

Mini Dexed Synthesizer

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Through Kevin's notes on Bare metal synths I came to the Mini Dexed synthesizer that allows me to do something interesting with my old Raspi 1 modules.

This is a summary based on Kevin's notes and my experience.

1. What is MiniDexed ?

„MiniDexed is a FM synthesizer closely modeled on the famous DX7 by a well-known Japanese manufacturer running on a bare metal Raspberry Pi (without a Linux kernel or operating system). On Raspberry Pi 2 and larger, it can run 8 tone generators, not unlike the TX816/TX802 (8 DX7 instances without the keyboard in one box). [Featured by HACKADAY](#), [adafruit](#), and [Synth Geekery](#).“

<https://github.com/diyelectromusic/MiniDexed>

<https://github.com/probonopd/MiniDexed>

System Requirements:

- Raspberry Pi 1, 2, 3, 4, or 400 (Zero and Zero 2 can be used but need HDMI or a supported i2s DAC for audio out). On Raspberry Pi 1 and on Raspberry Pi Zero there will be severely limited functionality (only one tone generator instead of 8)
- A [PCM5102A or PCM5122 based DAC](#), HDMI display or [audio extractor](#) for good sound quality. If you don't have this, you can use the headphone jack on the Raspberry Pi but on anything but the Raspberry 4 the sound quality will be seriously limited
- Optionally (but highly recommended), an [LCDC1602 Display](#) (with or without i2c "backpack" board) and a [KY-040 rotary encoder](#)

Discussions:

<https://github.com/probonopd/MiniDexed/discussions>

Wiki:

<https://github.com/probonopd/MaianiDexed/wiki>

2. First run

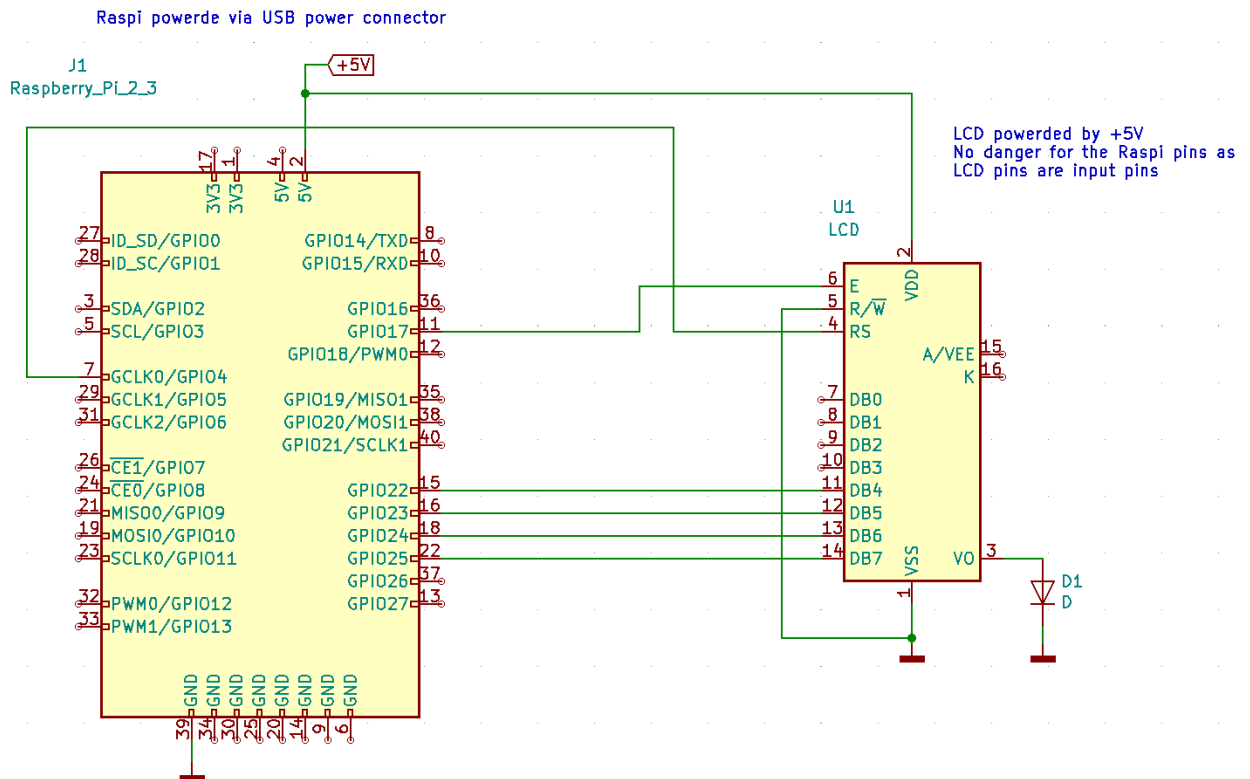
I copied the ready made release from here

<https://github.com/probonopd/MiniDexed/releases>

to an SD card, put it into the SD slot of the Raspi, connected power and USB and could start playing with a USB MIDI keyboard. (I also had a HDMI monitor connected, but this is not necessary)

The audio output was through the headphone jack. It didn't sound bad for the low frequency notes.

3. Connecting an LCD



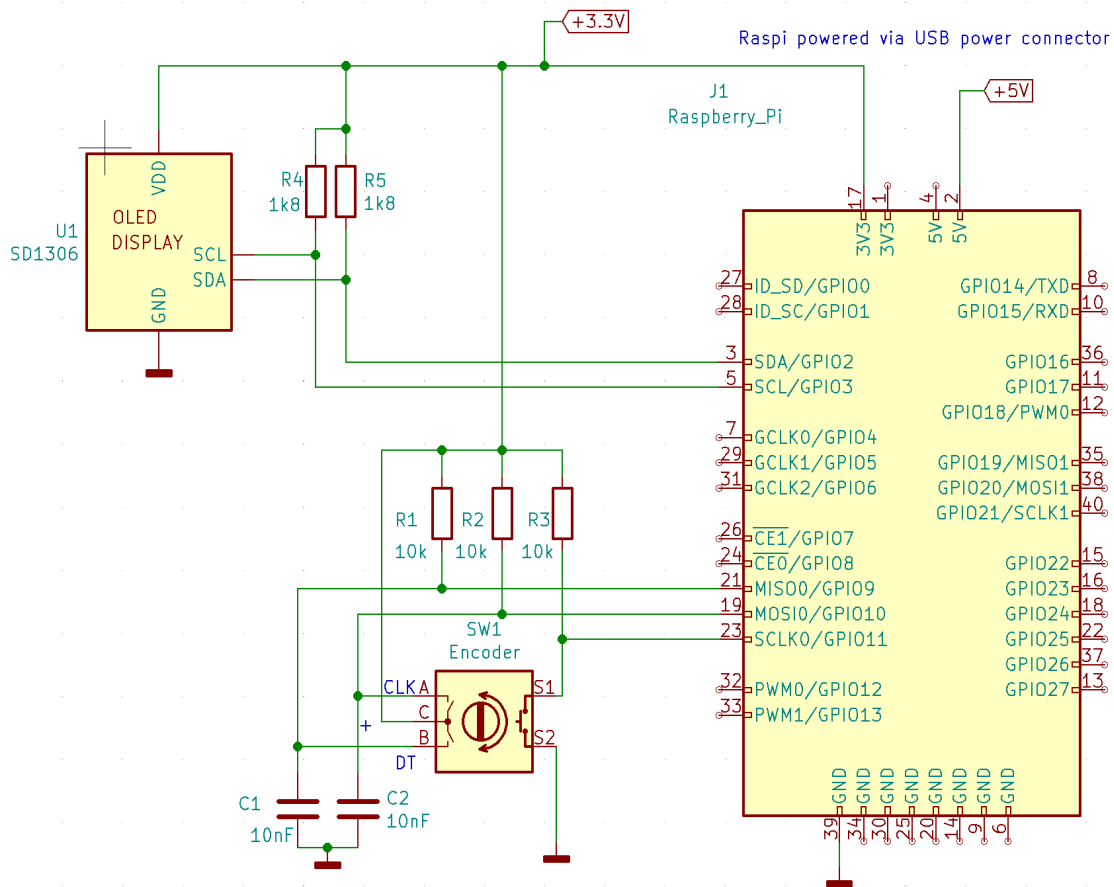
To make it work, verify and if necessary edit the settings in minidexed.ini (on the SD card):

```
# HD44780 LCD
LCDEnabled=1
LCDPinEnable=17
LCDPinRegisterSelect=4
LCDPinReadWrite=0
LCDPinData4=22
LCDPinData5=23
LCDPinData6=24
LCDPinData7=25
LCDI2CAddress=0x00
```

Like this, the LCD is not very useful, we need a possibility to control the synth:

5. Connecting an OLED

This is an alternative to the LCD that uses less pins.



In minindexd.ini :

```
# SSD1306 LCD
# For a 128x32 display, set LCDColumns=20; LCDRows=2
# For a 128x64 display, set LCDColumns=20; LCDRows=4
SSD1306LCDI2CAddress=0x3C
SSD1306LCDWidth=128
SSD1306LCDHeight=64
SSD1306LCDRotate=0
SSD1306LCDMirror=0
```

```
LCDColumns=20
LCDRows=4
```

6. I2S Audio

In minidexed.ini: Comment PWM output and uncomment I2S output.

```
# Sound device
SoundDevice=i2s
#SoundDevice=pwm
#SoundDevice=hdmi
SampleRate=48000
#ChunkSize=256
DACI2CAddress=0
ChannelsSwapped=0
```

On a Raspi > 1 the hardware connection should be quite straightforward.

The I2S pins are found on the 40 pin connector.

There are 3 signals that need connection from the Raspi to the audio DAC:

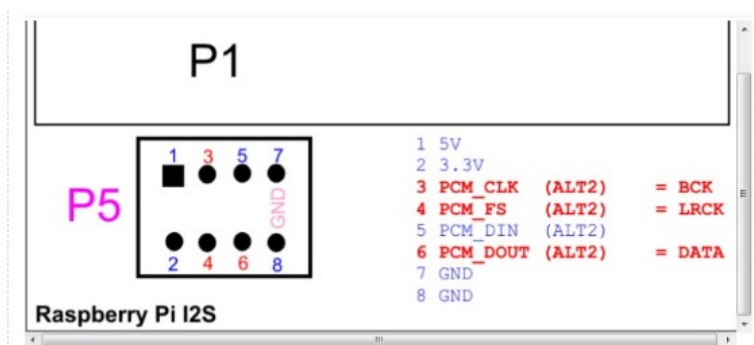
GPIO 21 (DOUT) → DIN	Audio data
GPIO 18 (BCK) → BCLK	Bit clock (in the MHz range)
GPIO 19 (LRC) → LRCLK	Left / right clock in the 10s of kHz range)

But I wanted to use one of my old Raspi 1 from 2011, and these use a 26 pin connector instead of the 40 pin connector, so not all signals are found on the connector. And what's worse, the official Raspi site has no more information about this model.

Fortunately I found a description on the Volumino discussions page:

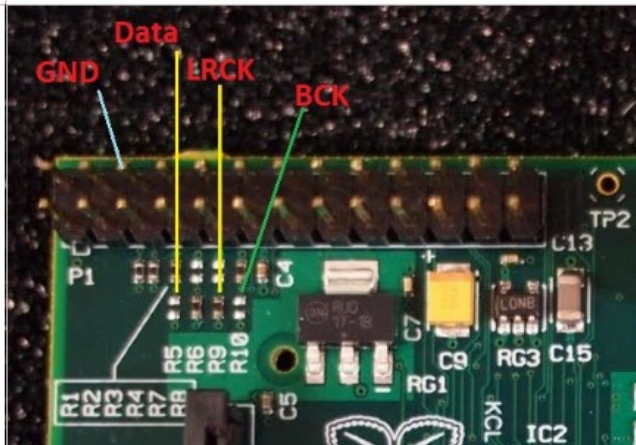
<https://community.volumio.com/t/i2s-on-raspberry-pi-rev1-256mb-ram/490>

My Raspi is a n 1B, so it even has pin holes for a connector labeled P6 (not P5 as in the following image!)



I connected a MAX98357 amplifier and it worked!

The older (?) Raspi 1 has no P6, but it seems possible to connect via resistance pads:



I have ordered an audio DAC PCM5102, so I can have a line output later.

TODO:

- Test PCM5102 as soon as it arrives
- Check button options
- Assemble the hardware to solid rack module
- Study examples in the Wiki to better understand the synthesizer:
<https://github.com/probonopd/MiniDexed/wiki/Exercises>