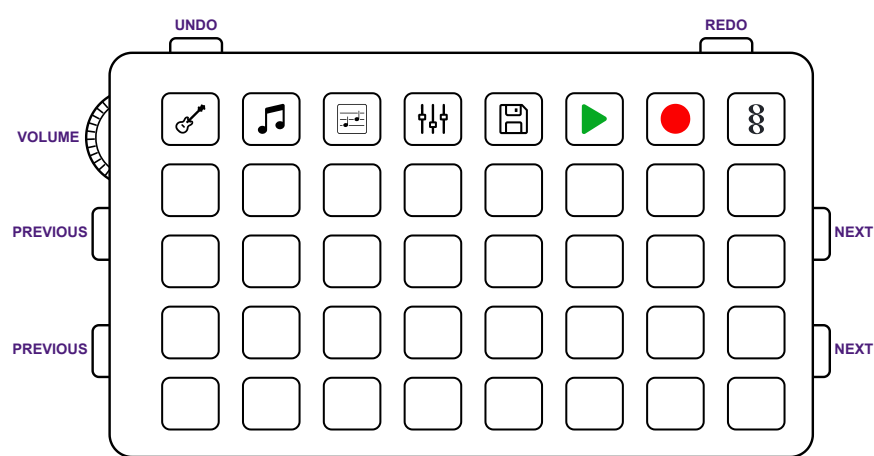
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The Device at a Glance

Button	Icon	What it's for
Instrument		Pick an instrument.
Notes		Create a melody with that instrument.
Bars		Repeat and arrange bars.
Mixer		Adjust per-instrument volume and mute.
Song		Save, load, and manage full songs.
Play		Start / stop playback. Hold to jump to the beginning.
Record		Record samples, record live, keep the pass you just played, hum a melody.
Chord		Click to automatically create chords that fit the key. Additional clicks cycle through chord modes. Hold turns chords off.

When MILO says no: a low two-tone buzz means the action could not be carried out.



Interactive Tutorials

A tutorial tells you what to do next, lights up the key it wants you to press, and waits until you have pressed it.

The basic tutorial covers the [Quick Start](#). It starts by itself the first time you switch MILO on, and again at every start until you have finished it or left it.

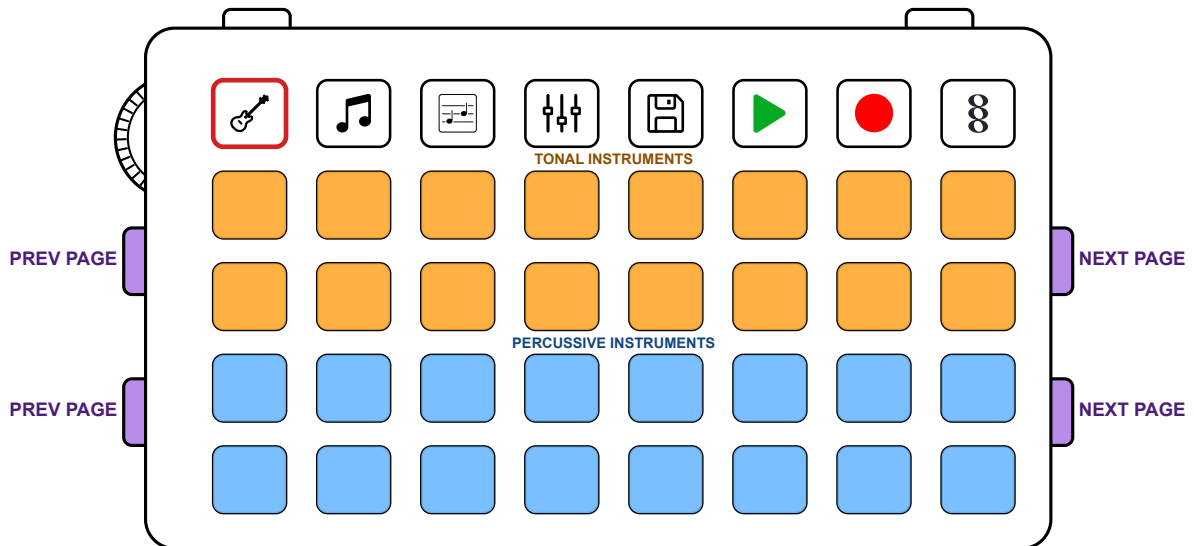
More chapters: hold the **Instrument**  button and click the **Chord**  button. Each time you do this, MILO starts the next chapter – the basic tutorial first, if you haven't finished it:

#	Chapter	#	Chapter
1	Bars View	8	Humming a melody
2	The side buttons	9	More in the Notes View
3	Recording a sample	10	Filling and looping bars
4	Volume and tempo	11	Exporting a song
5	Chords	12	Shortcuts
6	Mixer	13	Charging
7	Undo and redo		

- **Save your song first.** Every chapter starts with an empty song and clears it again at the end.
- While a tutorial runs, only the keys it asks for respond. **To leave it,** double-click the **Play**  button.
- Once you've heard every chapter, the gesture plays the "no" buzz.

Instrument View 🎸

Used to pick the active instrument.



Press any instrument key to select it. Also, a preview of the instrument is played while held.

- **First and second row:** tonal instruments (piano, guitar, etc.).
- **Third and fourth row:** percussive instruments (drums etc.).
- **Active instrument:** pulses **white**.
- **Other instruments in use:** pulse in their own color.

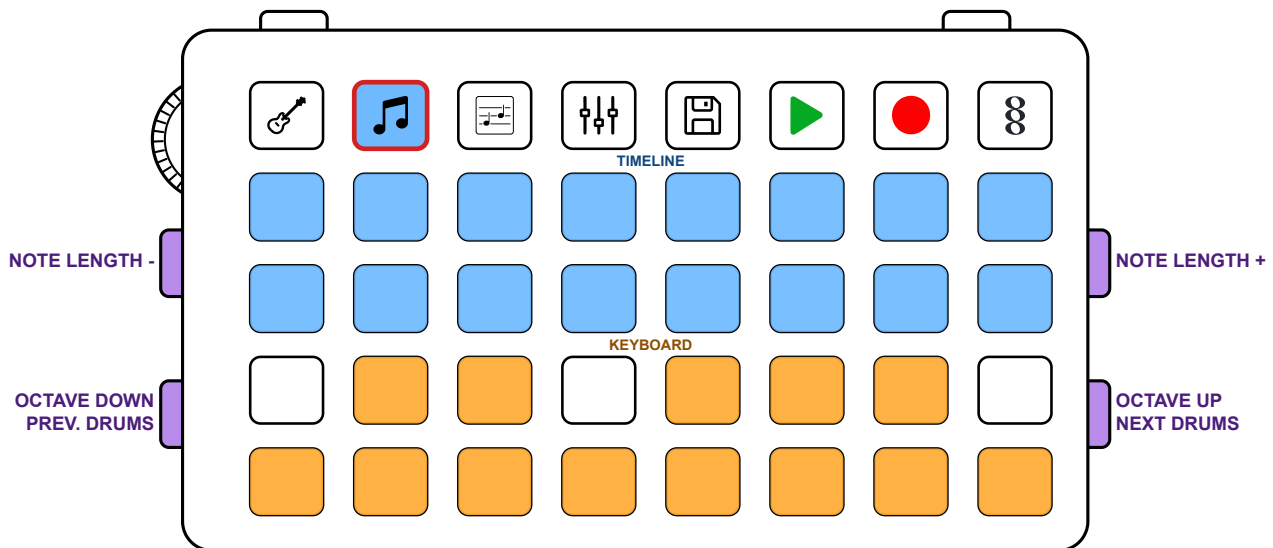
Pagination: Press a side button to page through the other instruments. MILO ships with one page of them, but you can add more: record samples on MILO (see [Record](#)), or make them on a computer at redgreenblue.ch/import-samples — unpack the zip it gives you into the top level of MILO's USB drive and restart.

The instruments MILO ships with, in key order — tonal on the first and second row, percussive on the third and fourth:

#	Tonal	Percussive
1	Piano	Kick 1
2	Guitar	Kick 2
3	Electric Guitar	Snare
4	Pluck Bass	Hi-Hat Closed
5	Bowed Bass	Hi-Hat Open
6	Cello	Ride
7	Violin	Crash 1
8	Harp	Crash 2
9	Flute	Tom High
10	Clarinet	Tom Low
11	Trumpet	Conga
12	Tenor Sax	Bongo
13	Vibraphone	Cowbell
14	Marimba	Woodblock
15	Pad Choir	Tambourine
16	Pipe Organ	Shaker

Notes View 🎵

This is where you place notes to create a melody



- **First and second row** are the **Timeline**: 16 steps showing the melody within one bar. The first row is the first half, the second row is the second half. During playback a playhead moves across both rows in real time.
- For tonal instruments (piano, guitar, trumpet, etc.), the **third and fourth row** represent a piano **Keyboard**. The third row is the chromatic (black-key) notes, the fourth row is the diatonic scale (white-key).
- For **percussive** instruments (kick, snare, hi-hat, etc.), the **third and fourth row** hold the drums themselves instead of a scale — the same instruments in the same places as in the Instrument View. A drum has no pitch to play, so the row gives you the whole kit instead, and you build a beat out of kick, snare and hi-hat together without leaving this view.

Action	How to do
Inserting a note	Hold down a key in the keyboard (third or fourth row), then — while still holding it — tap a step cell in the timeline (first and second row). On a drum kit it is the same gesture: hold the drum you want and tap the step.
Inspecting a note	Click a note in the timeline. This previews whatever note(s) already live there and lights up the matching keyboard keys — on a drum kit, every drum that plays on that step.
Removing a note	Double-click a note in the timeline to clear the note at that step. On a drum kit this clears every drum playing on it.
Cloning a note	Press and hold an existing note in the timeline, then (still holding) tap a different step in the same row — the note is copied onto the target step.
Changing a note's length	Press and hold an existing note's starting step, then (still holding) tap the upper-left or upper-right side button to shrink or grow it by one step.
Changing a note's volume	Press and hold a note on the timeline then (still holding) turn the scroll wheel.
Nudging notes	Press and hold an <i>empty</i> step — without holding a keyboard key — and every note from that step onwards moves one step later. A double-click moves that same part one step earlier.
Nudging the rest of the song	Hold the Bars button while you hold or double-click an empty step, and the nudge also moves every bar after this one.

Moving between bars: Click the upper-left or upper-right side button to step to the previous or next bar of the song, so you can work on another part of it without leaving this view. While a bar is looping (see the Bars View), the same two buttons move the loop instead: it jumps to the previous or next bar of the current instrument and keeps playing there. Empty bars have nothing to loop, so they are skipped, and at the instrument's first and last bar the loop stays where it is.

Changing Octave: Click the lower-left or lower-right side button to shift the active track down or up an octave. The available range depends on the instrument. A drum has no octave, so on a drum kit these two buttons page through the available drums instead — the same way the side buttons page instruments in the Instrument View.

Visibility in the Timeline: Notes that belong to another octave are still shown in the timeline, just very faint. So if you added a bassline earlier and then switched up a few octaves to write a melody, you can still see where the bass notes sit.

You won't edit them by accident: inspecting, removing, cloning and changing a note's length always act on the notes of the current octave only. Press a faint step and the keyboard first slides to the octave of the note lying there.

Nudging: if a part of your bar sits on the wrong beat, you don't have to move the notes one by one. Press and hold an empty step and everything from there to the end of the bar slides one step later; a double-click slides that same part one step earlier. The notes *before* that step stay where they are — so hold the very first step to move the whole bar. The bar is a loop: a note pushed past the last step comes back around at the first one.

Nudging the rest of the song: hold the Bars button while you do either of those, and every bar after this one moves along with it. Now a note pushed

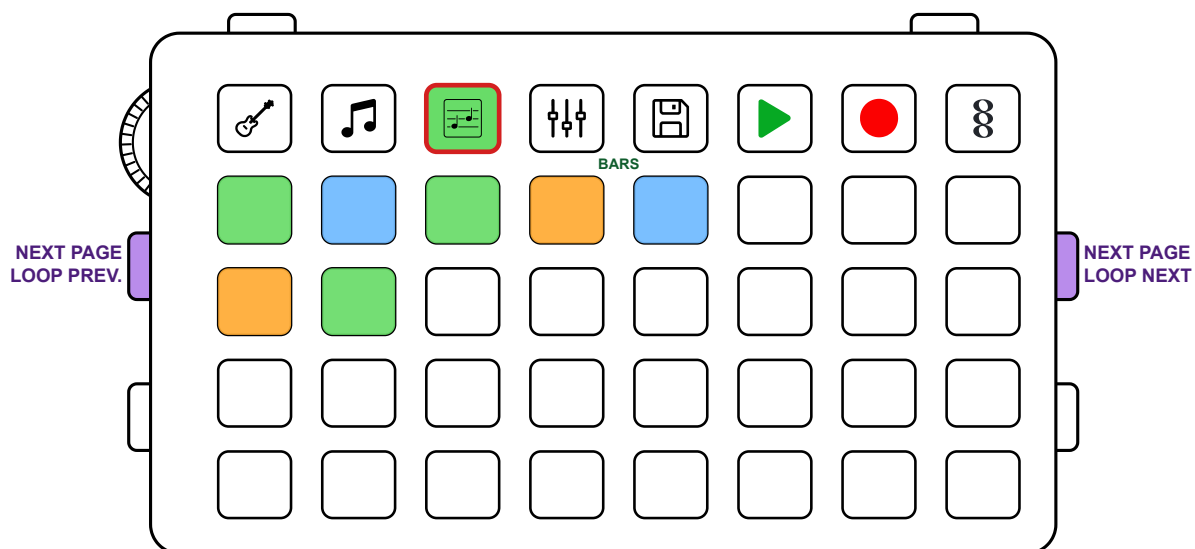
past the last step doesn't come back around in its own bar; it carries on into the first step of the next bar, so the whole part keeps its shape across bar lines. If a note is pushed off the end of the last bar, MILO adds a new bar for it. Letting go of the Bars button keeps you in the Notes View. If the shift would leave too many different bars for the track to hold, the step flashes red and nothing moves.

Randomize: press and hold both the upper-left and upper-right side button — this randomizes the length and volume of every note in the current melody by a small amount. This gets you a more natural sounding melody quickly.

Limits: If the melody already holds 64 notes — the maximum per melody — the step flashes red instead and nothing is added.

Bars View

Arrange bars to build a song



After you created a melody you will probably want to repeat and vary it to make the song more interesting. That is what the Bars View  is for.

Each key in the Bars View represents one bar of your song. A bar is what you can see and edit in the Notes View .

While the song plays, the bars are played from left to right and top to bottom (like reading a book)

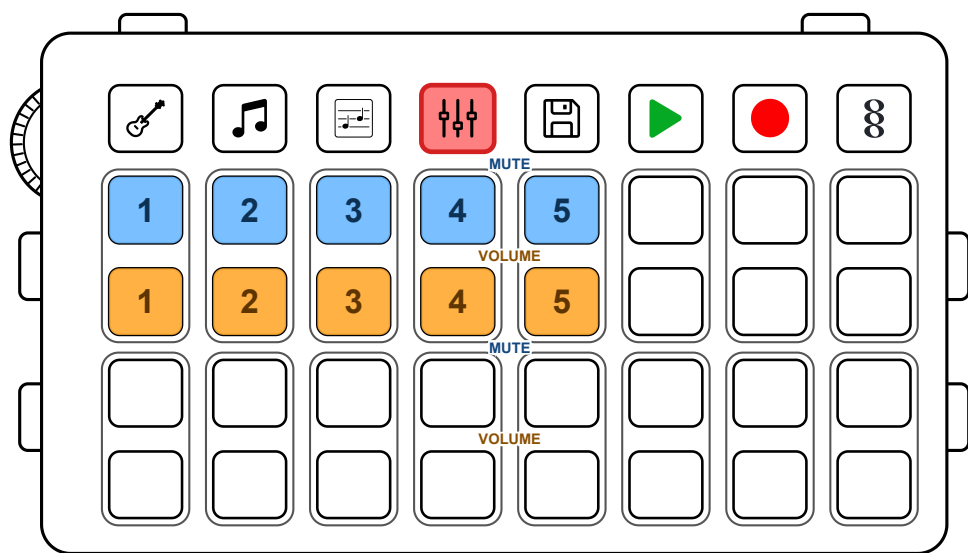
You can fill as many bars as you want. Running out of space? Click one of the upper side buttons, this brings you to an additional page – space for 32 more bars!

The bar that is currently playing blinks slowly.

Action	How to do
Starting a new bar	Click an empty key to start a new bar there.
Selecting a bar	Click a bar. Every other key playing the same melody pulses briefly so you can see where else it's used.
Removing a bar	Double-click a bar.
Copying a bar	Hold a bar, then tap an empty key. The copy stays linked to its original: editing the original in the Notes View later changes every copy made from it. Editing a copy unlinks it from the original. You will notice that when unlinked, a bar gets a new color.
Filling a whole run	Hold a bar and then hold the key the run should end on — every key in between gets a copy of it.
Moving bars along	Press and hold an <i>empty</i> key: every bar from there on moves one key along. A double-click does the opposite.
Looping a bar	Long-press a bar to pin playback there — the song repeats that bar indefinitely instead of moving on. The whole band stays with you: every other instrument keeps repeating what it plays in that bar instead of carrying on through its own bars. This is useful while you are working on a bar and don't want to wait every time until the playhead reaches it. Once it's playing, it blinks four times as fast as normal. Click any other key to release the loop.

Mixer View

Control the volume of each instrument



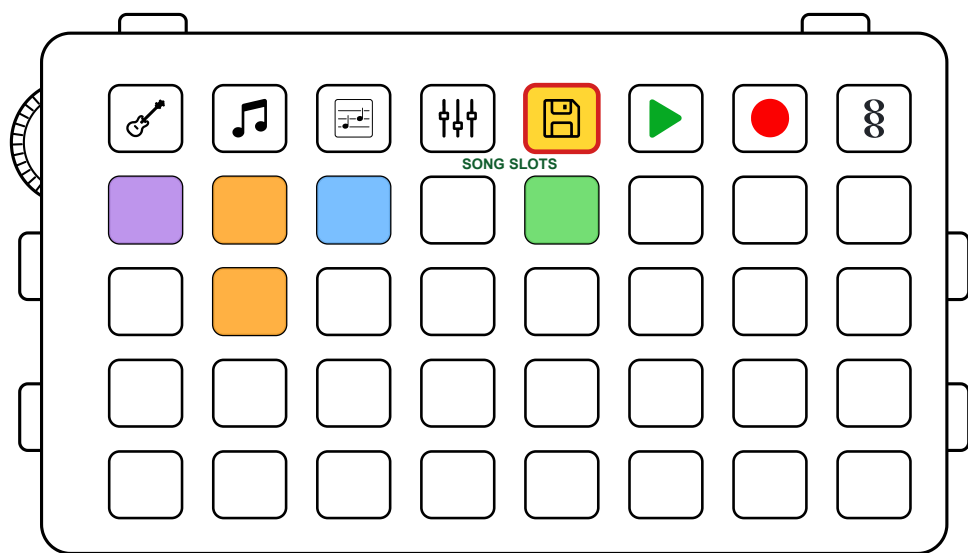
Sometimes you want to mute individual instruments or adjust their volume – this is the place for that. The instruments used in the current song are arranged from left to right and have the same color as in the Instrument View.

Row	How to do
First row	Click a key to mute an instrument
Second row	Hold a key and turn the scroll wheel to change that instrument's volume

The third and fourth row behave the same way.

Song View

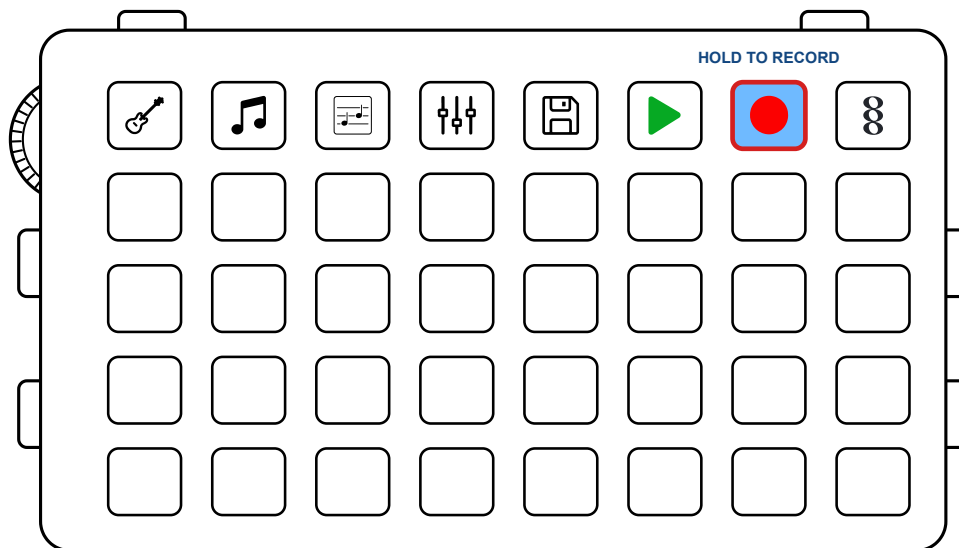
Save, load, and delete songs.



Action	How to do
Saving a song	Hold the Song  button and click a slot: an empty slot saves the current song there, an occupied one is overwritten with it
Loading a song	Click an occupied slot to load that song — it starts playing right away
Deleting a song	Double-click an occupied slot to arm deletion — it blinks red for 3 seconds. Click it again to confirm. Deleted by mistake? Undo it with the left shoulder button
Starting a new song	Click an empty slot to reset the current, not yet saved song

Record ●

Record samples using the built-in microphone – and more



The Record button does different things depending on how you use it:

How to use	What it does
Hold Record	Records a sample from the microphone as a new instrument
Click Record	Starts Live Record Mode – records every note you play, across as many bars as you need. With the Bars button held: looping a single bar
Double-click Record	Keeps the pass you just played – no need to start recording beforehand
Hold Notes 🎵 button, then click Record	Hum a melody , MILO turns it into notes – <i>experimental</i>

1. Recording a sample

Hold down the Record ● button to record a new instrument from MILO's built-in microphone. Recording runs until you release the button again.

- The Record ● button **blinks blue** while recording. Max recording length is currently 10 seconds.
- After releasing the button MILO processes and saves the recording, the Record ● button blinks blue rapidly — wait for it to finish before the new instrument appears.
- MILO looks for a clear, steady pitch in the recording.
 - If it finds one, the recording is saved as a **tonal** instrument
 - otherwise it is saved as a **percussive** instrument.

Deleting an instrument: If you don't like what you recorded, you can delete it again. When in **Instrument View** 🎸 double-click an instrument — it then double-blinks red for 3 seconds. Press it again to confirm and delete it. This only works for instruments you recorded yourself.

Deleted by mistake? Undo it with the left shoulder button — but only until the next restart.

2. Live Record Mode

Click **Record** , to start **Live Record Mode**. Recording always begins at the start of the song.

While recording, every note you play is placed in the timeline — at the exact moment you play it.

The playhead keeps running into new bars for as long as you record, so a take can be as long as you like. Silent bars at the beginning and end are discarded, silent bars in between are kept. The Record button **blinks red** while it is running.

To record to a single bar instead, hold the **Bars button**  and while holding it click **Record**. The bar you started on then repeats for as long as you record. The Record button **blinks yellow**.

The whole take is a single edit: if it came out badly, one press of Undo removes all of it at once.

3. Keeping what you just played

Getting a part right often takes a few tries, and the good one is usually the one you weren't recording. So MILO always remembers what you have just played — you don't have to start anything beforehand.

Play along while the song runs, and when a pass comes out the way you wanted it, **double-click Record** . The notes of that pass appear in the timeline, exactly as you played them.

- **How far back it reaches:** one bar while a bar is looping, otherwise the whole length of your song — one time round of whatever is repeating.
- **Take your time.** MILO keeps the pass you last *played*, not the last few seconds, so it makes no difference how long you take to reach for the button — as long as you don't play something else in between.
- Your timing is kept as you played it, not pulled onto the grid.
- **It is a single edit:** one press of Undo (left shoulder button) removes all of it.
- If there is nothing to keep — you haven't played anything, or the song is stopped — the Record button blinks red twice.

Tip: This works beautifully with a loop. Loop one bar in the Bars View , play over it until you like what you hear, then keep it.

4. Humming a melody

Hold the **Notes** 🎵 button, click the **Record** ● button and hum your melody — MILO listens and places the notes it recognises with the current instrument in the timeline. The Record button **blinks green** while MILO is listening.

Click **Record** ● again to end recording. Otherwise it stops on its own after 16 seconds. Shortly after, the notes appear in the timeline: notes MILO is sure about blink green, uncertain ones blink amber. When a note is genuinely unclear MILO leaves it out rather than guessing.

Tip: Sing one note at a time. Separate repeated notes of the same pitch with a "da-da" rather than one long "mmm", or they come out as one held note.

Experimental feature — use at your own risk.

Unless you always hummed perfect pitches, expect to tidy it up. A wrong pitch is quickest to fix with a double-click on that step (= delete) and placing the note again

MILO tries to adjust the song tempo automatically to the rhythm of your humming.

The whole take is a single edit. So if it came out badly, press Undo (left shoulder button) to remove all of it.

If nothing usable was recorded — too quiet or nothing but noise — the Record button blinks red twice and your song is left unchanged.

Chords 8

Click the **Chord 8** button to turn on automatic chord creation. Each further click on the Chord button steps to the next chord mode. Long-press the Chord button at any time to turn it off again. Pressing it from any other screen takes you to the Notes View first, where chords live.

Chords need notes to build on, so they only work on melodic instruments. On a drum kit the Chord button blinks red and beeps instead.

Chords that fit the key

The first two clicks give you chords that belong together. Every key plays the chord that fits its note, so any keys you pick will sound good one after another.

- **First click (warm white):** three-note chords.
- **Second click (cool white):** the same chords with a seventh added, for a softer, jazzier sound.

Key	C	D	E	F	G	A	B
First click	C	Dm	Em	F	G	Am	Bdim
Second click	Cmaj7	Dm7	Em7	Fmaj7	G7	Am7	Bm7b5

The black keys add the chords rock and pop songs like to borrow: D $\flat$, E $\flat$, A $\flat$ and B $\flat$ major (with a seventh on the second click), and F $\sharp$ diminished (F $\sharp$ m7b5 on the second click). Try C, A $\flat$, B $\flat$, C.

While you hold a key, it lights up in the color of the chord it plays, from the table below. The m7b5 chords light up lime, like Dim.

A fixed chord on every key

From the third click on, every key plays the same kind of chord, one type per click:

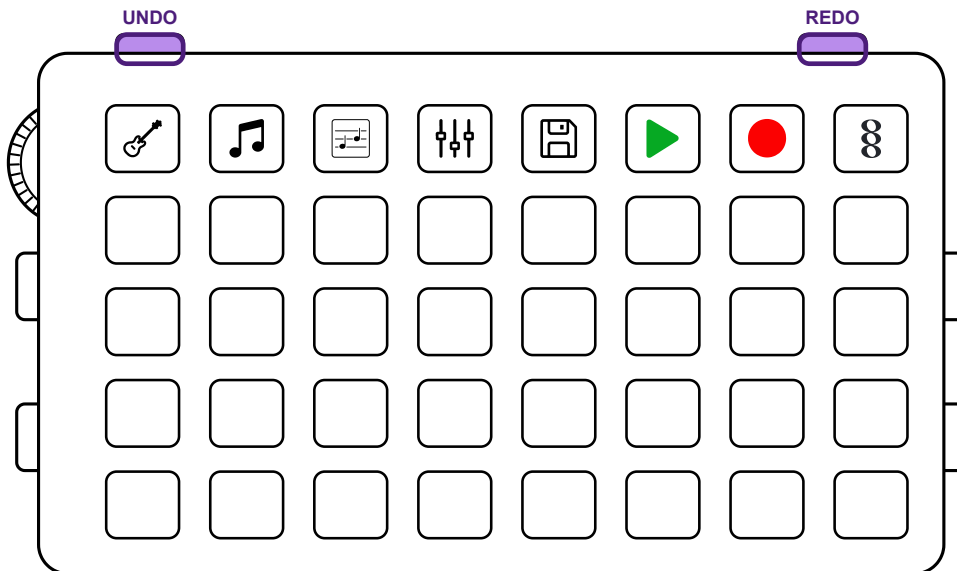
Color	Chord	Intervals above root
Red	Maj	+4, +7
Blue	Min	+3, +7
Yellow	Dom7	+4, +7, +10
Green	Min7	+3, +7, +10
Orange	Maj7	+4, +7, +11
Cyan	Sus4	+5, +7
Purple	Sus2	+2, +7
Pink	Power	+7
White	Maj6	+4, +7, +9
Magenta	Min6	+3, +7, +9
Lime	Dim	+3, +6
Azure	Dim7	+3, +6, +9

Guitar and Electric Guitar play every chord as a full six-string shape across two octaves, instead of the compact intervals above.

Undo and Redo

Click the left shoulder button to **undo** your last edit; click the right one to **redo** it.

- Making any new edit after undoing discards the remaining redo steps.
- When there's nothing left to undo or redo, the active view's header LED blinks red twice.
- Some actions, such as loading a song, cannot be undone.



Quickly switching instrument

Long-press either shoulder button to switch between the instruments already used in the song.

Scroll Wheel

Turn it alone to **adjust master volume**.

Hold the Play ► button while turning it and you can **adjust the tempo** instead (60–180 BPM).

Exporting Songs

Songs leave MILO in one of two forms:

- A **WAV** recording – an audio file, ready to listen to or share
- A **MIDI** file, which carries the notes themselves, for editing in a music program.

The easy way – My MILO:

1. Save your song in the [Song View](#) .
2. Connect MILO to a computer with a USB cable and open **redgreenblue.ch/manage** (the **My MILO** page).
3. In the **Songs** tab, pick the song and click **Export as WAV**. MILO creates the recording and your browser downloads it.

Export as MIDI in the same place gets you the MIDI file. See [My MILO](#) for everything else the page can do.

Exporting as WAV on MILO itself: Hold the **Song** 📁 button, then click the **Record** ● button. MILO saves the current song as a WAV recording on its card. The Song button pulses blue while exporting and flashes white when it's done. A MIDI file is written every time you save a song.

Getting the files onto a computer: Plug MILO in over USB and it appears as an ordinary USB drive – copy the files off exactly as you would from any other drive.

- MIDI files can be found in the `/midi` folder as `song_NN.mid`
- WAV files can be found in the `/wav` folder as `song_NN.wav`
- Saved songs live in the `/songs` folder – these are MILO's own files, for loading a song back onto the device

Note: Saving or exporting while MILO is plugged in disconnects it from the computer, so it can write to its own card without the computer overwriting what it just wrote. Unplug it and plug it back in to see the new files.

My MILO

Manage your songs and sounds from a web browser.

Open **redgreenblue.ch/manage** – or **My MILO** in the website's menu – connect MILO with a USB data cable, switch it on and click **Connect to MILO**. It works in Chrome or Edge on a computer, and in Chrome on an Android phone or tablet; not on an iPhone or iPad. It needs firmware 0.34 or newer; if yours is older, [update MILO](#) first.

The page shows a picture of MILO whose keys stand for what is on your MILO, in two tabs:

- **Songs** – click a song to select it, then:
 - press the **Play** key on the picture to listen to it on your computer
 - **Export as WAV**, **Export as MIDI** or **Export as note sheet** to download it
 - **Colour** to give it a different colour, **Delete** to remove it
 - drag it onto another key to move it
- **Instruments** – listen to, delete and move your instruments, see which songs use one, and **Upload** your own sounds from the computer.

Backup all saves all songs or instruments to your computer, and **Restore all** puts them back.

Updating MILO

New firmware brings new features and fixes. You install it from your browser:

1. Connect MILO to a computer with a USB **data** cable and switch it on.
2. Open **redgreenblue.ch/flash** (**Firmware Update** in the website's menu). The page tells you whether a newer version is available; **Release Notes** lists what's new.
3. Click **Update**. The first time, your browser asks which port to use – pick the one called "TinyUSB" or "Espressif".

MILO restarts on its own once it's done. If needed, the page installs new built-in sounds too. Your songs and recordings stay as they are.

- It works in Chrome or Edge on a computer, and in Chrome on an Android phone or tablet; not on an iPhone or iPad.
- If an update stops part way, MILO is not broken – it keeps the firmware it already had. Unplug it, plug it back in and click **Update** again.

Battery

On a full charge, MILO runs for about 6–8 hours. If the battery gets too low, the header LEDs blink red three times as a warning and a voice announces "battery low". Plugging into a charger briefly shows your battery level as a bar graph across the header LEDs, filling from red (empty) to green (full).

Contact

If you want to order another MILO, update its firmware for new features or get in touch with me, visit www.redgreenblue.ch

Feedback is very welcome – if something is unclear, doesn't work the way you expected, or you have an idea for a feature, I'd love to hear about it at the same address.

Licenses

MILO's built-in sounds and firmware are built on the work of several open-source and free-culture projects. None of them require you to do anything as a user, but here's what's inside.

Instrument samples

Source	License	Used for
VCSL (Versilian Community Sample Library)	CC0 (public domain)	Most percussion, plus harp, saxophone, vibraphone, marimba, and pipe organ
VSCO2 Community Edition	CC0 (public domain)	Strings, brass, woodwinds, and part of the drum kit
University of Iowa Musical Instrument Samples by Lawrence Fritts	Free to use for any project, without restrictions	Classical guitar
FreePats — Electric Guitar FSBS, Synth Pad Choir	CC0 (public domain)	Electric guitar and pad
Salamander Grand Piano V3 by Alexander Holm	CC-BY 3.0 (attribution required)	Piano
Karoryfer Samples — Big Rusty Drums, Unruly Drums, Black And Blue Basses	CC0 (public domain)	Kick, hi-hat, ride, and bass

Firmware libraries

Library	License	Author
Adafruit TLV320 I2S	MIT	Michael Bell and Pimoroni Ltd
Adafruit VEML7700 Library	BSD	Adafruit Industries
Adafruit BusIO	MIT	Adafruit Industries
ESP32 Arduino core (Wire, SD_MMC, LittleFS, FS)	LGPL-2.1	Espressif Systems
ESP-IDF	Apache-2.0	Espressif Systems
FreeRTOS	MIT	Amazon.com, Inc. or its affiliates
TinyUSB	MIT	Ha Thach (tinyusb.org)
Mbed TLS	Apache-2.0	The Mbed TLS Contributors
littlefs	BSD-3-Clause	Arm Limited and the littlefs authors
esp_littlefs	MIT	Brian Pugh
FatFs	BSD-style	ChaN
TLSF memory allocator	BSD-3-Clause	Matthew Conte
Xtensa HAL	MIT	Cadence Design Systems
newlib (C library)	BSD-style (several)	Red Hat, Inc. and others

CC0 means public domain — no credit required, use however you like. CC-BY requires crediting the original author, which this section does. LGPL, Apache-2.0 and MIT/BSD are standard open-source software licenses that permit use in a project like this one. Their full texts are in [third-party-licences.pdf](#) , next to this manual on MILO's drive.

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Music you make with MILO is yours — nothing in this manual or the licenses above places any claim on it.