LCC Pico Turntable Node User Guide

Version 2.4

This version utilizes the MCP2815 and MCP2562 discrete components for the LCC interface.
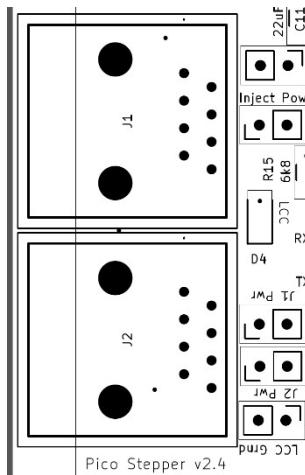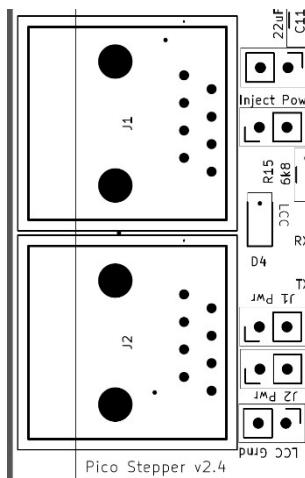
The intent of this node is to control all aspects of a turntable & roundhouse engine facility on a model railroad layout. It may also be adapted to several other uses as there is facility to connect to all the exposed pins on the Raspberry Pi Pico microcontroller. Some pins have power and ground pins in line to facilitate peripheral connections.

Note that the resistor in line with the reset button has been changed to zero ohm from the 10K shown. There are no resistors on the Blue and Gold button lines.


The node may be powered from the barrel jack or the LCC port. If driving a stepper motor power must be applied from the barrel jack. In this case the external power must be suitable for the motor and stepper controller. The barrel jack power should be at least seven (7) volts to power the node or fifteen (15) volts if using the node to inject power to LCC. Amperage should be sufficient to drive any external devices plus about half an amp for the node plus another 1.5 amps if injecting power to LCC.

Node power configuration is accomplished with five jumpers located behind the LCC ports.
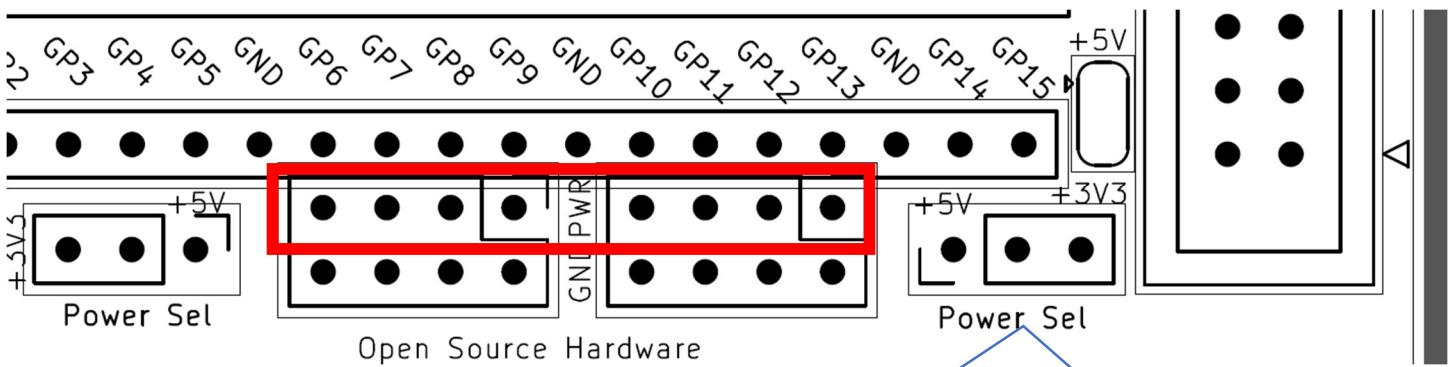
J1 Pwr and J2 Pwr jumpers allow power isolation of one or both LCC ports. Generally, both jumpers would be bridged. If power injection or utilization was only desired in one direction, then the opposing jumper would be opened to isolate that leg. The isolated leg should be powered downstream as opening the jumper will cut off any power from the node.
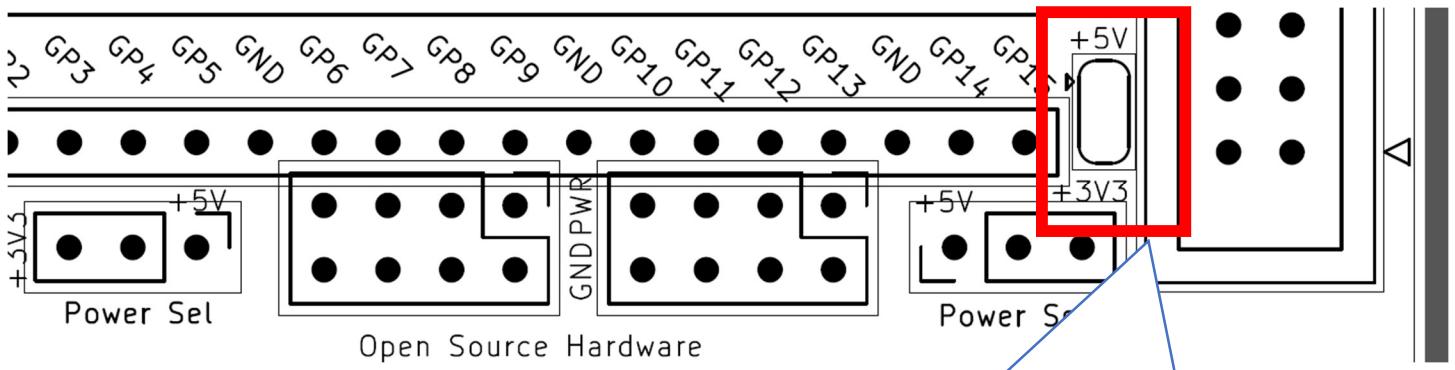
LCC Pwrd jumper should be bridged along with the LCC Grnd jumper if the node is to be powered from the LCC Port. Note that this will not provide power to the stepper driver which is powered exclusively from the barrel jack.

Inject Power should be bridged along with the LCC Grnd jumper if the node is intended to inject power to one or both of the LCC ports. 15 volts of at least 1.5 amps should be applied to the barrel jack in order to inject power.
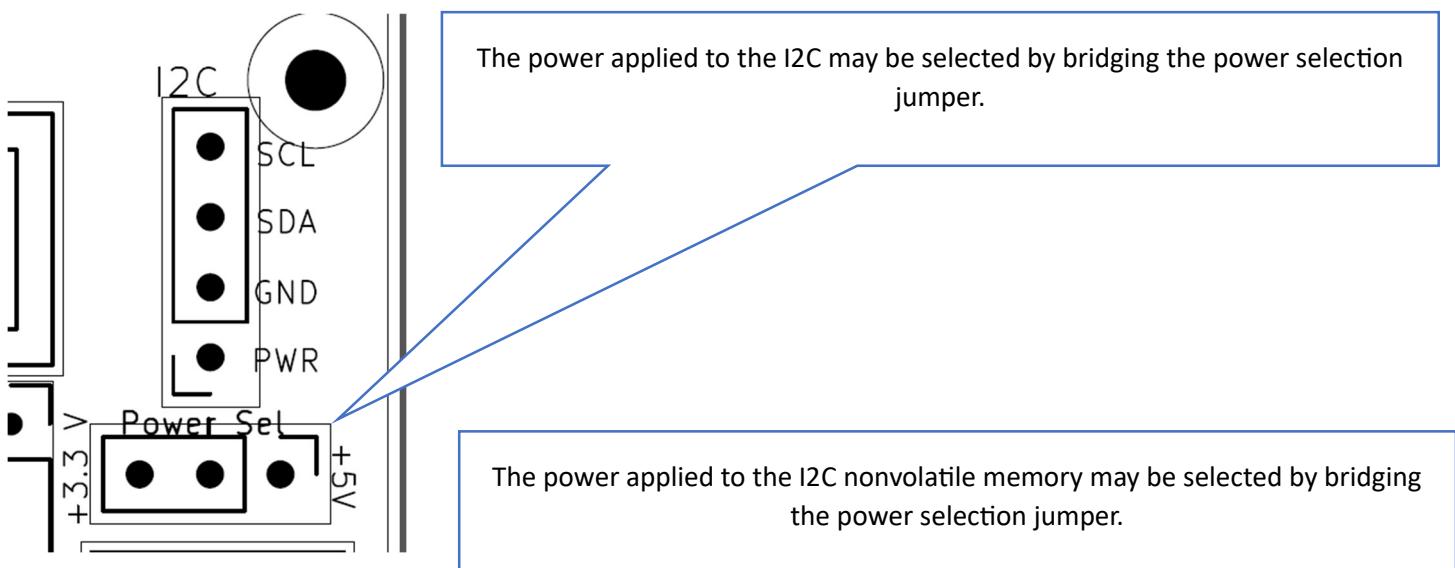
LCC Grnd jumper should be bridged if the node is intended to inject power to or draw power from one or both of the LCC ports.
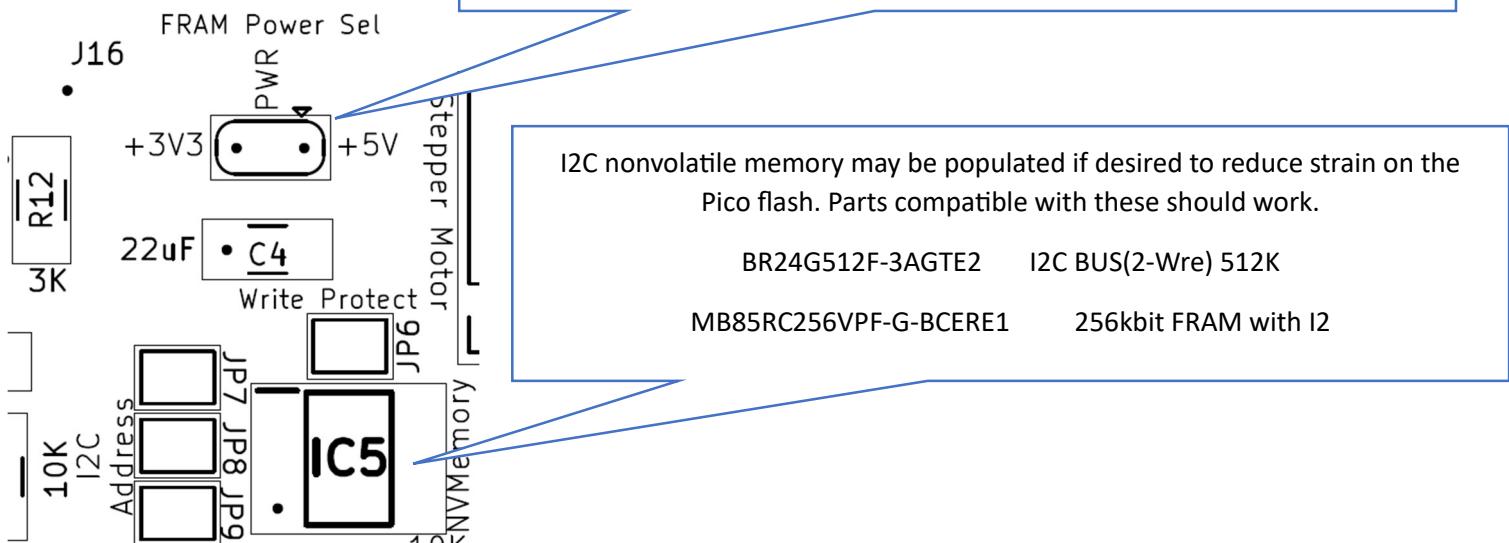
The power applied to the middle pins of the GPIO blocks of four may be selected by bridging the respective power selection jumpers.

GP3 GP4 GP5 GND GP6 GP7 GP8 GP9 GND GP10 GP11 GP12 GP13 GND GP14 GP1

+5V

+3V3

+5V

+3V3

+5V

Power Sel

GND PWR

Open Source Hardware

+5V

Power S

The power applied to the 40 pin display connector may be selected by bridging the respective power selection jumper.

I2C

SCL

SDA

GND

PWR

Power Sel

+3.3 V

+5V
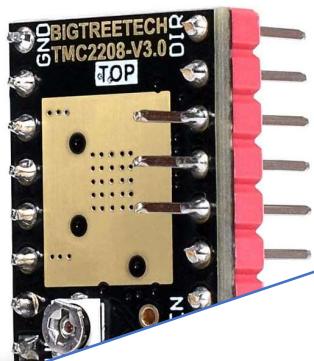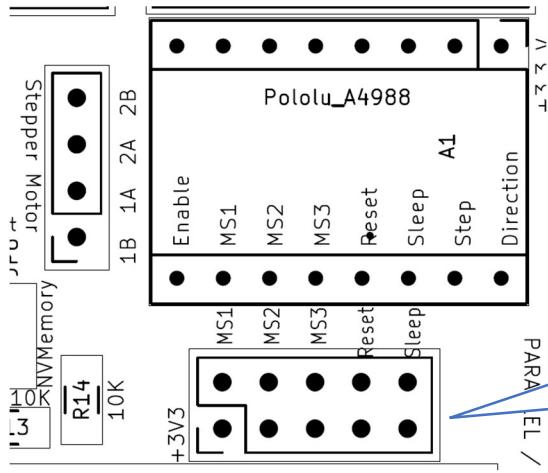
The power applied to the I2C may be selected by bridging the power selection jumper.

The power applied to the I2C nonvolatile memory may be selected by bridging the power selection jumper.

FRAM Power Sel

J16

PWR

+3V3

+5V

R12

3K

22uF

C4

Write Protect

JP6

JP7 JP8 JP9

Address

10K
I2C

IC5

Stepper Motor

NVMemory

I2C nonvolatile memory may be populated if desired to reduce strain on the Pico flash. Parts compatible with these should work.

BR24G512F-3AGTE2   I2C BUS(2-Wre) 512K
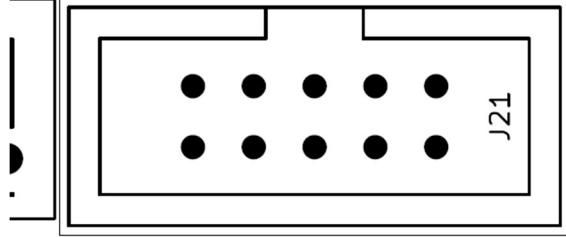
MB85RC256VPF-G-BCERE1   256kbit FRAM with I2

Pololu_A4988

Stepper Motor +5V / NVMemory

1B 1A 2A 2B

Enable MS1 MS2 MS3 Reset Sleep Step Direction

A1

+3V3

MS1 MS2 MS3 Reset Sleep

PARALLEL /

10K R14 10K

+3V3

GND BIGTREETECH
TMC2208-V3.0
TOP
DIR

The stepper motor driver, if populated, can be configured with these jumpers. Bigtreetech TMC2208 V3.0 UART Stepper with Heat Sink has worked well for me as a replacement for a A4988
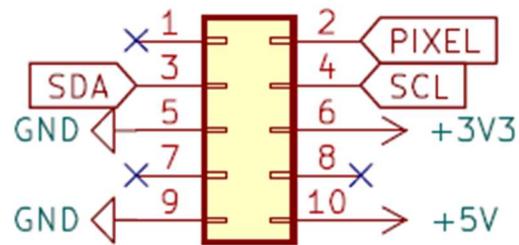
ROUNDHOUSE CONNECTIONS ▽

J21

Roundhouse
J21

1	2	PIXEL
SDA	3	4	SCL
GND	5	6	+3V3
7	8
GND	9	10	+5V

TURNTABLE CONNECTIONS ▽

J15

+12V

VMOT 8

J7

1B 3 — 1
1A 4 — 2
2A 5 — 3
2B 6 — 4

Conn_01x04

Turntable
J15

1	2	HOME
BRIDGE	3	4	PIXEL
GND	5	6	+5V
7	8
9	10

D_RST

J8

GND	1	2	D_PWR
GND	3	4	D_D/C
+3V3	5	6	D_WR
D_RST	7	8	
DB0	9	10	DB1
DB2	11	12	DB3
DB4	13	14	DB5
DB6	15	16	DB7
	17	18	
	19	20	
	21	22	
	23	24	
	25	26	
	27	28	
	29	30	
	31	32	
T_RST	33	34	T_SCL
T_SDA	35	36	T_INT
	37	38	
D_BL	39	40	GND

er Sel

+3V3

D_PWR

+5V

J22

1
2
3

AGND

C4
22uF

D_BL —— +3V3

PARALLEL / I2C INTERFACE TO CAP TOUCH DISPLAY PANEL

Direction

-5V

3V3

LCC Raspberry Pi Pico Shield

Using David Harris LCC schematic
changed to through hole and made specific to RPi Pico

Sheet: /
File: LCC-Pico-Stepper_v2_4.kicad_sch

Title:

Size: User
KiCad E.D.A. 8.0.7

Date: December 17, 2024

Rev: 2.4 Pico

Id: 1/1

Raspberry Pi Pico — RPiPico1
Raspberry Pi Pico

J17, J14, J8

J21 Roundhouse
J15 Turntable
J23 Display Power Sel
J22, J16 FRAM Power Sel
J7 Conn_01x04
J4

LCC Interface

TJA1042T_3.1J — IC3
MCP2518FDT-E_SL — IC2
MB85RCxxxV — IC5
ABM-40MHZ — Y1

Pololu_A4988
TPS54294PWPR — IC1

DMG2305UX-7 — Q1

J1 Pwr JP3, J2 Pwr JP1
JP5 Inject Power
JP2 LCC Pwrd
JP4 LCC Grnd
JP6 Write Protect
JP7 JP8 JP9 Address

Power Sel: J12, J13, J10, J11, J3
I2C Header J5

TP1 RX / RXD
TP2 TX / TXD

Pico Reset SW1
Blue Button SW2
Gold Button SW3

Barrel Jack J20 / Mp Mounting

J18 5 volt
J19 3.3 volt

F1 0ZCG0035AF2C
F2 0ZCG0035AF2C

RJ45 J1 / RJ45 J2
BPWRB / BPWRB
CANH / CANL
Alt_H / Alt_L
CANGND / ShldGND
BGND

LEDs: D5, D4, D7, D8
Resistors: R11 2K, R5 3K, R6 820R, R7 560R
+12V, VLCC, +5V, +3V3

D2, D3, D10, D9, D6, D11 M7

L1 SRP3212A-2R2M
L2 SRP3212A-3R3M

Capacitors: C1, C2 470uF, C3, C4 22uF, C5 22uF, C6 100nF, C7 1uF, C8 22uF,
C9 22uF, C10 22uF, C11 22uF, C12 22uF, C13 22pF, C14 22pF, C15 100nF,
C16 4.7uF, C19 100nF

Resistors: R1 22.1K, R2 22.1K, R3 73.2K, R4 22.1K, R8 10K, R9, R10 10K,
R12 3K, R13 10K, R14 10K, R15 6k8, R16 10K

VINPUT, VLCC, VSYS, VBUS, BGND, AGND, GND
+12V, +5V, +3V3