

OSCPOCKETD



Project: OscPocketD
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Introduction

Welcome to the OscPocketD (OPD) - the Daisy Pocket Platform!

The goal is to combine the Electosmith Daisy Seed with a 16x2 LCD Keypad to make a simple, inexpensive and portable audio tool running open source software. The OPD can also be controlled with CV and GATE signals and MIDI but this is optional. Last but not least -- the OPD has a lot of modulation capabilities, including a simple sequencer.

All software is running on the Daisy MCU/microcontroller, including sound generation. It processes sound with 24 bits at 48 KHz.

The OPD can handle up to 4 CV inputs and two potentiometers. The CV inputs are limited to 0-3V3, but can be scaled and offset in hardware and software.

The OPD can control up to 4 CV/GATE outputs, also limited to 3V3.

Currently the OPD has several different applications (firmwares):

- **OscPocketD/Base** - A multi-fx tool with a two voice synth
- **OscPocketD/Synth** - A portable beat/song-making tool (no CV/GATE support yet)
- **OscPocketD/Sampler**- A sampler and sampleplayer
- **OscPocketD/Drums** - A drum machine
- **OscPocketD/VASynth** - A MIDI virtual analog polyphonic synthesizer

If you like my projects and find them useful, I would be happy for a donation, whatever the amount! Contact me (staffan.melin@oscillator.se) on how to send me a contribution.

And if you make some interesting music/noise, I would be very happy to hear about it!

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OscPocketD/Base

This is a multif-fx device with a built in dual oscillator synth and lots of modulation options.

In submenus, press LEFT when you are in the first position to go back to the previous screen.

How to use it

Effects

Effect order with modulation options:

1. Input gain
2. Oscillator (frequency, amplitude)
3. Slicer (start record, start playback)
4. Decimator (bitcrush factor)
5. Overdrive (gain, drive)
6. Filter (frequency, resonance)
7. ADSR (gate, sustain)
8. Pan (pan)
9. Delay (time, feedback)
10. Chorus
11. Reverb
12. Output gain

Modulation

The OscPocketD/FX has many modulation sources:

- 2 x EG [E0-1]
- 3 x LFO [L0-2]
- 2 x CV in [C0-1]
- 2 x Gate in [G0-1]
- 2 x potentiometers [P0-1]
- MIDI in which detects Pitch and Velocity. Received Note off messages are internally converted to Note on with zero velocity. Midi data is accessible as one of two modulators: MP (pitch) and MV (velocity). If used for "normal playing" let the MP control the Oscillator pitch and MV the ADSR Gate. For all other uses the MP and MV returns a value from 0-1 (ie they are scaled from 0-127).
- 3 x Special Modulators (including sequencers) [S0-2]
- 3 x Triggers for Special Modulators [T0-2]
- Audio in, Left and Right channels are mixed [AU]

Screen: Overview

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	IN	UTIL	EG0	EG1	SM0	SM1	SM2	LFO0	LFO1	LFO2	CV0	CV1	G0	G1	POT0	POT1
1	O	S	D	O	F	A	P	Y	C	R						

Function:

- IN: Input from S (stereo, work on both channels), L (left channel), R (right channel), M (merge, add input to signal before Reverb effect). Press SELECT to go to Screen: Gain.
- UTIL. Press SELECT to go to Screen: Utility. Shortcut: Press DOWN to go to row 1 (bottom row).
- EGn. Press SELECT to go to Screen: EG.
- SMn. Press SELECT to go to Screen: Special Modulator.
- LFOn. Press SELECT to go to Screen: LFO.
- CVn. Press SELECT to go to Screen: CV.
- POTn. Press SELECT to go to Screen: Potentiometer.
- O. Oscillator. UP - on, DOWN - off. Press SELECT to go to Screen: Oscillator.
- S. Slicer. UP - on, DOWN - off. Press SELECT to go to Screen: Slicer.
- D. Decimator. UP - on, DOWN - off. Press SELECT to go to Screen: Decimator.
- O. Overdrive. UP - on, DOWN - off. Press SELECT to go to Screen: Overdrive.
- F. Filter. UP - on, DOWN - off. Press SELECT to go to Screen: Filter.
- A. ADSR/envelope. UP - on, DOWN - off. Press SELECT to go to Screen: ADSR.
- P. Pan. UP - on, DOWN - off. Press SELECT to go to Screen: Pan.
- Y. Delay. UP - on, DOWN - off. Press SELECT to go to Screen: Delay.
- C. Chorus. UP - on, DOWN - off. Press SELECT to go to Screen: Chorus.
- R. Reverb. UP - on, DOWN - off. Press to go to Screen: Reverb.

Screen: Gain

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	IN L		IN R		OUT L		OUT R									
1																

Gain is noted in numbers from 00 to 50, where 50 is a 5 times multiplier. 10 is no modification.

- IN L. UP/DOWN - set input gain for left channel.
- IN R. UP/DOWN - set input gain for right channel.
- OUT L. UP/DOWN - set output gain for left channel.
- OUT R. UP/DOWN - set output gain for right channel.

Screen: Utility

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A	S	L	G	>											
1																

- A. SELECT - enter screen where all CV inputs are displayed. Press any button to update this screen, press LEFT to go back.
- S. UP - save all settings to flash.
- L. UP - load settings from flash.
- G. SELECT - enter Screen: Gate length.
- >. Press SELECT to go to Screen: Outputs.

Screen: Gate length

Edit gate length of sequencer modulator(s). This setting is global for all Special Modulators.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	GL															
1																

- GL. UP/DOWN - set Gate length as percent of whole step.

Screen: Outputs

Edit which modulator is going to be output on each OPD output.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	CV0				CV1				G0				G1			
1									G0LVL				G1LVL			

- CV0. UP/DOWN - select modulator for CV0 output.
- CV1. UP/DOWN - select modulator for CV1 output.
- G0. UP/DOWN - select modulator for G0 output.
- G1. UP/DOWN - select modulator for G1 output.
- G0LVL. UP/DOWN - set threshold level; when the G0 modulator is larger than this value a 1/HIGH is output, else 0.
- G1LVL. UP/DOWN - set threshold level; when the G0 modulator is larger than this value a 1/HIGH is output, else 0.

Screen: Special Modulator

Special Modulators are similar to LFOs in that they can modulate different aspects. The possible outputs are:

- NOISE - randomized output (p0: max amplitude; p1: offset).
- CRAWL - the output is "crawling" up or down continuously; the direction is randomized (p0: how quickly the output changes; p1: probability of changing direction).
- INTERVAL - the output value is static but the time between outputs is randomized (p0: amplitude; p1: probability of waiting more than 1 tick).
- CHAOS - both output level and interval between outputs are randomized (p0: max amplitude; p1: probability of waiting more than 1 tick).
- SEQ - sequencer (p0/p1: not used).

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	TYPE				FREQ						P0				P1	
1					SYNC		SYNCLEVEL									

- TYPE. UP/DOWN - set output type. Press SELECT to go to Screen: Sequence.
- FREQ. UP/DOWN - set frequency of output. Value is multiplied by 10, ie you can set 1/10th of the frequency.
- P0. UP/DOWN - set parameter 0.
- P1. UP/DOWN - set parameter 1.
- SYNC. SELECT - select modulator. If selected, this is used to trigger the next step of the Special Modulator. Else FREQ will be used.
- SYNCLEVEL. UP/DOWN - set level. If the SYNC modulator is larger than this value it will move to the next step.

Screen: Sequence

Edit sequence for current Special Modulator. When a sequence is played the frequency value is used.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	STEP			MIDI				FREQ						END		
1																

- STEP. UP/DOWN - set step to edit. Press UP when on step 0 to exit. SELECT - set this step as last step of sequence.
- MIDI. UP/DOWN - edit MIDI note number. Corresponding frequency is set.
- FREQ. UP/DOWN - edit frequency.
- END. Shows a * if this is the last step of the sequence.

Screen: LFO

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	WAVEFORM				FREQ						AMP				OFFSET	
1																

- WAVEFORM. UP/DOWN - set LFO waveform.
- FREQ. UP/DOWN - set LFO frequency (in 1/10 Hz).
- AMP. UP/DOWN - set LFO amplitude.
- OFFSET. UP/DOWN - set LFO offset (added to LFO value).

Screen: EG

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	ATTACK			DECAY			SUSTAIN			RELEASE						
1	GATE			MOD												

- ATTACK. UP/DOWN - set time up to 9s (in 10ths).
- DECAY. UP/DOWN - set time up to 9s (in 10ths).
- SUSTAIN. UP/DOWN - set sustain level.
- DECAY. UP/DOWN - set time up to 9s (in 10ths).
- GATE. UP/DOWN - set level when a gate signal is detected. Around 33 seems to be an interesting level for gate detection but that depends on the equipment.
- MOD. SELECT - select gate modulator. If no modulator is selected the gate is always on.

Screen: CV

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	AMP				OFFSET											
1																

- AMP. UP/DOWN - scale CV amplitude.
- OFFSET. UP/DOWN - set CV offset (added to CV value). Can be negative.

Screen: Potentiometer

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	AMP				OFFSET											
1																

- AMP. UP/DOWN - scale potentiometer amplitude.
- OFFSET. UP/DOWN - set potentiometer offset (added to potentiometer value). Can be negative.

Screen: Oscillator

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	WAVEFORM1			FREQUENCY1						AMP1		DETUNE1				
1	WAVEFORM2									AMP2		DETUNE2				

- WAVEFORM1. UP/DOWN - select waveform.
- FREQUENCY1. UP/DOWN - set frequency. SELECT - select modulator.
- AMP1. UP/DOWN - set amplitude. SELECT - select modulator.
- DETUNE1. UP/DOWN - set relative frequency detune.
- WAVEFORM2. UP/DOWN - select waveform for 2nd oscillator.
- AMP2. UP/DOWN - set amplitude of 2nd oscillator. SELECT - select modulator.
- DETUNE2. UP/DOWN - set relative frequency detune for 2nd oscillator. SELECT - select modulator.

DETUNE1 works on both oscillators. DETUNE2 only on oscillator 2.

The 2nd oscillator is activated when DETUNE2 > 0.

Screen: Slicer

The Slicer samples a random number of "blocks" (a block = 48 samples) into a clip and repeats it a random number of times.

The Slicer operates in mono -- the left channel will be copied to the right.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	RECORD				RECMOD			RECGATE			T					
1	REPEAT				REPMOD			REPGATE								

- RECORD. UP/DOWN - set max number of "blocks" to sample to create clip.
- RECMOD. SELECT - select modulator for when to start recording a new clip.
- RECGATE. UP/DOWN - set gate level for when RECMOD should trigger.
- T. TRIG MODE - if on (T) switches between record and play using RECMOD/REPMOD triggers. Assign RECMOD and REPMOD before setting TRIG MODE to on.
- REPEAT. UP/DOWN - set max number of repeats of clip.
- REPMOD. SELECT - select modulator for when to stop recording and playback the new clip.
- RECGATE. UP/DOWN - set gate level for when RECMOD should trigger.

Screen: Filter

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	TYPE		FREQUENCY						RES							
1																

- TYPE. UP/DOWN - select filter type: H(high pass), L(ow pass), B(and pass).
- FREQUENCY. UP/DOWN - set filter frequency in Hz. SELECT - select modulator.
- RES. UP/DOWN - set filter resonance. SELECT - select modulator.

Screen: ADSR

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	ATTACK			DECAY			SUSTAIN			RELEASE						
1	GATE			MOD			MOD2									

- ATTACK. UP/DOWN - set time up to 9s (in 10ths).
- DECAY. UP/DOWN - set time up to 9s (in 10ths).
- SUSTAIN. UP/DOWN - set sustain level.
- DECAY. UP/DOWN - set time up to 9s (in 10ths).
- GATE. UP/DOWN - set level when a gate signal is detected. Around 33 seems to be an interesting level for gate detection but that depends on the equipment.
- MOD. SELECT - select gate modulator. If no modulator is selected the gate is always on.
- MOD2. SELECT - select sustain level modulator.

Screen: Decimator

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	DOWN			BITCRUSH			BITS									
1																

- DOWN. UP/DOWN - set downsample factor.
- BITCRUSH. UP/DOWN - set bitcrush factor. SELECT - set modulator.
- BITS. UP/DOWN - set number of bits to crush.

Screen: Overdrive

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	GAIN				DRIVE											
1																

- GAIN. UP/DOWN - set input gain (0 - 200%). SELECT - set modulator.
- DRIVE. UP/DOWN - set drive (0 - 100%). SELECT - set modulator.

Screen: Pan

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	PAN															
1																

- PAN. UP/DOWN - set pan, 0 (left), 49 (center), 99 (right). SELECT - set modulator.

Screen: Delay

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	TIME L				FEEDB L											
1	TIME R				FEEDB R											

- TIME L. UP/DOWN - set delay time for left channel (in 1/10 s). SELECT - set modulator.
- FEEDB L. UP/DOWN - set feedback for left channel. SELECT - set modulator.
- TIME R. UP/DOWN - set delay time for right channel (in 1/10 s). SELECT - set modulator.
- FEEDB R. UP/DOWN - set feedback for right channel. SELECT - set modulator.

Screen: Chorus

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	DELAY			FEEDBACK			LFO DEPTH			LFO FREQ						
1	DRY			WET												

- DELAY. UP/DOWN - set delay.
- FEEDBACK. UP/DOWN - set feedback.
- LFO DEPTH. UP/DOWN - set LFO depth.
- LFO FREQ. UP/DOWN - set LFO frequency (up to 10 000 Hz).
- DRY. UP/DOWN - set dry amount.
- WET. UP/DOWN - set wet amount.

Screen: Reverb

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	LPF FREQ						FEEDB			DRY			WET			
1																

- LPF FREQ. UP/DOWN - set frequency of the low pass filter.
- FEEDB. UP/DOWN - set feedback.
- DRY. UP/DOWN - set dry amount.
- WET. UP/DOWN - set wet amount.

OscPocketD/Synth

The OPD/S features a sequencer with:

- 3 x bassline tracks, 32 notes each (1/16ths, 2 bars)
- 4 x lead tracks, up to 64 notes/rests each
- 1 x drum track, 32 steps (1/16ths, 2 bars)
- 3 different note editors for each track style (bass, lead, drum)
- 10 sequences per track (0-9)
- a pattern play and a song play mode
- a song editor where you can chain sequences on all 8 tracks, up to 999 steps

The OPD/S creates the sounds:

- 7 synths that combine a VCO, a VCF and an ADSR and are editable (waveform, detune, LPF cutoff, resonance, attack, decay, sustain, release)
- all synths have an LFO that can modulate the filter cutoff
- all synths have delay with feedback and delay time
- a drum machine with kick, snare, open hihat, closed hihat, crash and clap that creates the sounds using oscillators and noise generators with VCFs and ENVs, the sounds are editable
- an 8 channel mixer with volume, pan and reverb send

The OPD/S also has utility functions for saving and loading to Flash, exporting to MIDI, editing FX, setting gate time and manipulating sequences (generate, shift, transpose, copy, clear).

All in a compact UI running on a 16x2 LCD screen.

How to use it

The Overview screen is the main screen for the OPD/S.

Terminology

Track. The OPD has 8 tracks: 3 bass tracks, 4 lead tracks and 1 drum track. Every track can play one of 10 different sequences.

Sequence. A sequence is the notes played by a track. The bass track sequence is always 2 bars long, and each note is 1/16th. The lead track sequence can play notes of varying length, and the sequence can also be of varying length. Max number of notes (and rests) is 64. The drum track sequence is always 2 bars long and each step is 1/16th. All sequences are looped.

Synth. The bass and lead tracks control one synth each. A synth consists of an oscillator, a low pass filter and an envelope as well as an LFO that can modulate the filter cutoff.

Drum. The drum track controls a drum machine. The drum machine has the following sounds: Kick, snare, open and closed hihat, crash and clap.

Song. A song can be of varying length (max is 999 steps). Each step tells the OPD which sequence to play on the different tracks.

Navigation

You navigate screens and options with the arrow buttons (UP, DOWN, LEFT, RIGHT).

You access a sub-screen using the UP button.

To go back to the Overview (or previous) screen go to the leftmost position of the first line and press LEFT.

Screen: Overview

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	Play	BPM			Song step			Util	Mix B1	Mix B2	Mix B3	Mix L1	Mix L2	Mix L3	Mix L4	Mix D
1	Track B1	Track B2	Track B3	Track L1	Track L2	Track L3	Track L4	Track D	Synth B1	Synth B2	Synth B3	Synth L1	Synth L2	Synth L3	Synth L4	Drum

Function:

- **PLAY. SELECT:** starts and stops the sequencer. **UP:** selects OFF, SEQ and SONG modes. **DOWN:** go to Track 1.
- **BPM. UP/DOWN:** +/- 1.
- **SONG.** Displays current song step. **SELECT:** edit song sequence (which variants should play at different song steps). **UP/DOWN:** change songstep (will have effect on next loop).
- **UTILITY menu. SELECT:** enter. **DOWN:** go to row below.
- **MIXnn.** Displays volume / 10. **UP/DOWN:** volume +/- 10. **SELECT:** mixer screens.
- **TRACKnn.** **UP/DOWN:** sequence to play on next loop. **SELECT:** edit sequence.
- **SYNTH/DRUMnn.** **SELECT:** edit synth/drum settings. **UP/DOWN:** on/off (X).

The red LED on the Daisy blinks every 1/4th note.

Screen: Song

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	song step 0-99			Last												
1	Sequence B1		Sequence B2		Sequence B3		Sequence L1		Sequence L2		Sequence L3		Sequence L4		Sequence D	

Function:

- SONG STEP. Which song step to edit. UP/DOWN: +/- 1. SELECT: back to OVERVIEW.
- LAST. Display * if this is the last song step. SELECT: Set/unset. If unset the first song step is set to last.
- SEQUENCEnn. UP/DOWN: +/- 1. SELECT: back to OVERVIEW.

Screen: Utility

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	Sv		Ld		Rv		Dy		S	M	gate1		gate2		gate3	
1	T	S	C	X	G			DIR	VALUE		from track type	from track #	from seq #	to track type	to track #	to seq #

General: UP: activate. SELECT: back to OVERVIEW.

Function:

- SAVE. Saves settings and note data to Flash. Stops OPD.
- LOAD. Loads settings and note data from Flash. Stops OPD.
- REVERB. Submenu. Set global Reverb parameters for send.
- DELAY. Submenu. Set Delay parameters for each track.
- S. Sync. Not yet implemented.
- M. MIDI export. See below. UP: export.
- GATE1, GATE2, GATE3. Gate length in % for Bass tracks 1-3. UP/DOWN: +/- 1.

Sequence functions.

- TRANSPOSE (T). Transpose sequence specified by FROM values.
- SHIFT (S). Shift sequence specified by FROM values, left (-), right (+).
- COPY (C). Copy sequence specified by FROM and TO values. Currently only supports FROM TRACK TYPE = TO TRACK TYPE. Stops OPD.
- CLEAR (X). Clears sequence specified by FROM values. Stops OPD.
- GENERATE (G). Generates some simple notes for the sequence specified by FROM values. Bass variation based on VALUE. Lead sequence is always 2 bars with variation based on VALUE. Drum sequence is a simple 4/4. Stops OPD. Does currently nothing for Chord.
- DIRECTION (DIR). Direction of transpose or shift. UP: +, DOWN: -.
- VALUE. Amount of transpose or shift. UP/DOWN: +/- 1.
- FROM. Track type (B, L, C, D), Track number (0-2 for B and L), Track sequence. UP/DOWN: +/- 1.

MIDI export.

The MIDI export function works by sending an XML file over the serial/USB line. You have to have your Daisy Seed connected to a computer and capture the data that is sent. On GNU/Linux you can do this with the screen command:

```
screen -L -Logfile opd.xml /dev/ttyACM0
```

The file can be convert to a MIDI file (SMF format 1) file by the Python script `xmltomidi.py`. The `opd.xml` file must be in the same directory as the Python script. It then creates a MIDI file `opd.mid` with one track for each track on the OPD.

Screen: Reverb

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	Fb	LPF freq														
1																

General: UP/DOWN: +/- . SELECT: back to OVERVIEW.

Function:

- FEEDBACK. 0-9.
- LPF FREQUENCY. Dampening of the reverb. In 100 Hz units.

Screen: Delay

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	Time B1		Feedback B1		Time B2		Feedback B2		Time B3		Feedback B3		Time L1		Feedback L1	
1	Time L2		Feedback L2		Time L3		Feedback L3		Time L4		Feedback L4					

General: UP/DOWN: +/- . SELECT: back to OVERVIEW.

Function:

- TIME. From 0 to 2 seconds, in 1/10 seconds.
- FEEDBACK. From 0 to 99.

Screen: Synth

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	WAVEFORM			DETUNE			Cutoff freq			Res				LFO freq		
1	Adsr			aDsr			adSr			adsR				LFO amount	LFO target	

General: SELECT: back to OVERVIEW. UP/DOWN: +/- 1.

Function:

- WAVEFORM. UP/DOWN: select waveform.
- DETUNE. Detune synth, value in Hz.
- FILTER CUTOFF FREQUENCY. Value in frequency / 100.
- FILTER RESONANCE. Filter resonance value.
- ADSR ATTACK. Value in 1/100th of seconds (10 ms/step).
- ADSR DECAY. Value in 1/100th of seconds.
- ADSR SUSTAIN. Level 0-100.
- ADSR RELEASE. Value in 1/100th of seconds.
- LFO FREQUENCY. Value in 1/10th of seconds.
- LFO AMOUNT. Percent. Calculated from cutoff frequency and down.
- LFO TARGET. X = none; F = filter (cutoff frequency)

Screen: Drum

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	kick freq			kick len			snare freq			snare len			snare noise			
1	hihat open freq			hihat open len			hihat open freq			hihat open len			Cr freq	Cr len	Clap freq	Clap len

General: SELECT: back to OVERVIEW. UP/DOWN: +/- 1.

Function:

- KICK FREQUENCY. Start frequency of kick / 10.
- KICK LENGTH. Length of kick, ms * 100.
- SNARE FREQUENCY. Start frequency of snare / 10.
- SNARE LENGTH. Length of snare, ms * 100.
- SNARE NOISE. Amount of noise. Affects noise filter frequency and noise release time.
- HIHAT OPEN FREQUENCY. Filter frequency of open hihat / 100.
- HIHAT OPEN LENGTH. Length of open hihat, ms * 100.
- HIHAT CLOSED FREQUENCY. Filter frequency of closed hihat / 100.
- HIHAT CLOSED LENGTH. Length of closed hihat, ms * 100.
- CRASH FREQUENCY. Filter frequency of crash, / 500.
- CRASH LENGTH. Length of crash, * 0.3 s.
- CLAP FREQUENCY. Filter frequency of clap, 0-9 corresponds to 800-1800 hz / 100. Bandpass filter.
- CLAP LENGTH. Length of clap, * 0.1 s.

Screen: Mixer - synth

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	volume B1		pan B1	FX B1	volume B2		pan B2	FX B2	volume B3		pan B3	FX B3	volume L1		pan L1	FX L1
1	volume L2		pan L2	FX L2	volume L3		pan L3	FX L3	volume L4		pan L4	FX L4				

General: SELECT: back to OVERVIEW. UP/DOWN: +/- 1.

Function:

- VOLUME. Level 0-99.
- PAN. 1-9 (left to right, 5 = center).
- FX. Reverb send.

Not used for drums because it has its own mixer.

The Daisy LED light up when the signal clips (> 1).

Screen: Mixer - drum

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	kick volume		kick pan	kick fx	snare volume		snare pan	snare fx	hihat volume		hihat pan	hihat fx	crash volume		crash pan	crash fx
1	clap volume		clap pan	clap fx												

General: SELECT: back to OVERVIEW. UP/DOWN: +/- 1.

Function:

- VOLUME. Level 0-99.
- PAN. 1-9 (left to right, 5 = center).
- FX. Reverb send.

Screen: Sequencer - bass

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	note pitch 1	note pitch 2														
1																

All bass sequences are 2 bars long, all notes are 1/16ths, so the editor works with 32 notes.

LEFT/RIGHT: when passing right/left edge show next/prev 16 notes.

SELECT: back to OVERVIEW.

Function:

- NOTE PITCH nn. MIDI note number (0-99). UP/DOWN: change value (note pitch). Value 0 = rest.

Screen: Sequencer - lead

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	note pitch 1	note time 1	note pitch 2	note time 2												
1																

A lead sequence can be up to 64 notes/rests long. It repeats when it reaches the end of the sequence, so if you want it to synchronize with the bass and drums (in terms of bars) you have to make the sequence align.

LEFT/RIGHT: when passing right/left edge show next/prev 16 notes.

SELECT: back to OVERVIEW.

Function:

- NOTE PITCH nn. MIDI note number (0-99). UP/DOWN: change value (note pitch). Value 0 = rest.
- NOTE TIME.
 - Length:
 - t1 = 16
 - t2 = 8
 - t4 = 4
 - t8 = 2
 - t16 = 1
 - Set time to 0 to set end marker (*), ie place where the sequence will loop.

Screen: Sequencer - drum

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0 Kick																
1 Snare																
2 Hihat																
3 Crash																
4 Clap																

All drum sequences are 2 bars long, all steps are 1/16ths, so the editor works with 32 notes.

LEFT/RIGHT: when passing right/left edge show next/prev 16 notes.

SELECT: Set or Unset trigger of sound.

Each instrument in the drum set has its own row:

- 0: Kick (K)
- 1: Snare (S)
- 2: Hihat. Toggle open (O) or closed (C).
- 3: Crash (X)
- 4: Clap (P)

Go UP past the Kick row to get back to OVERVIEW.

OscPocketD/Sampler

This is a sampler/sampler player device with built in fx.

You can sample one sound of up to 60 seconds, that you can play back at different pitches.

It can handle 4 CV/GATE inputs and 2 potentiometers. The CV inputs are limited to 0-3V3, but can be scaled and offset in hardware and software.

In submenus, press LEFT when you are in the first position to go back to the previous screen.

How to use it

Effects

Effect order with modulation:

1. Input gain
2. Sampler (frequency, amplitude)
3. Filter (frequency, resonance)
4. ADSR (gate)
5. Decimator (bitcrush factor)
6. Overdrive
7. Delay (time, feedback)
8. Chorus
9. Reverb
10. Output gain

Modulation

The OscPocketD/FX has 9 modulation sources:

- 3 x LFO
- 4 x CV in
- 2 x potentiometers

Typical basic use

1. Connect Line in to a sound source that you want to sample.
2. Connect Line out to an active speaker or mixer so you can hear the result.
3. Connect your keyboard or sequencer as follows: CV (pitch) to CV1, GATE to CV0.
4. Screen: Overview: Set status to r. Press SELECT to start recording (status turns to "R") and press SELECT again to stop recording. You will hear the input as soon as you enter status "r".
5. Screen: Sampler: In Frequency press SELECT and set it to CV1. In Mod press SELECT and set it to CV0. Adjust GATE until you hear something. (The default settings are probably fine.)
6. Screen Sample: Adjust Start, End and Loop Start and Loop End to your liking.

Screen: Overview

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	ST	IN	UTIL	SI				LFO0	LFO1	LFO2	CV0	CV1	G0	G1	P0	P1
1	S	F	A			Y		R								

Function:

- STATUS: UP/DOWN
 - -: off
 - S: single play
 - L: loop play
 - r: prime for record
 - R: record (SELECT button)
 - press LEFT to go directly to S(ampler)
- IN: Input from S (stereo, work on both channels), L (left channel), R (right channel). Press SELECT to go to Screen: Gain.
- UTIL. Press SELECT to go to Screen: Utility.
- SI. Press SELECT to go to Screen: Sample (info).
- LFO n. Press SELECT to go to Screen: LFO.
- CV n/Gn/Pn. Press SELECT to go to Screen: CV.
- S. Sampler. UP - on, DOWN - off. Press SELECT to go to Screen: Sampler.
- F. Filter. UP - on, DOWN - off. Press SELECT to go to Screen: Filter.
- A. ADSR/envelope. UP - on, DOWN - off. Press SELECT to go to Screen: ADSR.
- D. Decimator. UP - on, DOWN - off. Press SELECT to go to Screen: Decimator.
- O. Overdrive. UP - on, DOWN - off. Press SELECT to go to Screen: Overdrive.
- Y. Delay. UP - on, DOWN - off. Press SELECT to go to Screen: Delay.
- C. Chorus. UP - on, DOWN - off. Press SELECT to go to Screen: Chorus.
- R. Reverb. UP - on, DOWN - off. Press SELECT to go to Screen: Reverb.

Screen: Gain

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	IN L		IN R		OUT L		OUT R									
1																

Gain is noted in numbers from 00 to 50, where 50 is a 5 times multiplier. 10 is no modification.

- IN L. UP/DOWN - set input gain for left channel.
- IN R. UP/DOWN - set input gain for right channel.
- OUT L. UP/DOWN - set output gain for left channel.
- OUT R. UP/DOWN - set output gain for right channel.

Screen: Utility

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A	S	L													
1																

- A. UP - enter screen where all CV inputs are displayed. Press any button to update this screen, press LEFT to go back.
- S. UP - save all settings to flash.
- L. UP - load settings from flash.

Screen: LFO

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	WAVEFORM				FREQ						AMP				OFFSET	
1																

- WAVEFORM. UP/DOWN - set LFO waveform.
- FREQ. UP/DOWN - set LFO frequency (in 1/10 Hz).
- AMP. UP/DOWN - set LFO amplitude.
- OFFSET. UP/DOWN - set LFO offset (added to LFO value).

Screen: CV

Edit settings for inputs: CV, Gate and potentiometers.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	AMP				OFFSET											
1																

- AMP. UP/DOWN - scale CV amplitude.
- OFFSET. UP/DOWN - set CV offset (added to CV value). Can be negative.

Screen: Sampler

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	FREQUENCY								AMP			DETUNE				
1	GATE			MOD			R									

- FREQUENCY. UP/DOWN - set frequency. SELECT - select modulator.
- AMP. UP/DOWN - set amplitude. SELECT - select modulator.
- DETUNE. UP/DOWN - set frequency detune as a percent value (1-999%).
- GATE. UP/DOWN - set level when a gate signal is detected. Around 33 seems to be an interesting level for gate detection but that depends on the equipment.
- MOD. SELECT - select gate modulator. If no modulator is selected the gate is always on.
- R. If on ("R") and STATUS = LOOP, continue to loop when GATE is low and let the ADSR handle the release stage.

Screen: Sample

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	START								END							
1	LOOP START								LOOP END							

- START. Start point in sample.
- END. End point in sample.
- LOOP START. Loop start point.
- LOOP END. Loop end point.

Screen: Filter

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	TYPE		FREQUENCY						RES							
1																

- TYPE. UP/DOWN - select filter type: H(high pass), L(ow pass), B(and pass).
- FREQUENCY. UP/DOWN - set filter frequency in Hz. SELECT - select modulator.
- RES. UP/DOWN - set filter resonance. SELECT - select modulator.

Screen: ADSR

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	ATTACK			DECAY			SUSTAIN			RELEASE						
1																

- ATTACK. UP/DOWN - set time up to 9s (in 10ths).
- DECAY. UP/DOWN - set time up to 9s (in 10ths).
- SUSTAIN. UP/DOWN - set sustain level.
- DECAY. UP/DOWN - set time up to 9s (in 10ths).

Screen: Decimator

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	DOWN			BITCRUSH			BITS									
1																

- DOWN. UP/DOWN - set downsample factor.
- BITCRUSH. UP/DOWN - set bitcrush factor. SELECT - set modulator.
- BITS. UP/DOWN - set number of bits to crush.

Screen: Overdrive

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	DRIVE															
1																

- DRIVE. UP/DOWN - set drive.

Screen: Delay

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	TIME L				FEEDB L											
1	TIME R				FEEDB R											

- TIME L. UP/DOWN - set delay time for left channel (in 1/10 s). SELECT - set modulator.
- FEEDB L. UP/DOWN - set feedback for left channel. SELECT - set modulator.
- TIME R. UP/DOWN - set delay time for right channel (in 1/10 s). SELECT - set modulator.
- FEEDB R. UP/DOWN - set feedback for right channel. SELECT - set modulator.

Screen: Chorus

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	DELAY			FEEDBACK			LFO DEPTH			LFO FREQ						
1	DRY			WET												

- DELAY. UP/DOWN - set delay.
- FEEDBACK. UP/DOWN - set feedback.
- LFO DEPTH. UP/DOWN - set LFO depth.
- LFO FREQ. UP/DOWN - set LFO frequency (up to 10 000 Hz).
- DRY. UP/DOWN - set dry amount.
- WET. UP/DOWN - set wet amount.

Screen: Reverb

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	LPF FREQ						FEEDB			DRY			WET			
1																

- LPF FREQ. UP/DOWN - set frequency of the low pass filter.
- FEEDB. UP/DOWN - set feedback.
- DRY. UP/DOWN - set dry amount.
- WET. UP/DOWN - set wet amount.

OscPocketD/VASynth

This is a virtual analog polyphonic synthesizer. It features:

- dual oscillators with detune and transpose, each with selectable waveforms
- adjustable polyphony, 5 voices is ok, maybe more depending on the other settings
- noise generator
- envelope generators for pitch, filter and amplitude control
- an LFO that can affect pitch, filter or amplitude
- portamento
- delay and reverb
- stereo out with pan
- audio in for mixing an additional sound source
- two pots controlling filter cutoff and resonance
- MIDI in (note on/off, velocity, filter cutoff and resonance)
- a couple of presets to get you started and 16 slots for your own creations (save to Flash)

In submenus, press LEFT when you are in the first position to go back to the previous screen.

How to use it

The VASynth works with the OPD Version2/MIDI.

Connect a MIDI controller/keyboard to the MIDI in of the OscPocketD/Base2.

Screen: Overview

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	IN	M	U	L	T	L	S									
1	O	AO	F	AF	AA	Y	R									

Function:

- IN: Input - (off, don't mix audio in with the synth), S (merge, add stereo input to signal after the synth).
- M. Press SELECT to go to Screen: Mixer.
- U. Press SELECT to go to Screen: Utility.
- L. Press SELECT to go to Screen: LFO.
- T. Test. Press SELECT to play a single note and a chord.
- L. Press SELECT to go to Screen: Load.
- S. Press SELECT to go to Screen: Save.
- O. SELECT to go to Screen: Oscillator.
- AO. ADSR for pitch. Press SELECT to go to Screen: EG - Pitch.
- F. SELECT to go to Screen: Filter.
- AF. ADSR for filter. Press SELECT to go to Screen: EG - Filter.
- AA. ADSR for amplitude. Press SELECT to go to Screen: EG - Amplitude.
- Y. Delay. Press SELECT to go to Screen: Delay.
- R. Reverb. Press SELECT to go to Screen: Reverb.

Screen: Oscillator

Each voice is made up out of two oscillators.

UP/DOWN - change value.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	WAV1				DET1						VO			PORTA		
1	WAV2				DET2						TRANSP2			LVL2		

Function:

- WAV1. Waveform of oscillator 1.
- DET1. Detune oscillator 1.
- VO. Number of active voices. 5 works fine, 6 works with most (less processor-intensive) settings. 1 is useful for solo portamento. Use 7 and 8 at your own risk -- nothing will start to burn, but the OPD might hang and you have to reboot (cut the power).
- PORTA. Portamento time. Only affects oscillator 1.
- WAV2. Waveform of oscillator 2. Set to NONE to turn off.
- DET2. Detune oscillator 2.
- TRANSP2. Transpose oscillator 2 (note steps).
- LVL2. Level of oscillator 2.

Screen: EG - Pitch

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A				D				S				R			
1																

Function:

- A. Attack time.
- D. Decay time.
- S. Sustain level.
- R. Release time.

Screen: Filter

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F		CUTOFF						RES							
1																

Function:

- F. Filter type: Low, High, Band, Notch, Peak.
- CUTOFF. Cutoff frequency.
- RES. Resonance.

Screen: EG - Filter

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A				D				S				R			
1																

Function:

- A. Attack time.
- D. Decay time.
- S. Sustain level.
- R. Release time.

Screen: EG - Amplitude

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A				D				S				R			
1																

Function:

- A. Attack time.
- D. Decay time.
- S. Sustain level.
- R. Release time.

Screen: Delay

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	TIME				FEEDB											
1																

- TIME. Delay time.
- FEEDB. Feedback.

Screen: Reverb

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	LPF FREQ						FEEDB			DRY			WET			
1																

- LPF FREQ. Frequency of the low pass filter.
- FEEDB. Feedback.
- DRY. Dry amount.
- WET. Wet amount.

Screen: Mixer

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	LEVEL				PAN				NOISE							
1																

Function:

- LEVEL. Set output level.
- PAN. Stereo pan, 0 - left, 50 - center, 100 - right.
- NOISE. Set white noise level.

Screen: LFO

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	WAVEFORM				FREQ						AMP				TARGET	
1																

Function:

- WAVEFORM. LFO waveform.
- FREQ. LFO frequency.
- AMP. Amplitude.
- TARGET. -- (none), PI (pitch), FI (filter), AM (amplitude).

Screen: Utility

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	CHANNEL				P0TARGET				P1TARGET							
1																

Function:

- CHANNEL. MIDI channel (0-16), ALL (receive on all channels).
- P0TARGET. Target for potentiometer 0: --- (none), FIL (filter - cutoff).
- P1TARGET. Target for potentiometer 1: --- (none), FIL (filter - resonance).

Screen: Load

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	PRESET															

Function:

- A-P. Slots for saved settings. Press DOWN to go to PRESET. Press SELECT to load.
- PRESET. Press SELECT to load.

If you load from slots that don't have any note data the OPD might hang.

Screen: SAVE

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																

Function:

- A-P. Slots to save settings. Press SELECT to save.

OscPocketD/Drums

The OPD/Drums features:

- 8 drum tracks
- sequencer with up to 64 steps, adjustable track length
- save/load sounds and sequences in 16 slots
- internal adjustable tempo
- external sync
- sync out
- trig mode to control 4 sounds with external trig signal

The OPD/Drums sequencer features 8 drum tracks with many adjustable sound parameters:

- 3 types of bass/kick (analog, synthetic, OPD) with delay and overdrive
- snare with delay and overdrive
- hihat open/closed with delay
- crash with delay
- ride with delay
- clap with delay
- tom hi with delay
- tom lo with delay

Performance

Although there is code to handle snares and hihats of 2 additional types (analog and synthetic) the Daisy Seed doesn't have the performance to handle them in combination with the rest of the stuff needed to drive the drum machine.

Screen: Overview

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	P	BPM			M	U	S	L	K	S	H	C	R	C	T	L
1	K	S	H	C	R	C	T	L								

Function:

- P. Play off (-), Play on (P), Play on trigger (T). Triggers can be connected to CV0 (bass/kick), CV1 (snare), Gate 0 (hihat), Gate 1 (crash) and will trigger if above the gate threshold set in Screen: Utility.
- BPM.
- M. Go to Screen: Mixer.
- U. Go to Screen: Utility.
- S. Go to Screen: Save.
- L. Go to Screen: Load.
- K-L (green). UP/DOWN track on/off. Press SELECT to go to Screen: Edit *.
- K-L (red). Press SELECT to go to Screen: Seq.

Screen: Mixer

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	bass level		snare level		hihat level		crash level		ride level		clap level		tomhi level		tomlo level	
1	bass pan		snare pan		hihat pan		crash pan		ride pan		clap pan		tomhi pan		tomlo pan	

Function:

- * level. Adjust level of track.
- * pan. Pan track, 00 (left), 50 (center), 99 (right).

Screen: Utility

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	L	seq len			E	sync		G	gate		P	pp16			I	merge
1	I	in gain				O	out gain				P	0	pot0			R

Function:

- seq len. Length of sequence in 1/16.
- sync. Internal or External sync. External sync is connected to Gate0. As of now external sync cannot handle BPM > 150 (with pp16 = 6).
- gate. Gate threshold level for sync/trig.
- pp16. Ext sync ticks needed to advance one step (one 1/16). Ie a value of 6 equals 24PPQ.
- merge. Add audio in to audio output.
- in gain. Adjust strength of audio input.
- out gain. Adjust strength of audio output.
- pot0. Let pot 0 control tempo.
- R. On/off, SELECT to go to Screen: Reverb.

The OPD/Drums always sends out a sync pulse on CV0 at 1 pulse/16th.

Screen: Save

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																

Function:

- A-P. Slots to save settings. Press SELECT to save.

Screen: Load

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																

Function:

- A-P. Slots for saved settings. Press SELECT to load.

If you load from slots that don't have any previously saved data the OPD might hang.

Screen: Reverb

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	L	P	F	lpf freq						F	B	feedback				
1	D	R	Y	dry			W	E	T	wet						

Function:

- lpf freq. Control frequency of internal low pass filter.
- feedback. Control reverb time.
- dry. Amount to signal to output outside of reverb effect.
- wet. Amount to reverb signal to output.

Screen: Seq

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	track						offset				end					
1	steps															

Function:

- track. Track name (sound).
- offset. Amount of steps the second row is scrolled.
- end. Number of steps in sequence (can be adjust in Screen: Utility).
- steps. Use UP to set normal (x) and accented (X) step.

Screen: Edit bass

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	T	t		F	freq				T	tone			D	decay		
1	A		F	A	fm attack			F	S	fm self						

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	S		D	dirt			F	A	fm env amt			F	D	fm env dec		
1	O		M	min												

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	X		D	D	delay delay				D	F	delay fb				
1	R	L	rev lvl			O	D	overdrive				A	C	accent		

Function:

- t. Type: 1 (analog/808), 2 (synthetic), 3 (OPD).
- freq. Frequency of bass drum.
- tone. Amount of click (type 1), brightness (type 2).
- dec. Decay.
- For type 1:
 - fm attack. Amount of FM attack.
 - fm self. Amount of self FM.
- For type 2:
 - dirt.
 - fm env amt. Amount of pitch sweep.
 - fm env dec. Time of pitch sweep.
- For type 3:
 - min. End level of pitch sweep.
- delay delay. Delay time.
- delay fb. Delay feedback.
- rev lvl. Amount to send to reverb.
- overdrive. Amount of applied overdrive.
- accent. Volume of accented note (in percent).

Screen: Edit snare

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	T	t		F	freq				T	tone			D	decay		
1	A		S	N	snappy			S			F	M	fm amount			

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	O		N	F	freq noise					R	res			A	amp noise	
1			M	min			D	drive								

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	X		D	D	delay delay				D	F	delay fb				
1	R	L	rev lvl			O	D	overdrive				A	C	accent		

Function:

- t. Type: 1 (analog/808), 2 (synthetic), 3 (OPD). Due to performance issues only type 3 is possible (although there is code to handle type 1 and 2).
- freq. Frequency of snare drum. 30-60 is good for type 1 and 2, while above 100 is better for type 3.
- tone. Brightness (type 2).
- dec. Decay.
- For type 1:
 - snappy. Mix between snare (1) and drum (0).
- For type 2:
 - fm amt. Amount of fm sweep.
- For type 3:
 - freq noise. Frequency of high pass filter applied to noise.
 - res. Resonance of high pass filter.
 - amp. Amount of noise.
 - min. End level of pitch sweep.
 - drive. Drive of high pass filter.
- delay delay. Delay time.
- delay fb. Delay feedback.
- rev lvl. Amount to send to reverb.
- overdrive. Amount of applied overdrive.
- accent. Volume of accented note (in percent).

Screen: Edit hihat

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	T	t		F	freq				T	tone			D	dec		
1												2	D	dec2		

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	A	S		N	noisiness											
1	O		A	amp			D	drive			R	res				

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	X		D	D	delay delay				D	F	delay fb				
1	R	L	rev lvl									A	C	accent		

Function:

- t. Type: 1 (squarenoise), 2 (ringmodnoise), 3 (OPD/white noise). Due to performance issues only type 3 is possible (although there is code to handle type 1 and 2).
- freq. Root frequency (type 1 and 2), frequency of high pass filter applied to noise (type 3).
- tone. Brightness (type 1 and 2).
- dec. Decay.
- dec2. Decay of accented note (make it longer for open hihat).
- For type 1 and 2:
 - noisiness. Mix between tone and noise.
- For type 3:
 - amp. Amount of noise.
 - drive. Drive of high pass filter.
 - res. Resonance of high pass filter.
- delay delay. Delay time.
- delay fb. Delay feedback.
- rev lvl. Amount to send to reverb.
- accent. Volume of accented note (in percent).

Screen: Edit crash/ride

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	freq					M	mix					D	decay		
1	A	amp			D	drive			R	res			M	min		

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	X		D	D	delay delay				D	F	delay fb				
1	R	L	rev lvl									A	C	accent		

Function:

- freq. Frequency of high pass filter applied to noise.
- mix. Amount of white noise added to ringnoise.
- dec. Decay.
- amp. Amount of noise.
- drive. Drive of high pass filter.
- res. Resonance of high pass filter.
- min. End level of filter envelope.
- delay delay. Delay time.
- delay fb. Delay feedback.
- rev lvl. Amount to send to reverb.
- accent. Volume of accented note (in percent).

Screen: Edit clap

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	freq											D	decay		
1	A	amp			D	drive			R	res						

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	X		D	D	delay delay				D	F	delay fb				
1	R	L	rev lvl									A	C	accent		

Function:

- freq. Frequency of high pass filter applied to noise.
- dec. Decay.
- amp. Amount of noise.
- drive. Drive of high pass filter.
- res. Resonance of high pass filter.
- delay delay. Delay time.
- delay fb. Delay feedback.
- rev lvl. Amount to send to reverb.
- accent. Volume of accented note (in percent).

Screen: Edit tom

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	freq											D	decay		
1	A	amp			M	min										

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	X		D	D	delay delay				D	F	delay fb				
1	R	L	rev lvl									A	C	accent		

Function:

- freq. Frequency of sound.
- dec. Decay.
- amp. Amount of tone.
- min. End level of pitch envelope.
- delay delay. Delay time.
- delay fb. Delay feedback.
- rev lvl. Amount to send to reverb.
- accent. Volume of accented note (in percent).

How to build it

The OPD platform exists in two versions.

Both

- audio in/out
- 2 potentiometers

Version 1

- 2 CV in/out where one of the ins goes through a scaling potentiometer
- 2 Gate in/out

Version 2/MIDI

- 1 CV in/out. Do not use CV1 in as it is not connected.
- 1 Gate in/out. Do not use G0/G1 out, CV1 out is routed to G0 out.
- 1 Gate switch (Gate1)
- MIDI in

Hardware

Things you need:

- 1 x Daisy Seed (<https://www.electro-smith.com/daisy/daisy>)
- 1 x LCD Keypad (made for Arduino)
- 2 x 3.5 mm female stereo audio connector (audio in and audio out)
- to add 1 CV/GATE input:
 - 1 x 3.5 mm female audio connector
 - 2 x Schottky diodes 1N5819
 - 1 x 2.9k Ohm resistors (R1)
 - optional 10k Ohm potentiometer (R2)
- to add 1 CV/GATE output
 - 1 x 3.5 mm female audio connector
- to add MIDI in
 - 1 x MIDI DIN socket
 - 1 x 220 Ohm resistor
 - 1 x 470 Ohm resistor
 - 1 x 10kOhm resistor
 - 1 x 1N4148 diode

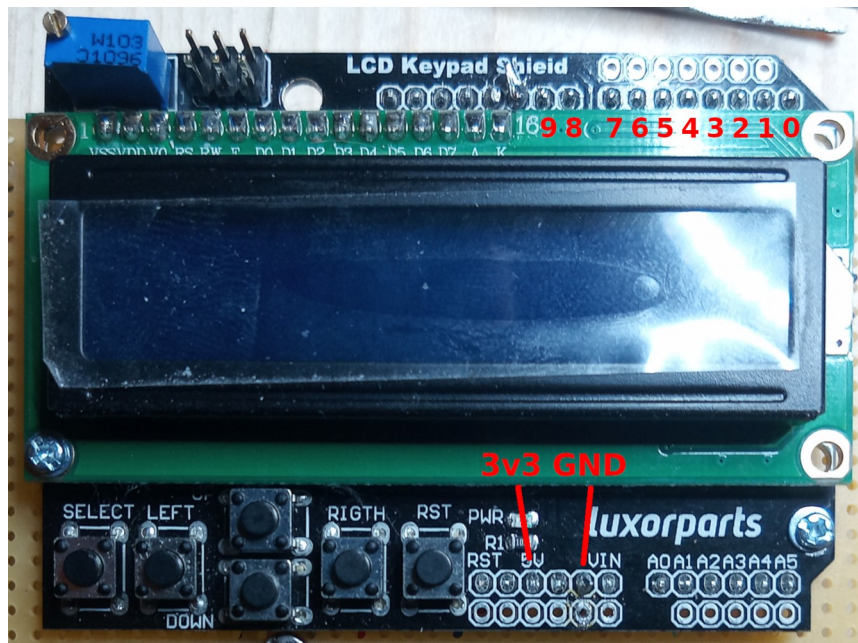
- 1 x 6N138 optocoupler
- 2 x 10k Ohm potentiometer (R2)
- momentary pushbutton for easy upload of new code
- optional: 9V battery, battery holder/connector, switch

Preparations

Connect AGND and DGND to each other.

Connect screen

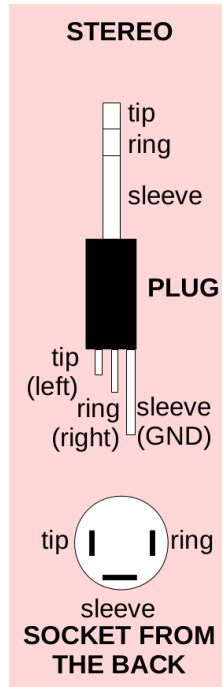
Daisy V1	Daisy V2/MIDI	LCD	LCD pin name
10	8	8	RS
9	7	9	EN
11	9	D4	D4
12	10	D5	D5
13	11	D6	D6
14	12	D7	D7
3v3 Analog	3v3 Analog	5V	power
AGND/DGND	AGND/DGND	GND	ground
17	17	A0	buttons



Connect audio jacks

Connect the audio jack Left and Right to Audio Out 1 and 2 on the Daisy, as well as ground (the plug is just shown for information).

Connect the second audio jack Left and Right to Audio In 1 and 2 on the Daisy.

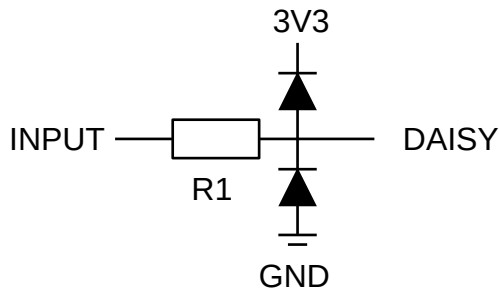


Connect boot pin

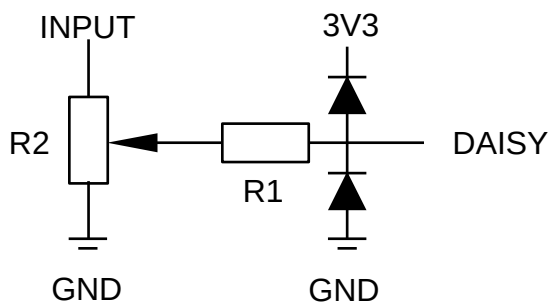
The OPD contains code for easy upload of new programs. If you connect a momentary push button to Daisy pin 26 and AGND/DGND, a press on this button will be the same as the BOOT/RESET sequence presses, ie Daisy will enter the mode for uploading of new programs.

Connect CV/Gate inputs and outputs

To protect the inputs we connect them like this with a resistor and two Schottky diodes:



On CV1 in and CV1 I added a 10k potentiometer (R2) to scale the input values. The middle pin goes to the input (R1):



I squeezed up to 12V into this and still got no more than 3.6V output (into the Daisy), but use inputs of more than 3.3V at your own risk.

As the Daisy operates at 3V3 you cannot modulate with larger signals than this. But you can use the scaling and offsets on the Screen: CV to handle some of this limitations.

The inputs are connected to Daisy pins:

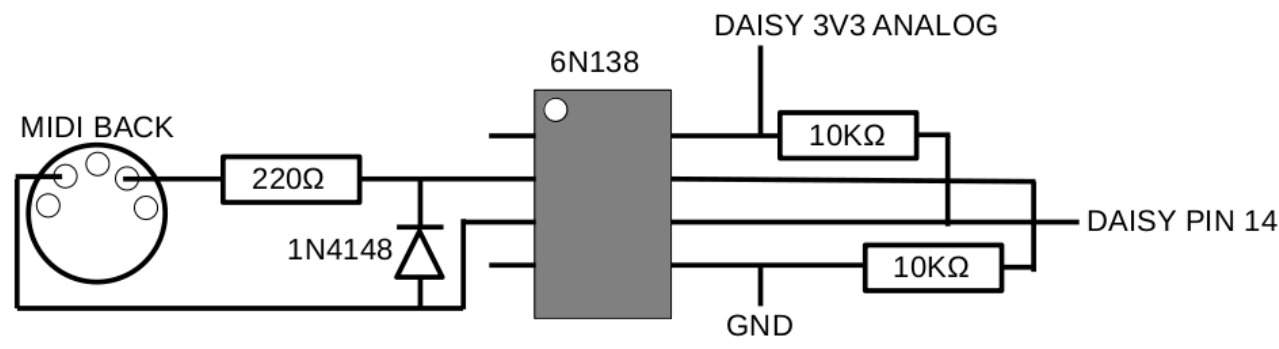
Name	Daisy V1	Daisy V2/MIDI	Note
CV0 in	18	18	use protection circuit
CV1 in	19	-	use protection circuit and scaling pot
Gate0 in	20	20	use protection circuit
Gate1 in	21	21*	V1: use protection circuit
Pot0 in	15	15	
Pot1 in	16	16	
CV0 out	22	22	
CV1 out	23	-	
Gate0 out	24	23	Do not use G0/G1 out, CV1 out is routed to G0 out.
Gate1 out	25	-	

*For my V2 build a put a switch connected to Daisy Pin 21 and GND as a simple manual gate. It works with a gate level around 10.

You don't have to add every connection -- use as few as you like.

Potentiometers are connected with one side pin to 3V3 Analog on the Daisy, the other side pin to GND, and the middle pin to the pins in the table above.

Connect MIDI in

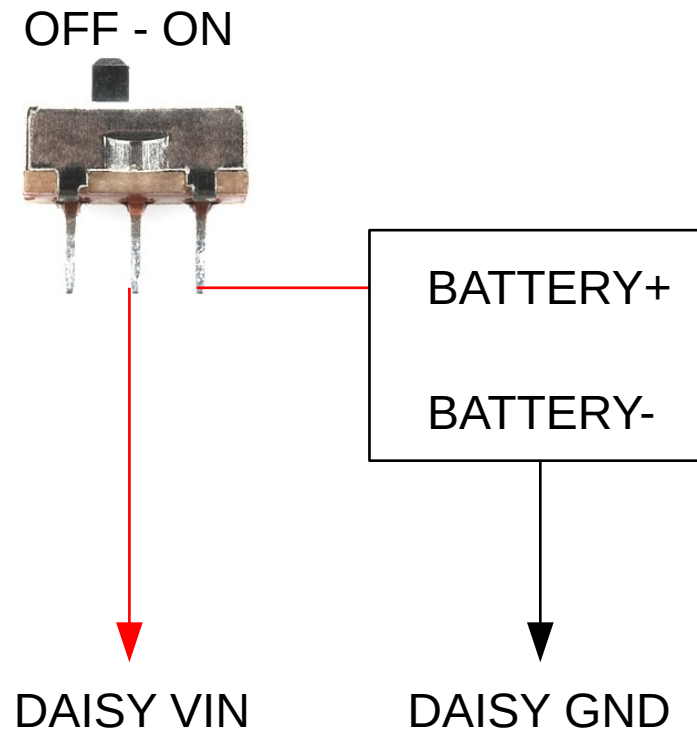


Optional: Connect switch and battery

If you want to carry the OPD with you without an attached computer, you can use a powerbank.

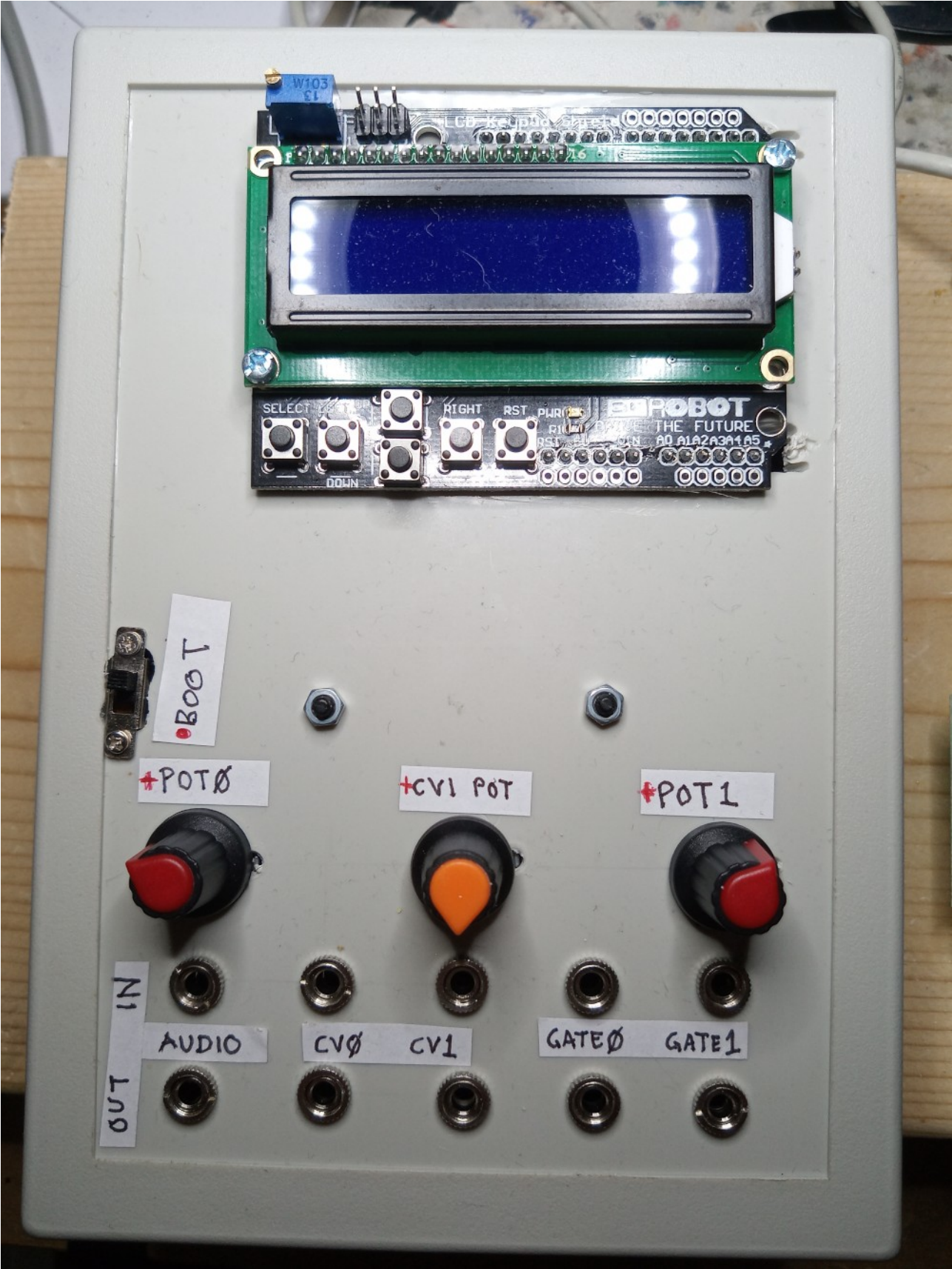
But you can also attach a switch and a battery holder to get a portable solution.

Attach a wire to VIN on the Daisy Seed, the other end to a slider switch (I used a "SPDT slide switch"), and connect the battery holder to the other connection of the slider switch and GND.

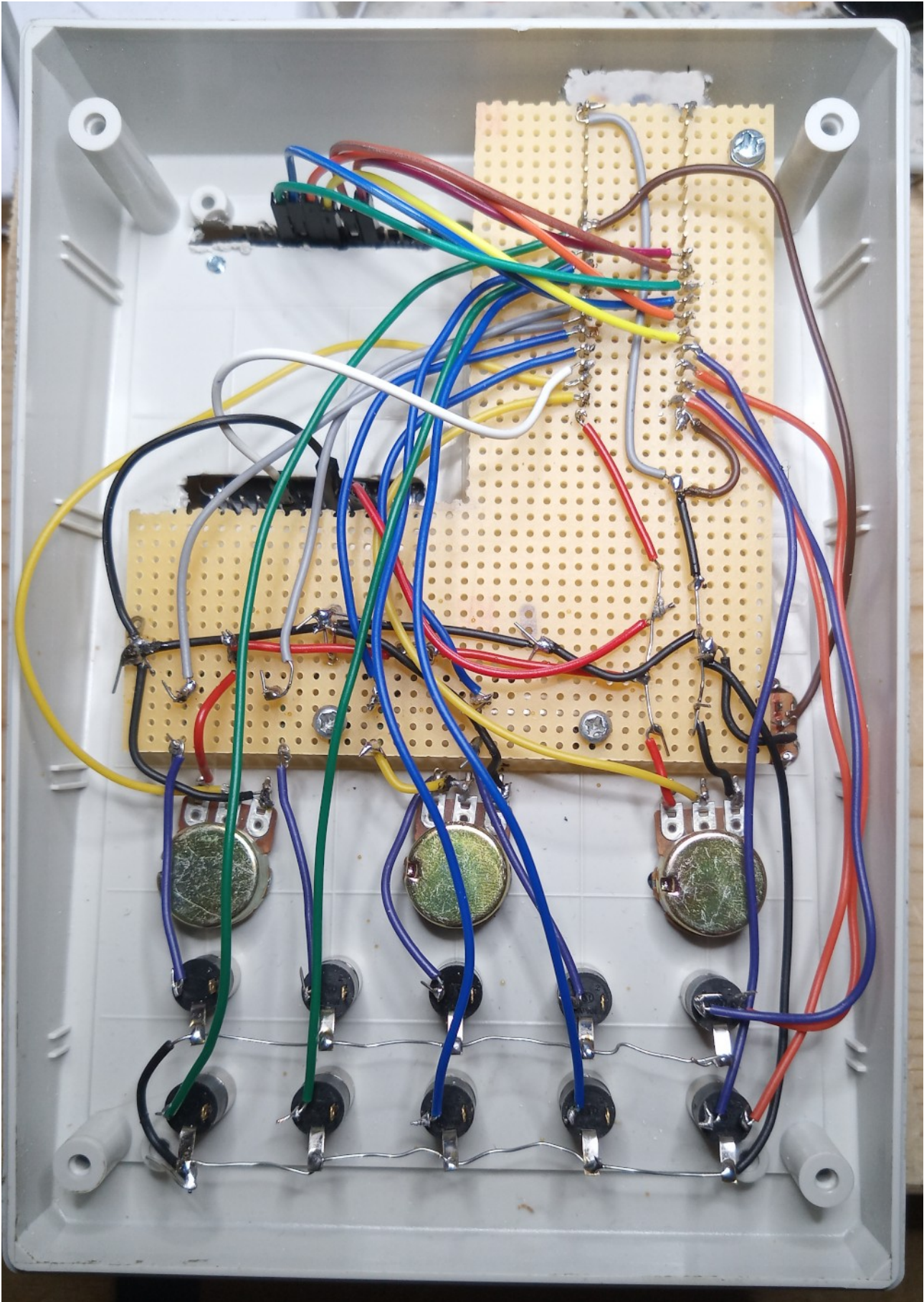


Photos

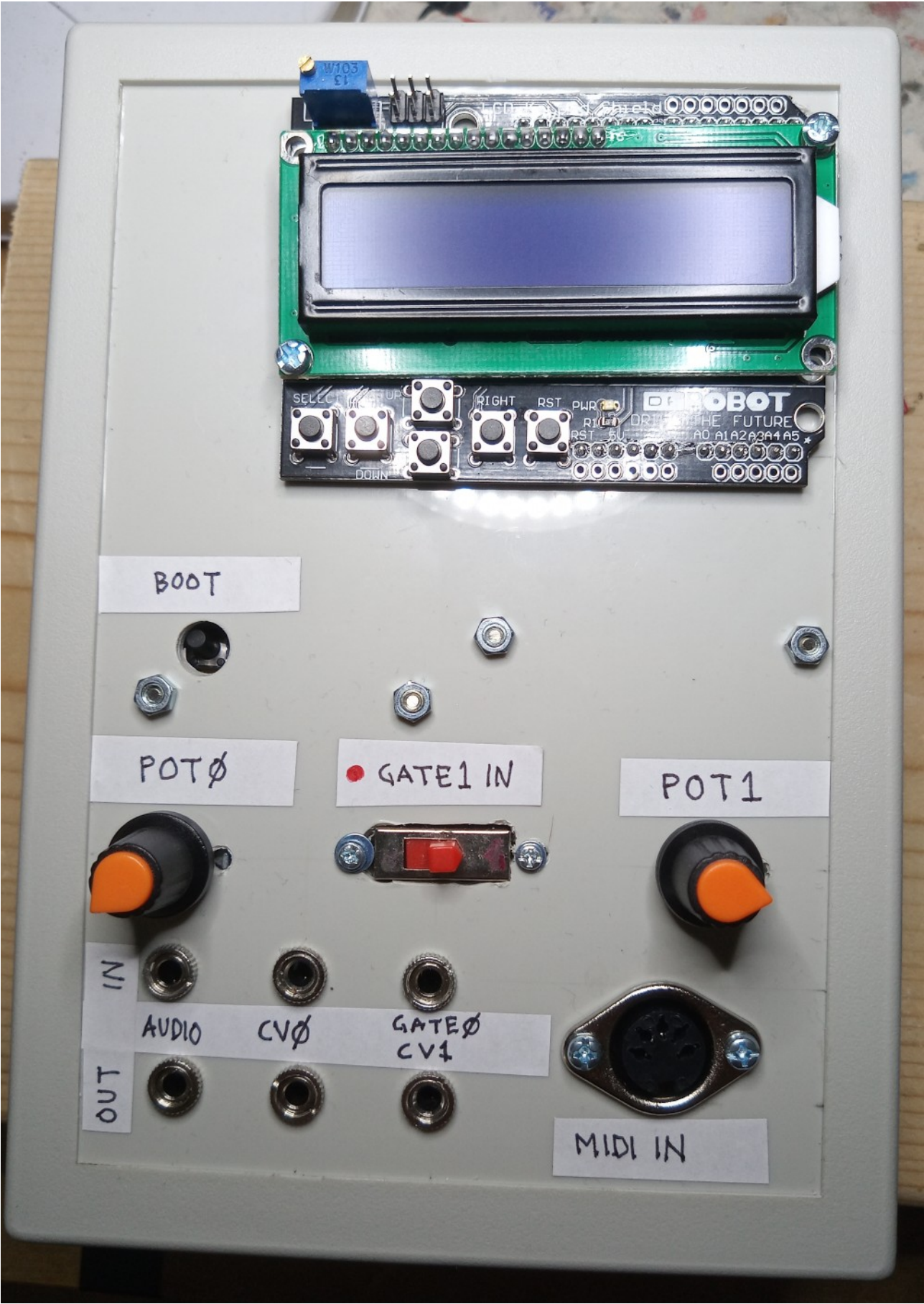
Base 1 - front



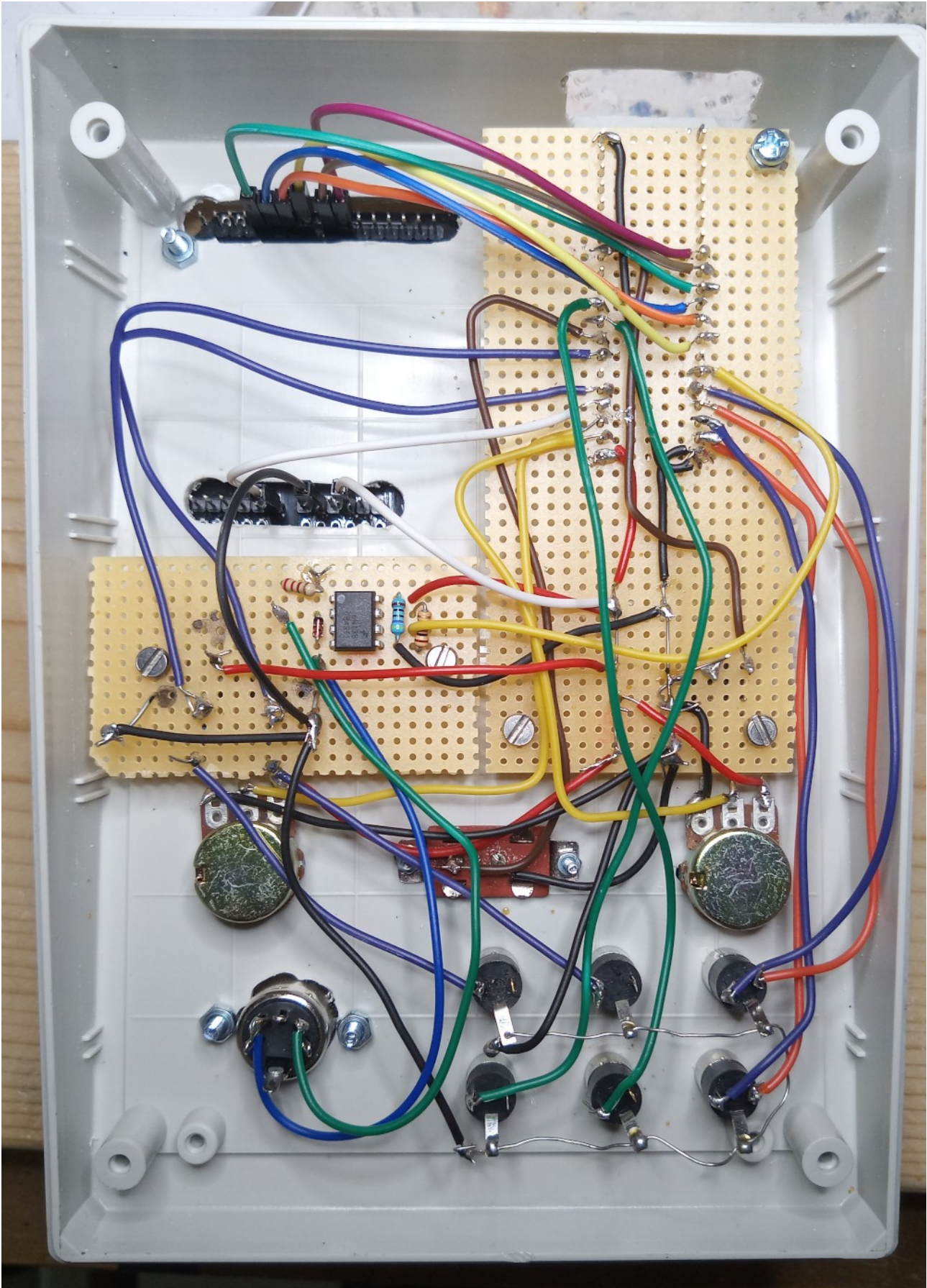
Base 1 - inside



Base 2 - front



Base 2 - inside



Daisy pins

DAISY PINOUT

ANALOG
AUDIO

ANALOG
GPIO

DIGITAL AUDIO
GPIO

PERIPHERAL
GPIO

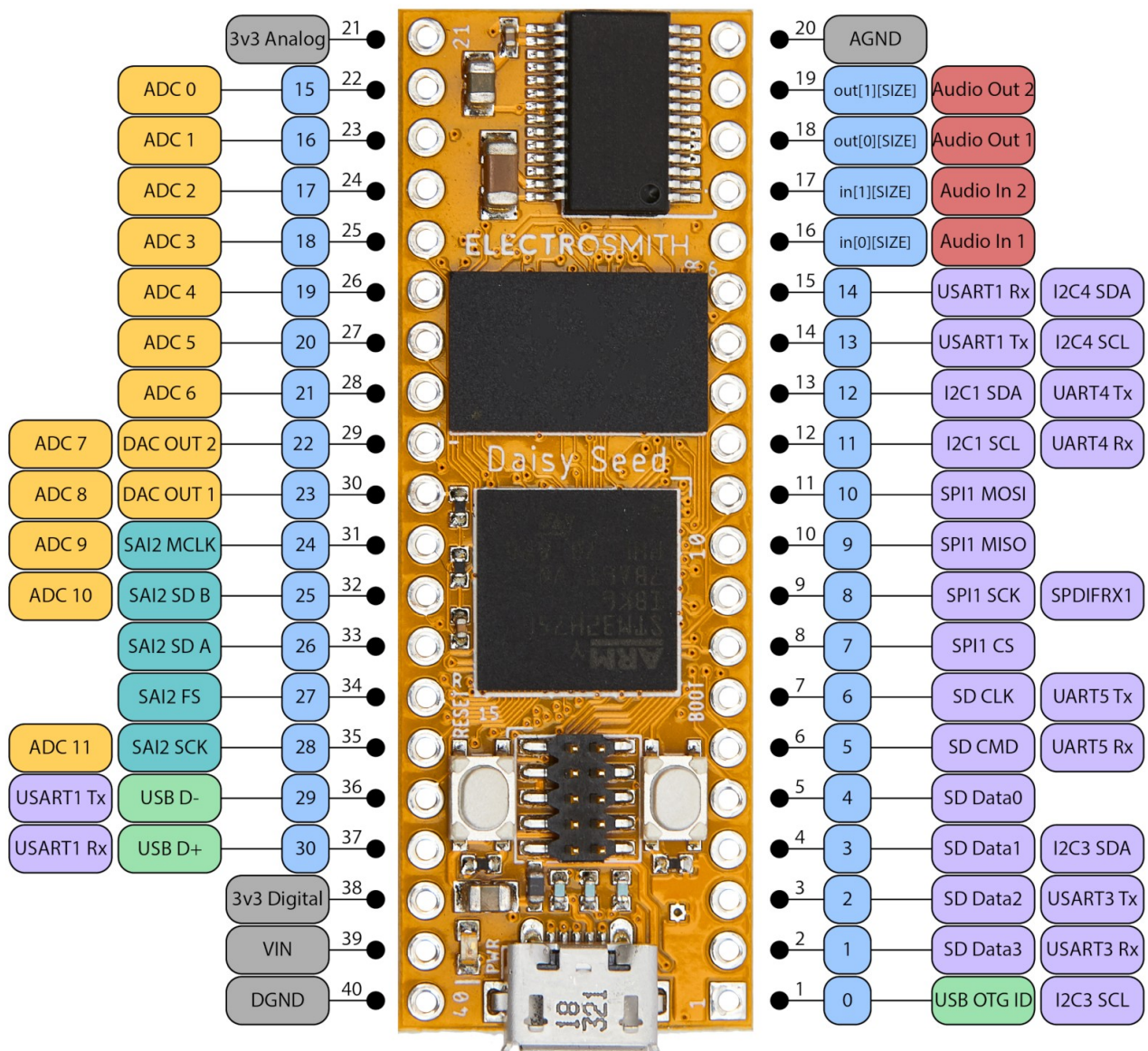
USB
GPIO

POWER
I/O

LIBDAISY
PIN NAMES*

* ARDUINO PIN NAMES ARE THE SAME INDICES.
PRECEDED BY:

- "D" FOR GPIO OR
- "A" FOR ANALOG I/O



Software

First chose which application you want to use:

- code_base
- code_sampler
- code_synth

If you are chosing the Base application, you have to make a small change in the program to select Version 1 or Version 2/Midi. Open "main.cpp" and look around line 14 for this line:

```
#define OPD_BASE_MIDI
```

Leave it like this if you want Version 2/Midi. If you want Version 1 you should comment the line:

```
//#define OPD_BASE_MIDI
```

Run

```
make
```

enter bootloader mode and run

```
make program-dfu
```

to upload the code to the Daisy.

Flags

The code contains two more flags in main.cpp.

```
//#define OPD_LOGG // start serial over USB Logger class  
//#define OPD_MEASURE // measure MCU utilization
```

With OPD_LOGG defined the Daisy Seed starts logging over serial/USB. This can be used for debugging but is also used for the MIDI export for the Synth application.

With OPD_MEASURE defined the OPD measures how long the audio callback loop takes and lights up the LED if it is nearing maximum utilization.

Problem solving

The code_test folder contains a few test program that you can use when building the OPD.

The buttons

All buttons change a value on a pi on the Daisy. It could be that your model of LCD Keypad shield gives different values than mine.

Upload the code_test_lcd to your OPD. It will print out the values associated with each button. Check that it uses the right pins for your build.

The LCD should show values all the time, that is the correct behavior, even if you don't press a button.

Note down the values that appear when you press the different buttons (ignore RST reset button).

These values are detected in the code, in the function

```
void OsciUI::Button(float aButtonValue) {
```

in ui.cpp. It works like this:

```
void OsciUI::Button(float aButtonValue) {  
    int aInButtonValue = (int)(aButtonValue*100);  
    buttonPrevious = button;  
  
    if (aInButtonValue < 5) {  
        button = BUTTON_RIGHT;  
    } else if (aInButtonValue < 15) {  
        button = BUTTON_UP;  
    } else if (aInButtonValue < 30) {  
        button = BUTTON_DOWN;  
    } else if (aInButtonValue < 50) {  
        button = BUTTON_LEFT;  
    } else if (aInButtonValue < 70) {  
        button = BUTTON_SELECT;  
    } else {  
        button = BUTTON_NONE;  
    }  
}
```

The value in aInButtonValue will be different depending on the pressed button.

If the value is less than 5 it is the RIGHT button.

If the value is less than 15 it is the UP button.

If the value is less than 30 it is the DOWN button.

If the value is less than 50 it is the LEFT button.

If the value is less than 70 it is the SELECT button.

An example: This means that the value, when you press the LEFT button, must be between 30 and 50.

Now, your shield could give different values to my LCD shield, so you might have to change the values in the code.