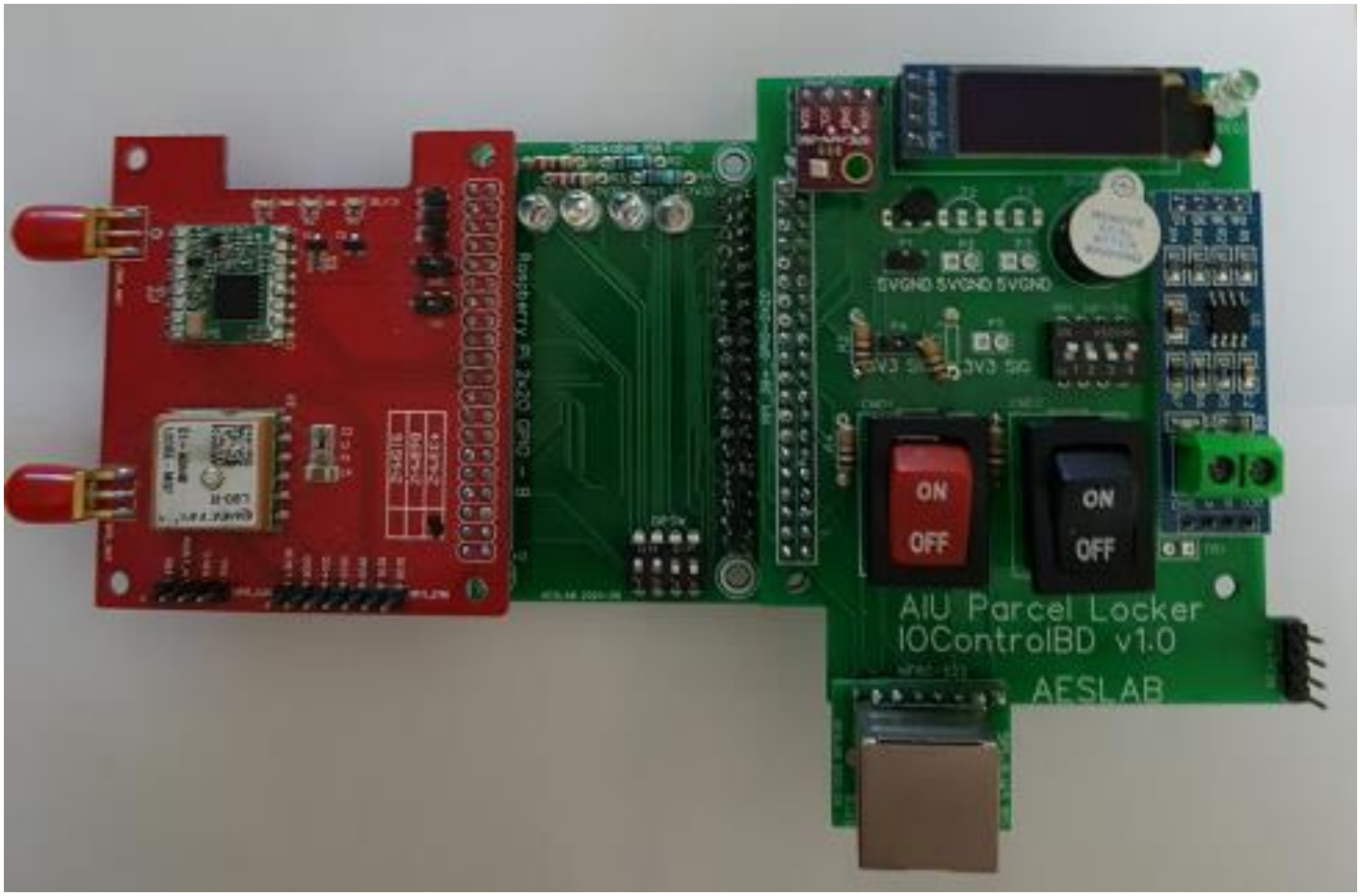
MLS (Multi Layer Stackable) Hat–0 User Guide

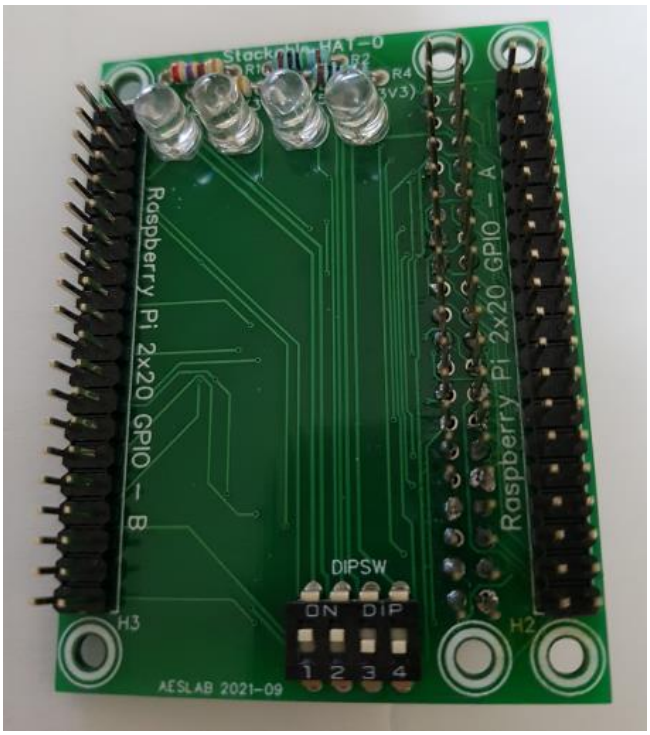


For example, GPIO A (Left) connected AESLAB Own IO Control Board
and GPIO B (Right) connected GPS and LoRa Wireless Communication Board

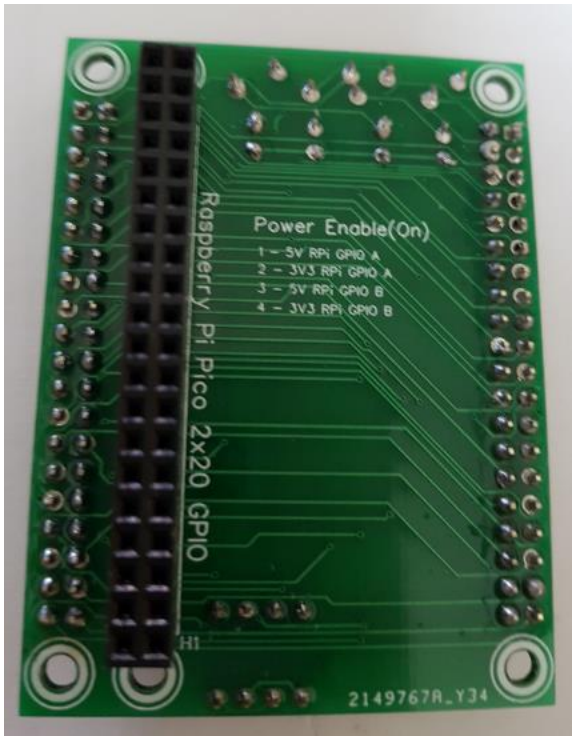
Raspberry Pi 2x20 GPIO A (Left)	x 1 Port
Raspberry Pi 2x20 GPIO B (Right)	x 1 Port

1. Hardware Setup

a) PCBA (PCB Assembled)



Top Side



Bottom Side

b) Used Pin List

All Pico GPIO pins map to Raspberry Pi 2x20 A, B GPIO pins.

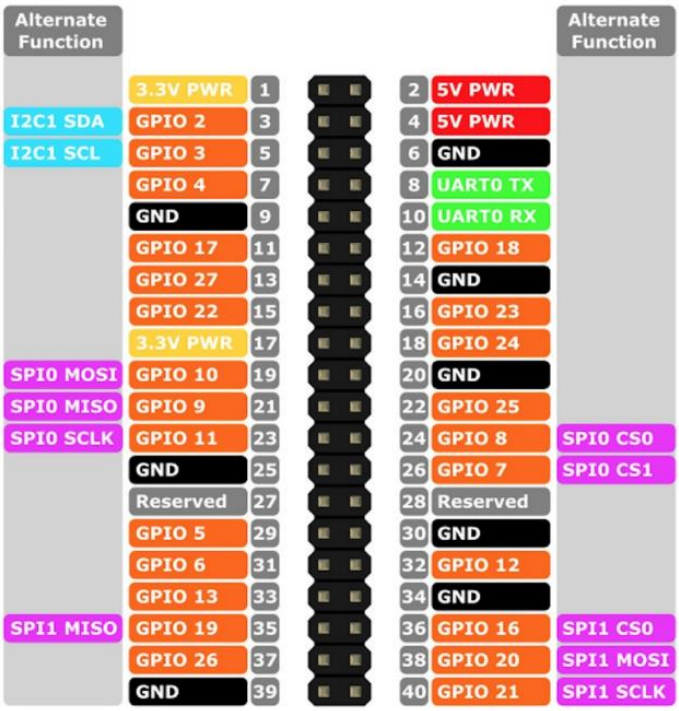
c) Power Enable (DIPSW On/Off)

1	5V	RPi GPIO A (Left) 5V Enable & LED A(5V) On
2	3V3	RPi GPIO A (Left) 3V3 Enable & LED A(3V3) On
3	5V	RPi GPIO B (Right) 5V Enable & LED B(5V) On
4	3V3	RPi GPIO B (Right) 3V3 Enable & LED B(3V3) On

2. MicroPython with Thonny IDE

```
from machine import Pin, PWM, ADC, I2C, SPI, Timer
import utime

from SSD1306 import SSD1306_I2C
from MFRC522 import MFRC522


# Pico vs RPi Pinmap (BCM Type)

GPIO2 = 20
GPIO3 = 21
GPIO4 = 14

GPIO17 = 15
GPIO27 = 18
GPIO22 = 19

GPIO10 = 3
GPIO9 = 4
GPIO11 = 2

GPIO5 = 20
GPIO6 = 22
GPIO13 = 26
GPIO19 = 27
GPIO26 = 28

TxD = 16
RxD = 17
GPIO18 = 0

GPIO23 = 1
GPIO24 = 6

GPIO25 = 7
GPIO8 = 5
GPIO7 = 13

GPIO12 = 8

GPIO16 = 9
GPIO20 = 11
GPIO21 = 10

# AIUPL Used Pin
LED = GPIO4

DIPSW1 = GPIO17
DIPSW2 = GPIO27
DIPSW3 = GPIO22
DIPSW4 = GPIO7

BUZZER = GPIO16
CMD1 = GPIO20
CMD2 = GPIO21

TROUT1 = GPIO13
TROUT2 = GPIO19
TROUT3 = GPIO12

RELAY1 = GPIO12
RELAY2 = GPIO26

DIN1 = GPIO23
DIN2 = GPIO24

SDA = GPIO2
SCL = GPIO3

MFRC_RST = GPIO5
MFRC_IRQ = GPIO25
MFRC_MISO = GPIO9
MFRC_MOSI = GPIO10
MFRC_SCK = GPIO11
MFRC_SS = GPIO8

WIDTH  = 128          # 0.91" OLED display width
HEIGHT = 32           # 0.91" OLED display height

led = Pin(LED, Pin.OUT)
dipsw1 = Pin(DIPSW1, Pin.IN)
dipsw2 = Pin(DIPSW2, Pin.IN)
dipsw3 = Pin(DIPSW3, Pin.IN)
dipsw4 = Pin(DIPSW4, Pin.IN)

buzzer = Pin(BUZZER, Pin.OUT)
cmd1 = Pin(CMD1, Pin.IN)
cmd2 = Pin(CMD2, Pin.IN)
trout1 = Pin(TROUT1, Pin.OUT)
trout2 = Pin(TROUT2, Pin.OUT)
trout3 = Pin(TROUT3, Pin.OUT)
relay1 = Pin(RELAY1, Pin.OUT)
relay2 = Pin(RELAY2, Pin.OUT)
din1 = Pin(DIN1, Pin.IN)
din2 = Pin(DIN2, Pin.IN)

sda = Pin(SDA)
scl = Pin(SCL)
i2c = I2C(0, scl=scl, sda=sda, freq=400000)
print (i2c)

oled = SSD1306_I2C(width=WIDTH, height=HEIGHT, i2c=i2c,
addr=0x3C, external_vcc=False)
print (oled)

reader = MFRC522(spi_id=0, sck=MFRC_SCK,
                 miso=MFRC_MISO,
                 mosi=MFRC_MOSI,
                 cs=MFRC_SS, rst=MFRC_RST)
print ("MFRC522 RFID Reader :", reader)
```

3. Raspberry Pi 2x20 GPIO Pinmap



BCM Type

BCM	wPi	Name	Mode	V	Physical	V	Mode	Name	wPi	BCM
		3.3v			1 || 2			5v		
2	8	SDA.1	ALT0	1	3 || 4			5V		
3	9	SCL.1	ALT0	1	5 || 6			0v		
4	7	GPIO. 7	IN	1	7 || 8	0	ALT0	TxD	15	14
		0v			9 || 10	1	ALT0	RxD	16	15
17	0	GPIO. 0	IN	0	11 || 12	0	IN	GPIO. 1	1	18
27	2	GPIO. 2	IN	0	13 || 14			0v		
22	3	GPIO. 3	IN	0	15 || 16	0	IN	GPIO. 4	4	23
		3.3v			17 || 18	1	OUT	GPIO. 5	5	24
10	12	MOSI	ALT0	0	19 || 20			0v		
9	13	MISO	ALT0	1	21 || 22	1	OUT	GPIO. 6	6	25
11	14	SCLK	ALT0	1	23 || 24	1	ALT0	CE0	10	8
		0v			25 || 26	1	ALT0	CE1	11	7
0	30	SDA.0	ALT0	1	27 || 28	1	ALT0	SCL.0	31	1
5	21	GPIO.21	IN	1	29 || 30			0v		
6	22	GPIO.22	IN	1	31 || 32	0	IN	GPIO.26	26	12
13	23	GPIO.23	IN	0	33 || 34			0v		
19	24	GPIO.24	IN	0	35 || 36	0	IN	GPIO.27	27	16
26	25	GPIO.25	IN	0	37 || 38	0	IN	GPIO.28	28	20
		0v			39 || 40	0	IN	GPIO.29	29	21
BCM	wPi	Name	Mode	V	Physical	V	Mode	Name	wPi	BCM