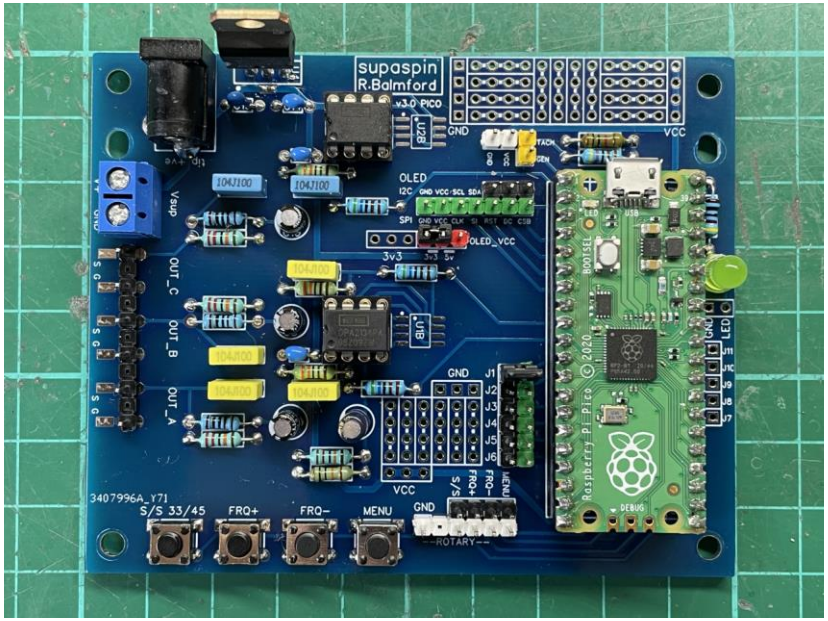
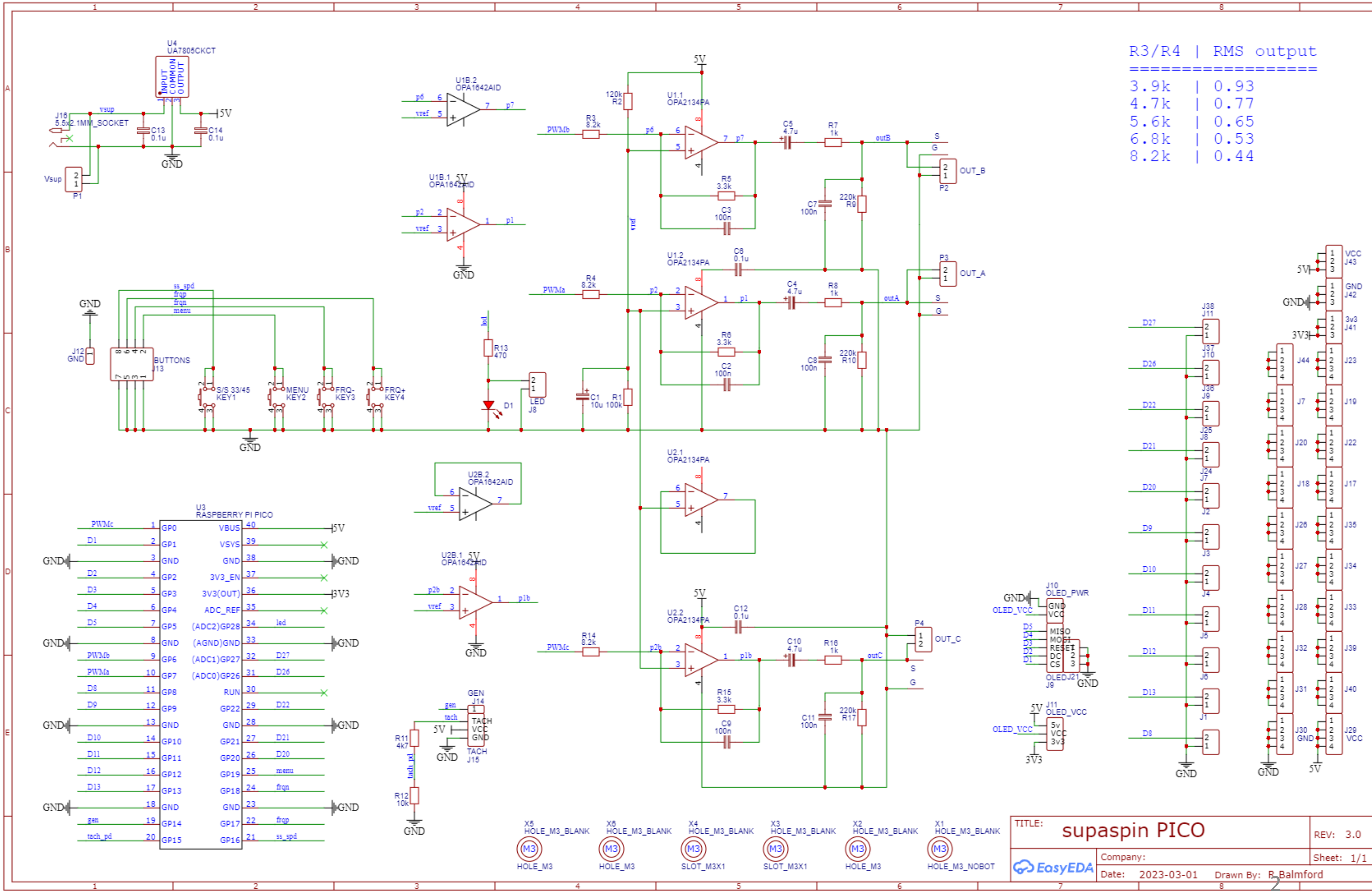
SUPASPIN

PCB v3.x PICO

The v3.x PICO PCB is compatible with the Raspberry Pi Pico processor module



Schematic - PCB v3.x PICO



BOM - PCB v3.x PICO

Part	Designator		Total quantity	
	2 phase	3 phase	2 phase	3 phase
100kΩ	R1		1	1
120kΩ	R2		1	1
8.2kΩ *	R3, R4	R14	2	3
3.3kΩ	R5, R6	R15	2	3
1kΩ	R7, R8	R16	2	3
220kΩ %	R9, R10	R17	2	3
4.7kΩ	R11		1$	1$
10kΩ	R12		1$	1$
470Ω	R13		1	1
10µF electrolytic, 6.3v+, 0.1” spacing	C1		1	1
100nF, 0.2” spacing	C2, C3, C7, C8	C9, C11	4	6
4.7µF electrolytic, 6.3v+, 0.1” spacing	C4, C5	C10	2	3
0.1µF, decoupling, 0.2” spacing	C6, C13^, C14^	C12	1/3^	2/4^
OPA2134 DIP or OPA1642 SOIC	U1 / U1B	U2 / U2B	1	2
DIL socket, 8-pin (if required)			1	2
7805 regulator (if required)	U4		1^	1^
5.5x2.1mm PCB mount socket (if required)	J16		1	1
LED	D1		1	1
miniature momentary push switches	KEY1-4		4	4
Raspberry Pi Pico			1	1
SSD1306 OLED display, 128x64, SPI or I2C			1	1
PCB			1	1

* choose according to desired output amplitude, see table on schematic
$ for tachometer sensor, if used
^ if regulator used
% choose to give total parallel resistance of this and amplifier input of approximately 40-50kΩ

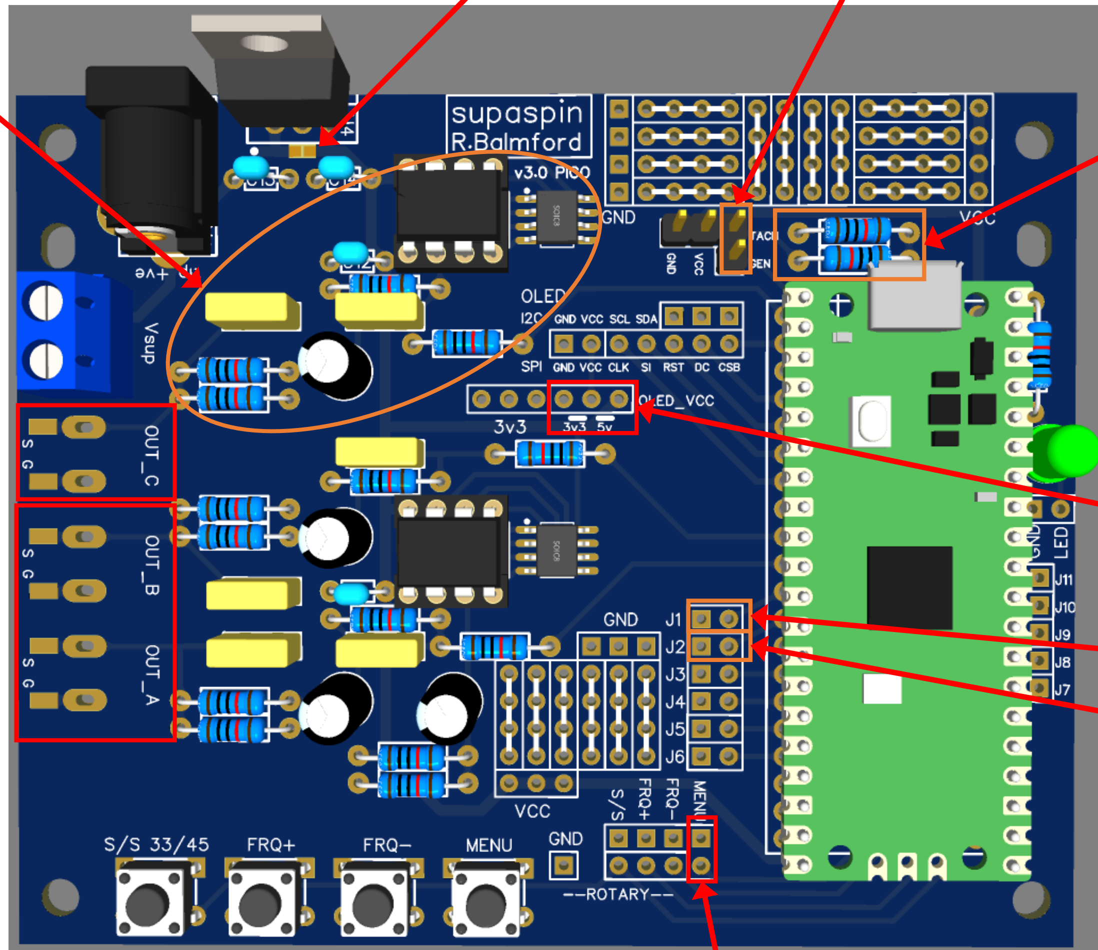
PCB v3.x PICO build – common

these components only for 3 phase

link when not using regulator

connect for TACH test (turntable sensor disconnected)

these components if using tachometer



Output 3rd phase

Outputs 2 phase

link to set OLED VCC voltage

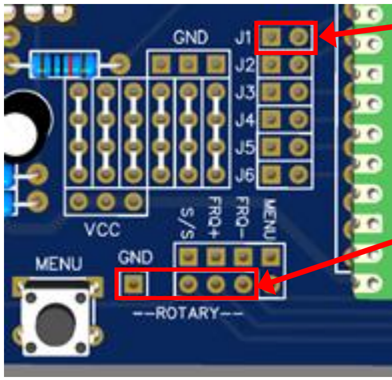
rotary/button link

OLED type link

menu button

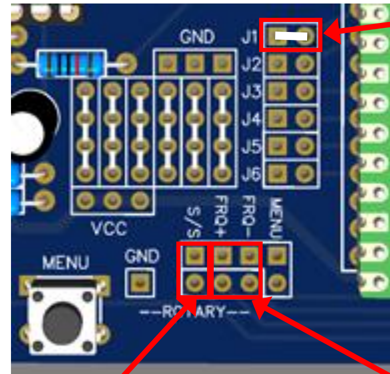
PCB v3.x PICO build - options

- rotary encoder OR buttons



no link

rotary encoder header

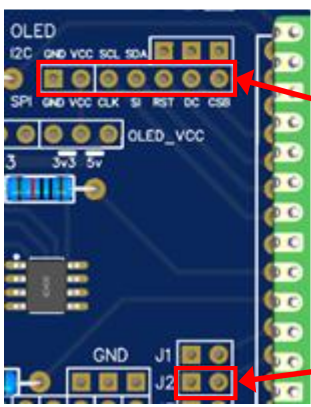


make link

start/stop (short press) & 33/45 (long press)

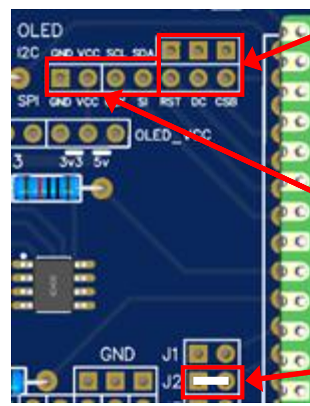
frequency trim +/- 0.01Hz steps

- SPI OLED OR I2C OLED



SPI OLED header

no link



I2C address select links:

LINKS			address
N	N	N	0x3C

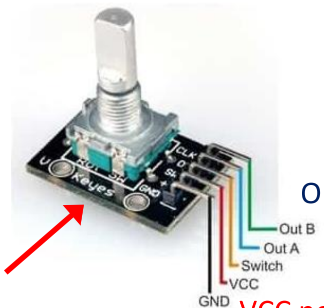
I2C OLED header

make link

PCB v3.x PICO build - notes

- rotary encoder connection

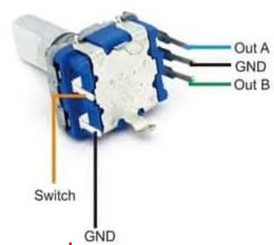
No external pull-ups are required on the rotary encoder, hence no connection to VCC. Remove any pull-up resistors on the encoder PCB

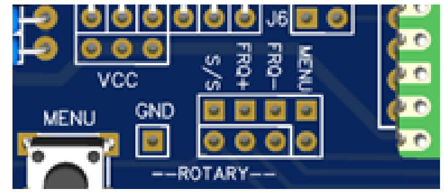


remove any pull-up resistors on encoder PCB

VCC no connect

OR



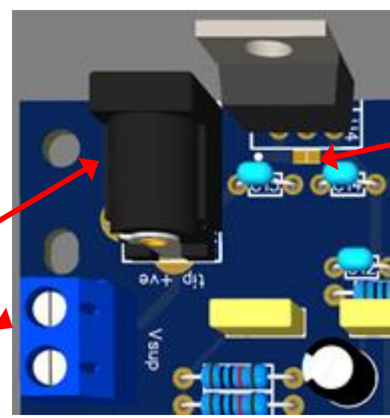


GND Switch Out A Out B

- power

There are footprints for a 5.5x2.1mm DC barrel socket, or 2-terminal connector. If the regulator is used, these can be supplied with a suitable voltage above 5v (typically 7-12v). Otherwise, these can be supplied with 5v DC, in which case the regulator is not fitted and the link made

5v DC when not using regulator, or higher with regulator

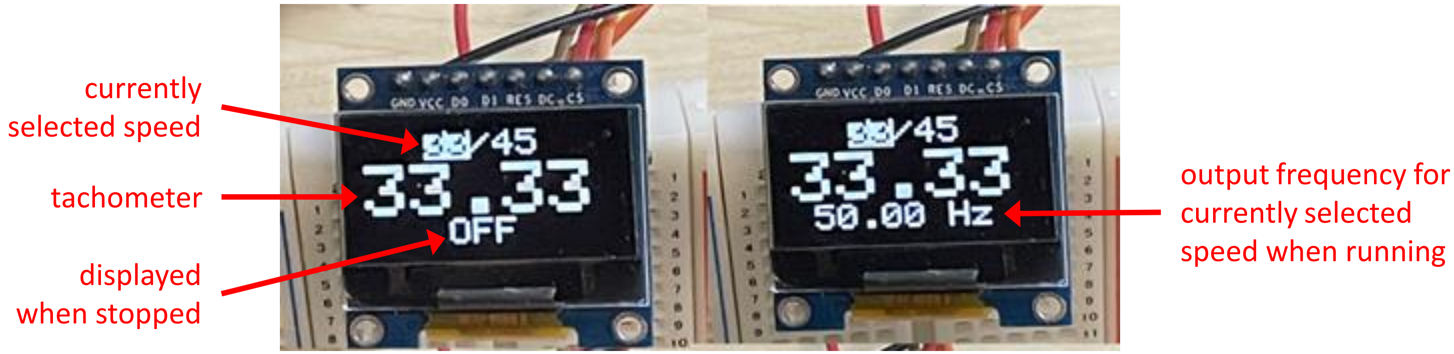


solder bridge when not using regulator

OLED display

A 128x64 pixel OLED display based on a SSD1306 driver with SPI or I2C interface, can be connected using the header pins shown in the diagrams above, along with the pin ordering. The display can have a 3.3v or 5v supply.

Example displays, tachometer enabled:

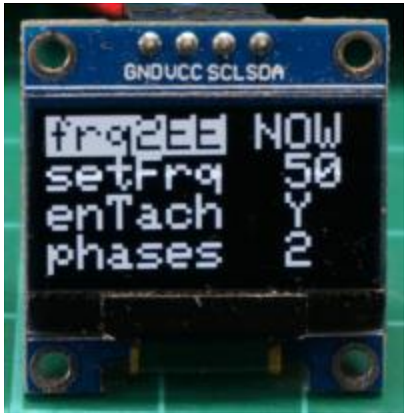


Example menu items:

Top menu

amplitude sub-menu

setup sub-menu



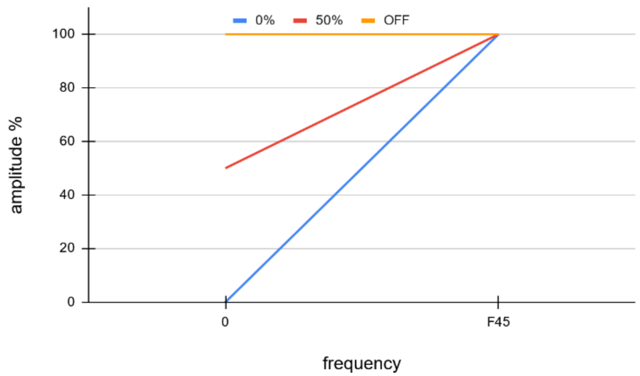
MENU

TOP MENU	SUB MENU	VALUES	DESCRIPTION
amplitude	ampRed	OFF, 5s, 10s, 20s	delay before reduced amplitude: OFF - always maximum amplitude XXs - amplitude reduces to amp_33/amp_45 value after XX seconds
	amp_33	100 -> 50%, 5% steps	percentage of amplitude after ampRed time
	amp_45		
	SStart	OFF, AMP, F 2, F 4, F 8, F16	choose soft start type at turn on: OFF - no soft start AMP - 0.5s amplitude ramp Fxx - frequency ramp over xx seconds
	FDAval	0 -> 100%, 10% steps	Frequency dependant amplitude scaling, sets value for 0Hz
phase	phB_33	-30 -> 30°, step 1°	phase trim around nominal point, for 33 and 45 RPM phB for 2 or 3 phase
	phB_45		
	phC_33		as above, phC only for 3 phase
	phC_45		
setup	frq2EE	NOW, 30s	choose when frequency adjustments are saved to NVM: NOW - current frequencies saved on menu exit (this time only) 30s - saved after 30s of frequency adjustment inactivity when running
	setFrq	10 -> 99Hz, 1Hz steps	set initial output frequencies for both 33 & 45 RPM. Displayed value is for 33 RPM, value for 45 RPM is calculated
	enTach	Y, N	enable/disable tachometer function
	phases	2, 3	choose between 2 (0° and 90° on OUT_A/B) or 3 (0°, 120° & 240° on OUT_A/B/C) phase output
	<version ID>		firmware version identifier (not editable)
tachometer	CP_REV	1, 2, 4	number of tachometer pulses per revolution new reading generated on each pulse
	NR_AVG	1, 2, 4, 8	number of readings over which to average

* to enter top menu, press start/stop whilst holding down MENU button
* highlight sub-menu using buttons/encoder, and press start/stop to descend to sub-menu
* highlight item using buttons/encoder, and press start/stop to begin editing
* change value using buttons/encoder, and press start/stop to finish editing
* return to top menu by pressing start/stop whilst holding down MENU button
* to exit from top menu, press start/stop whilst holding down MENU button – all edited items are saved to NVM

MENU – notes

- the menu can be entered with the generator output either on or off
- phase and amplitude values: **phB_33, phB_45, phC_33, phC_45 and amp_33, amp_45**
  These take immediate effect, enter menu whilst the generator is on
- **setFrq**
  This is intended to set the 33 and 45 RPM frequencies close to the desired values, before fine-tuning with the up/down controls. This takes immediate effect, enter menu with generator on
- **frq2EE**
  This provides two options of when the frequencies are saved to NVM, depending on preference:
  STP: saved each time the generator is stopped. Last values resumed on restart/power-on
  NOW: only saved when this menu item is edited. This allows a ‘default’ frequency to always be restored at power-up, and each record played can be individually fine-tuned without saving
- **FDAval**
  This sets the frequency-amplitude characteristic in all modes, can be used to maintain a near constant motor current/torque for 33/45rpm and during frequency ramp if selected



FIRMWARE

Connect processor module to computer (whilst holding down the ‘BOOT’ button if necessary). Upload the .uf2 file via ‘drag-and-drop’ to the corresponding drive letter

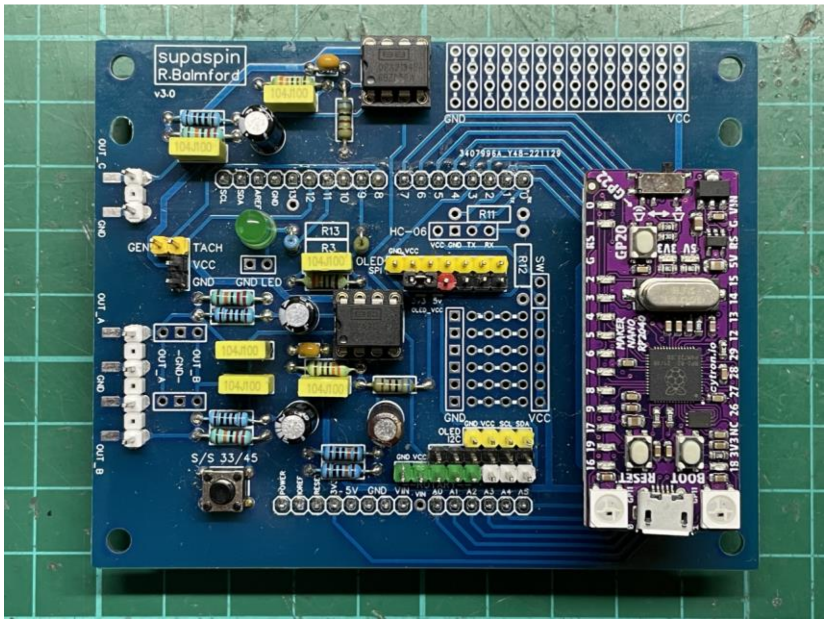
Initial menu values will be determined by the contents of the RP2040 Flash – ***check all menu values on first use***.

SUPASPIN

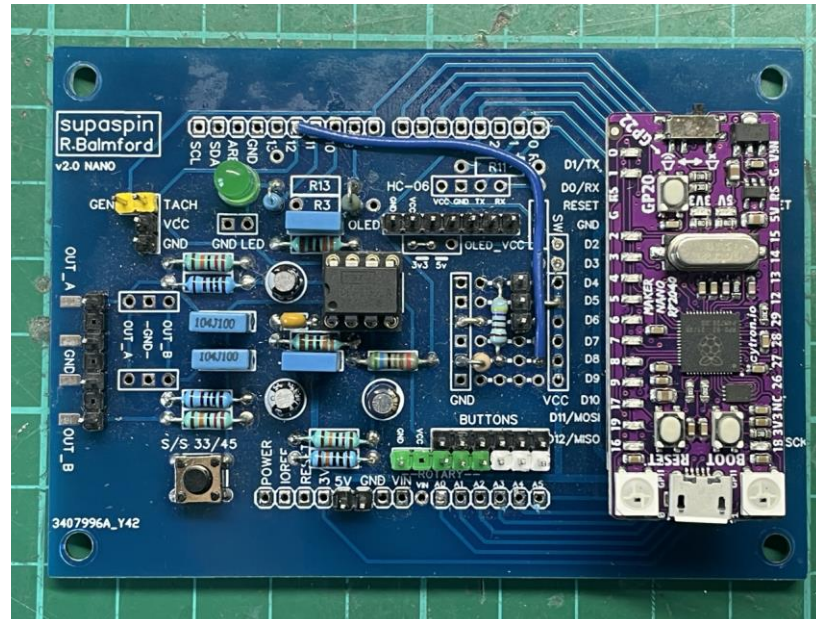
PCB v3.0 and v2.0 NANO

Both the v3.0 and v2.0 NANO PCBs can be used, in conjunction with the Cytron Maker Nano RP2040 processor module

v3.0

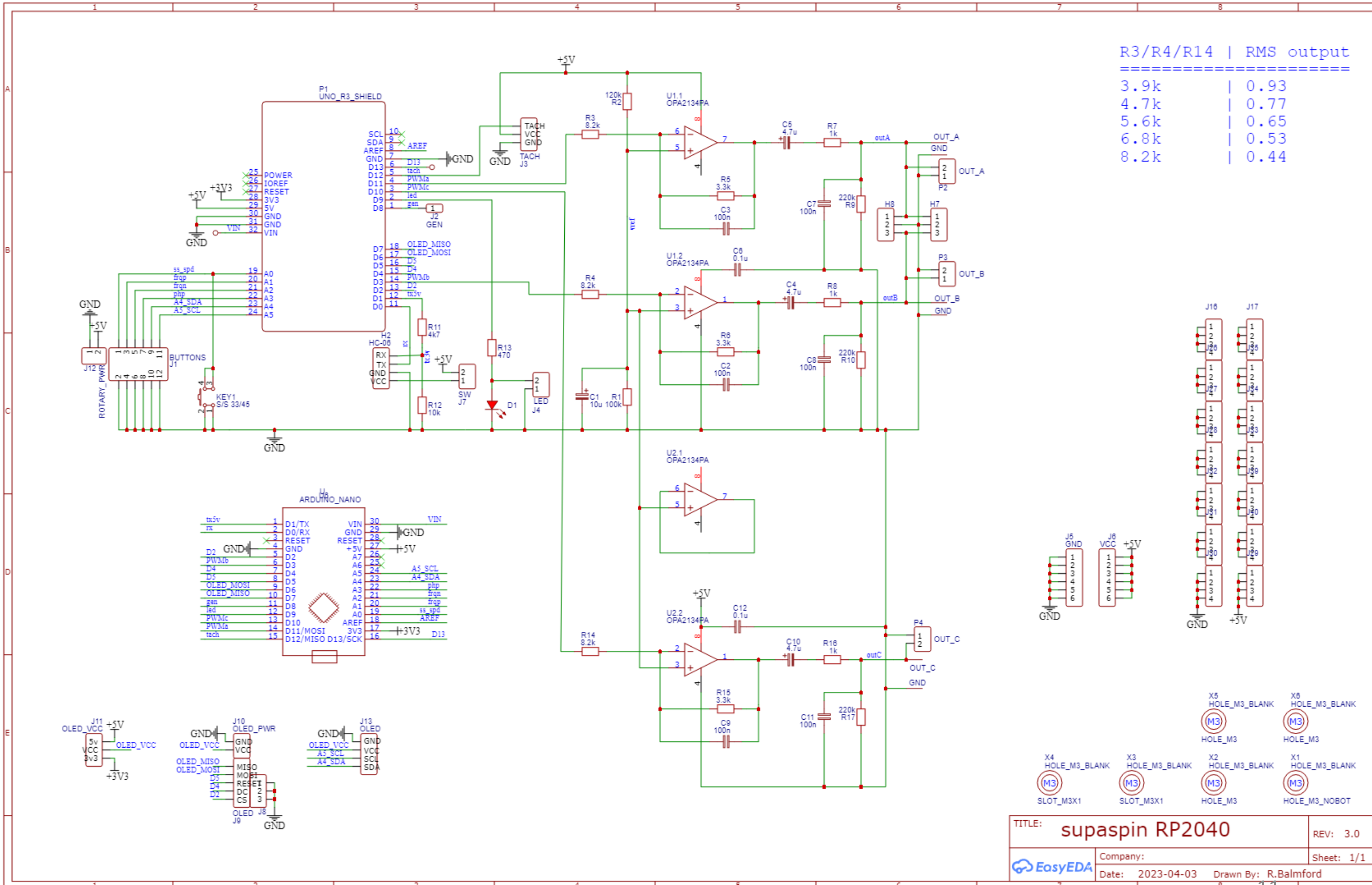


v2.0 NANO



Build for the v2.0 NANO PCB is the same as for the v3.0 detailed here, disregarding the additional schematic components and PCB area for the 3rd phase, and using the 2 phase BOM. The tachometer potential divider can be similarly constructed on the available prototype area as shown

Schematic - PCB v3.0 and v2.0 NANO



BOM - PCB v3.0 & v2.0 NANO

Part	Designator		Total quantity	
	2 phase	3 phase	2 phase	3 phase
100kΩ	R1		1	1
120kΩ ^	R2		1	1
8.2kΩ *^	R3, R4	R14	2	3
3.3kΩ	R5, R6	R15	2	3
1kΩ	R7, R8	R16	2	3
220kΩ %	R9, R10	R17	2	3
4.7kΩ	R11t		1$	1$
10kΩ	R12t		1$	1$
470Ω	R13		1	1
10µF electrolytic, 6.3v+, 0.1" spacing	C1		1	1
100nF, 0.2" spacing	C2, C3, C7, C8	C9, C11	4	6
4.7µF electrolytic, 6.3v+, 0.1" spacing	C4, C5	C10	2	3
0.1µF, decoupling, 0.2" spacing	C6	C12	1	2
OPA2134 DIP	U1	U2	1	2
DIL socket, 8-pin			1	2
LED	D1		1	1
miniature momentary push switch	KEY1		1	1
Cytron Maker Nano RP2040 ^			1	1
SSD1306 OLED display, 128x64, SPI or I2C			1	1
PCB			1	1
not populated ^	R11, R12, J7			

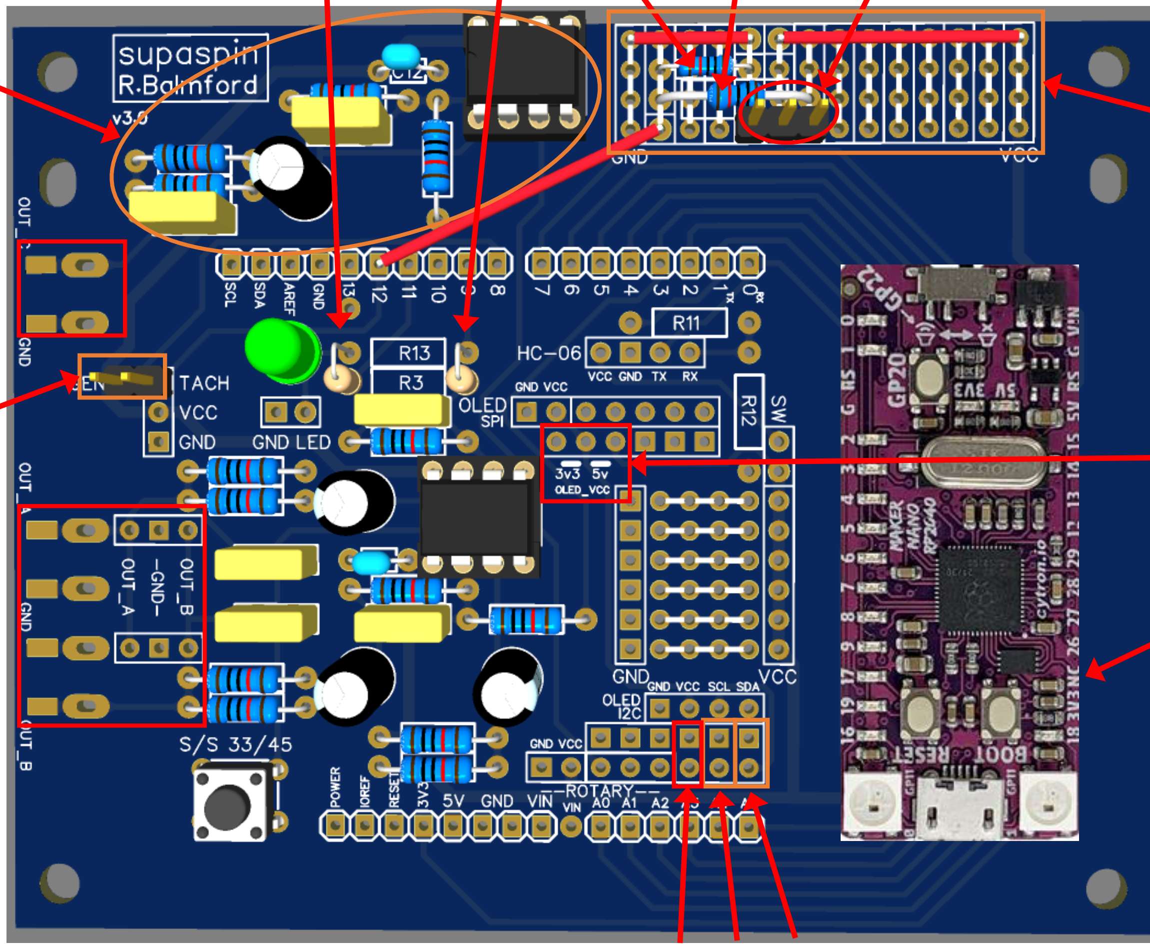
* choose according to desired output amplitude, see table on schematic

$ for tachometer sensor, if used

^ changed compared with Nano version

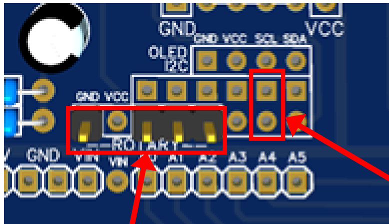
% choose to give total parallel resistance of this and amplifier input of approximately 40-50kΩ

PCB v3.0 & v2.0 NANO build - common



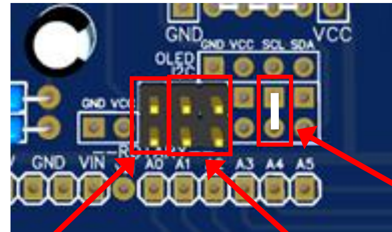
PCB v3.0 & v2.0 NANO build - options

- rotary encoder OR buttons



no link

rotary encoder header
NOTE: VCC not connected

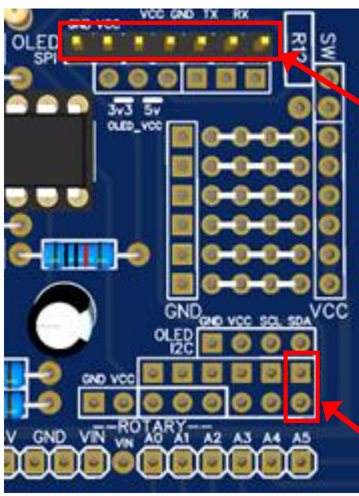


make link

start/stop (short press)
& 33/45 (long press)

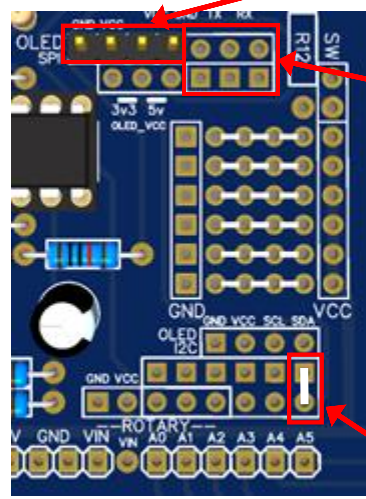
frequency trim
+/- 0.01Hz steps

- SPI OLED OR I2C OLED



SPI OLED header
Pin order:
GND, VCC, CLK,
MOSI, RST, DC, CSB

no link



I2C OLED header
Pin order: GND, VCC, SCL, SDA

I2C address select links:

LINKS			address
N	N	N	0x3C

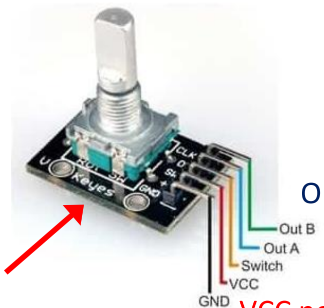
make link

PCB v3.0 & v2.0 NANO build - notes

- rotary encoder connection

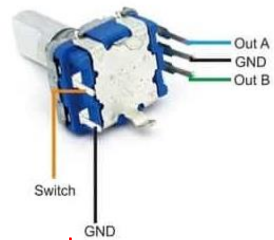
No external pull-ups are required on the rotary encoder, hence no connection to VCC. Remove any pull-up resistors on the encoder PCB

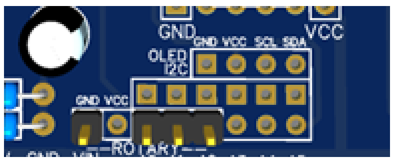
remove any
pull-up resistors
on encoder PCB



VCC no connect

OR

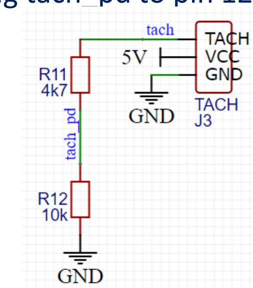




GND
Switch
Out A
Out B

- tachometer sensor potential divider

A 5v tachometer sensor will need its output voltage reducing to 3v3 logic levels. Use the available prototype area to form a potential divider using R11t & R12t, connecting tach_pd to pin 12, with an example shown on the 'PCB build – common' page above



- R3 / R13

Note the new positioning of these, differs from the schematic/PCB silkscreen