This document contains the bill of materials and build info to build the 8 hp adaptation by Timo Rozendal of the WSynth FM Ogre for eurorack

Parts with an asterisk (*) behind it are mentioned in the comments by the original designer Bill/Wsy

IC's

1 x DSPIC33FJ128GP804-I/PT,	U1 Mouser (or these variants: Mouser , Mouser)
1 x LD1086DT33TR,	U2 Mouser
4 x MCP6002-I/SN in SO8	U3,U4,U5,U6 Mouser **(see note 1)**
3 x TL072CDT in SO8	U7,U10,U13 Mouser
1 x LM4040AEX3-3.3+T in SC70,	U14 Mouser **(see note 2)**

Ceramic capacitors 0805 (>=16v)

3 x 100nF	C1,C2,C3
3 x 1µF	C12,C13,C14
2 x 20pF	C8,C9

Ceramic capacitors 1206 (>=35v)

4 x 10µF C4,C5,C6,C7

Ceramic capacitors 0603 (>=10v)

11 x 100nF	C23*,C24*,C25*,C26*,C27,C28,C29,C30,C31,C32,C33
2 x 18pF	C34,C35
4 x 3.3n	C15,C19,C20,C21
4 x 100pF	C16*,C17*,C18*,C22*

resistors: 5% through hole 1 or 2 w

1 x 47Ω R2*

resistors: 1% 0603

3 x	1kΩ	R1,R31,R36
19 x	100kΩ	R3,R6,R10,R14,R17,R19,R20,R22,R23,R25,R26,R42,R43,R44,R56,R60,R61,R62,R71
1 x	165kΩ	R5
3 x	300kΩ	R9,R13,R16
1 x	510kΩ	R28
2 x	180kΩ	R32,R37
2 x	22kΩ	R33,R38
3 x	470Ω	R39,R40,R41
1 x	1MΩ	R46
1 x	220kΩ	R47
2 x	220Ω	R48,R49

1 x 680kΩ R50
4 x 200kΩ R57,R58,R59,R63
3 x 10kΩ R66,R67,R68
2 x 43kΩ R69, R70

resistors: 1% 0805 (0603 is also fine if you are ok with that)

2 x	100kΩ Resistor	R64,R65
2 x	10kΩ Resistor	R72,R73
1 x	300kΩ Resistor	R54
1 x	120kΩ Resistor	R55

Misc:

1 x Crystal (frequency 4 MHz; package THT; pin spacing 4.88mm) XTAL1 Mouser
5 x 100kb 9mm alpha potmeters or similar Tayda
5 x knobs fitting to your potentiometer of choice Tayda
3 x 3mm red led Tayda
1 x 40 pin male header, 2.54mm spacing Tayda
1 x 40 pin female header, 2.54mm spacing Tayda
1 x eurorack power shrouded header Tayda
1 x 20k multiturn trimmer (3296w style) R53 Tayda
8 x 'thonkiconn' 3.5mm jacks (wqp pj301m12) Thonk, ModularAddict
3 x subminiature on/on switch (2.54mm pin spacing) S1,S2,S3 EOO, mouser, mouser
4 x Schottky Diode 1n5819 smd / SO package SOD-123 or DO-214AC D1,D2,D3,D4 mouser

If you do not have a pre programmed dspic chip you need the Pickit 3 programmer (PG164130). Also useful for possible future updates/upgrades. A Pickit 2 might also work, but I haven't tried that myself.
If you have a board (version M27) with a place for R4 you can bridge that with solder, a small wire or a zero ohm resistor

Note 1: *beware of fakes!, don't buy from AliExpress*
Note 2: *please note the footprint on the pcb for the lm4040 is sot23, but the part is sc70. It is a little smaller but it fits. Feel free to replace it with another lm4040 with similar specs and pinout in sot23*
Note3: *ignore the J1 sign on the board, it relates to nothing*

The schematic can be found here
The design files can be found here (Fritzing)

The latest firmware for this module can be found here
You need to download MP LAB X ide from here
You need the XC 16 compiler from here
Unzip the project, open the project in MP Lab

Connect Pickit3 to your computer and the module (module should be powered)
Run main project (Play button), something similar to this screenshot should be the result

** some distillled quotes of remarks by the original designer Bill/Wsy after building this version:*
"I was not getting the full swing of pitch, so I jumpered R72 and R73 and R64 and R65"
(TIMO: I added these resistors intentionally to improve the behavior at the end of the range i.c.w. CV input, see what behavior suits you best)

"Change R2 (the big 1/2 watt power resistor) from 22 ohms to 47 ohms. Reason is that the regulator was running fairly hot (about 50C in free air) and that's too hot for long life in an enclosed system. "
"For the big thru-hole power resistor - minimum 1 watt, recommend 2 watt and airspace it up off the board by 10-15mm. Seriously.... it's handling ~100 mA
and dropping it 9 volts, so it's dissipating close to a watt. 2 watts will give you a much longer, cooler lifetime. "
(TIMO: it was 22 ohms, 1/2w, now changed to Bill's recommendation)

"Do not install capacitors C16, C17, C18, and C22. They were originally there to prevent oscillation in the op-amp preamps, but are demonstrably unnecessary; they actually harm the high frequency response (you won't be able to modulate above about 100 Hz unless you get rid of them!) "
(TIMO: I think you can modulate above 100 Hz (see demo's), but yes, removing them should improve the frequency response (but also make it possibly a little less stable))

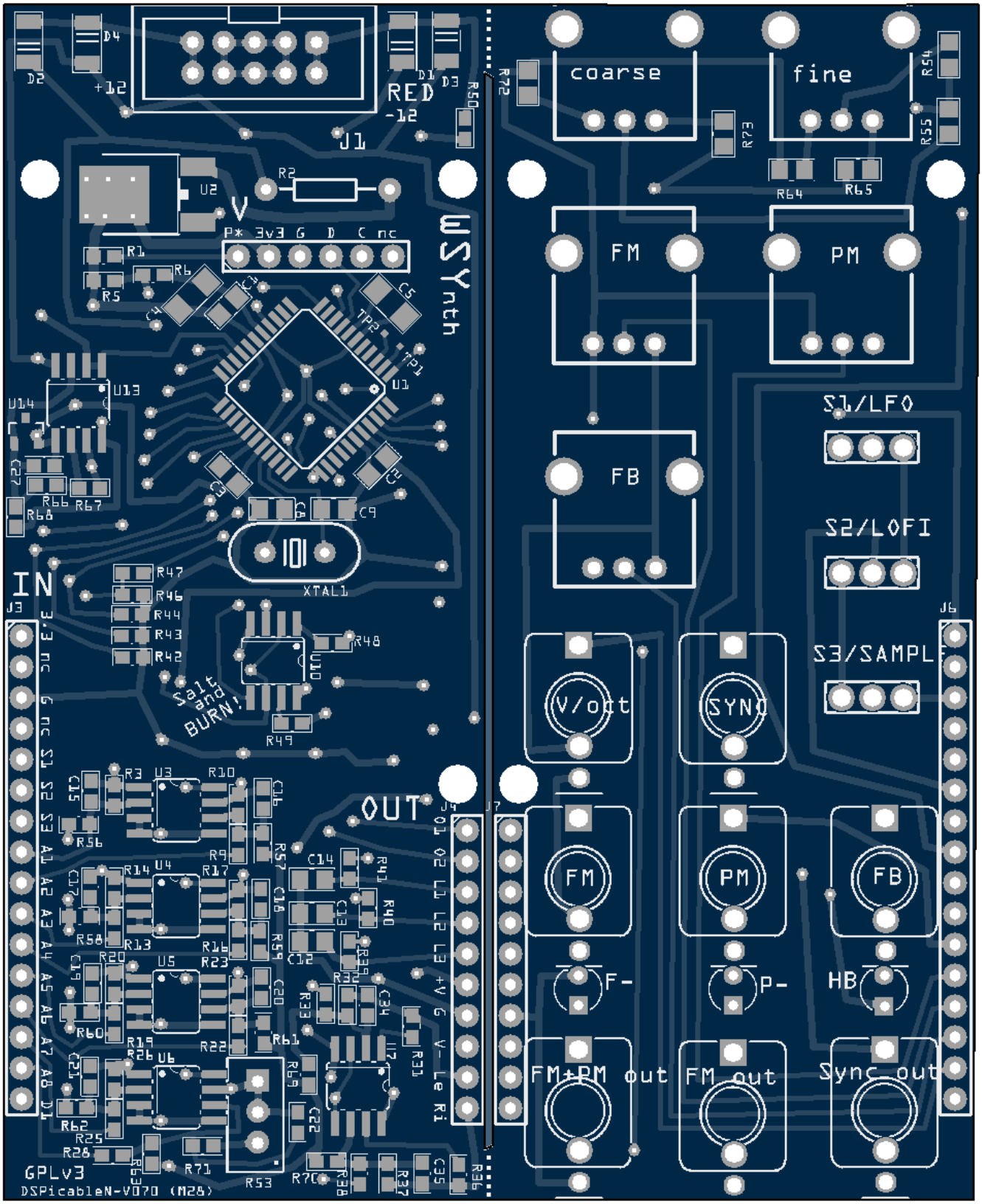
"Bypass capacitors C23, C24, and C25 are also unnecessary (tested). C26 is probably unnecessary (but haven't tested that yet)"
(TIMO: I still think it is good practice to bypass capacitor close to every ic that is used)

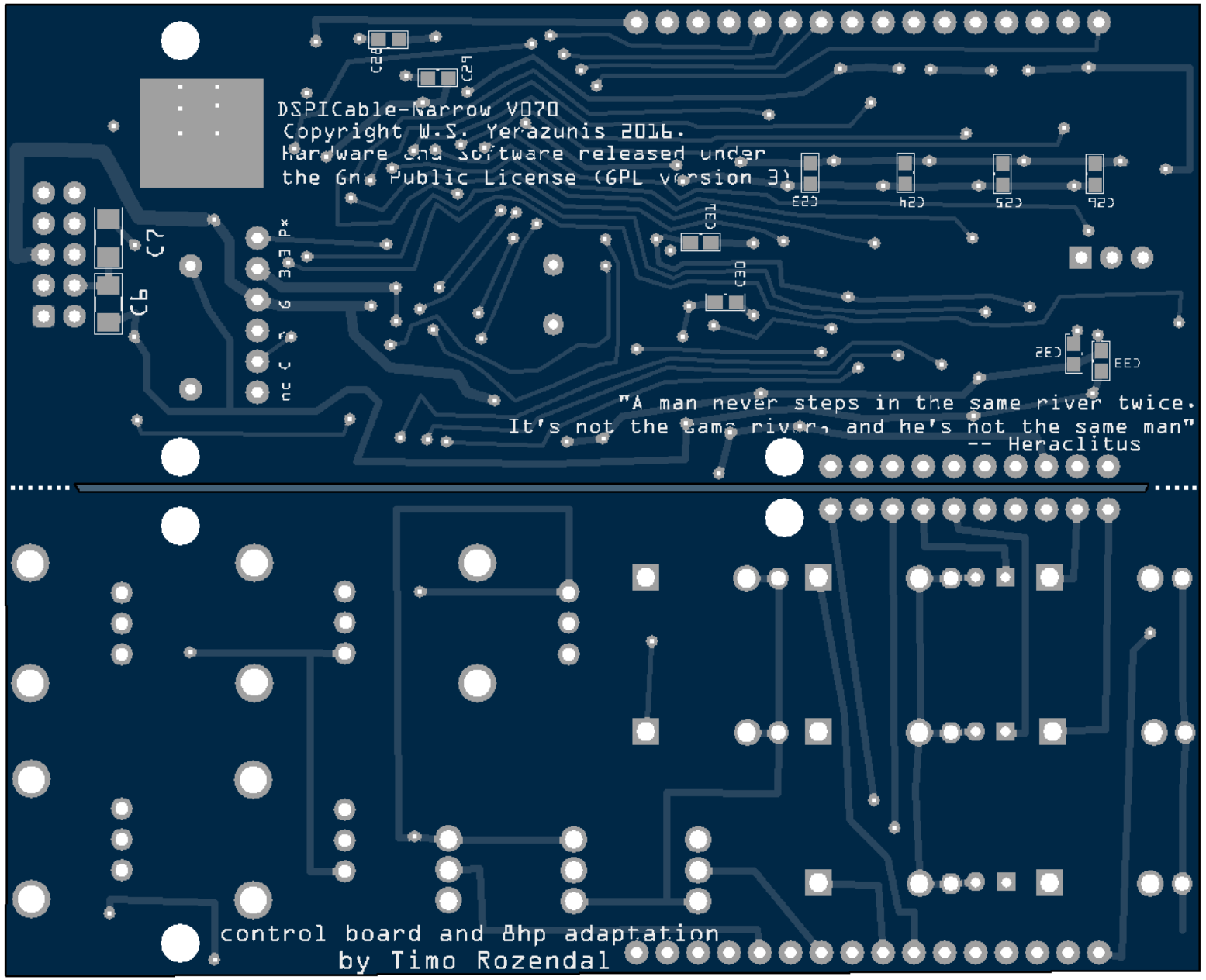
Further more it is useful and interesting to follow the discussion in the build thread here

Brief usage info:
The trimmer is for v/oct calibration, just calibrate it like any other VCO

about the switches and inputs:
First the obvious: FM is frequency modulation, PM is phase modulation,Feedback will let the module feedback on itself (FM i think), LFO will lower your frequency range, LOFI will add some grittiness to the sound in some cases and SYNC will reset your waveform (SYNC out will send a signal out every time the waveform resets, keep in mind that this output is less accurate than the audio outputs)

The sample switch switches to a live sampling lofi wavetable mode which needs some explanation:
- input the audio in into the feedback cv in:
now it continuously samples and uses this as wavetable data (with the correct pitch setting this a rough pitchshifter) that responds to fm and pm and the feedback knob
- now send in a high signal to the sync in, then it stops sampling new data and holds/freezes the current buffer for playback


coarse
fine
FM
PM
FB
S1/LFO
S2/LOFI
S3/SAMPLE
V/oct
SYNC
FM
PM
FB
F-
P-
HB
FM+PM out
FM out
Sync out
IN
OUT
J1
RED
+12
-12
J3
J6
J7
WSYnth
Salt and BURN!
XTAL1
GPLv3
DSPicableN-V070 (M28)


DSPICable-Narrow V070
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"A man never steps in the same river twice.
It's not the same river, and he's not the same man"
-- Heraclitus
control board and 8hp adaptation
by Timo Rozendal