Mirte-Master build

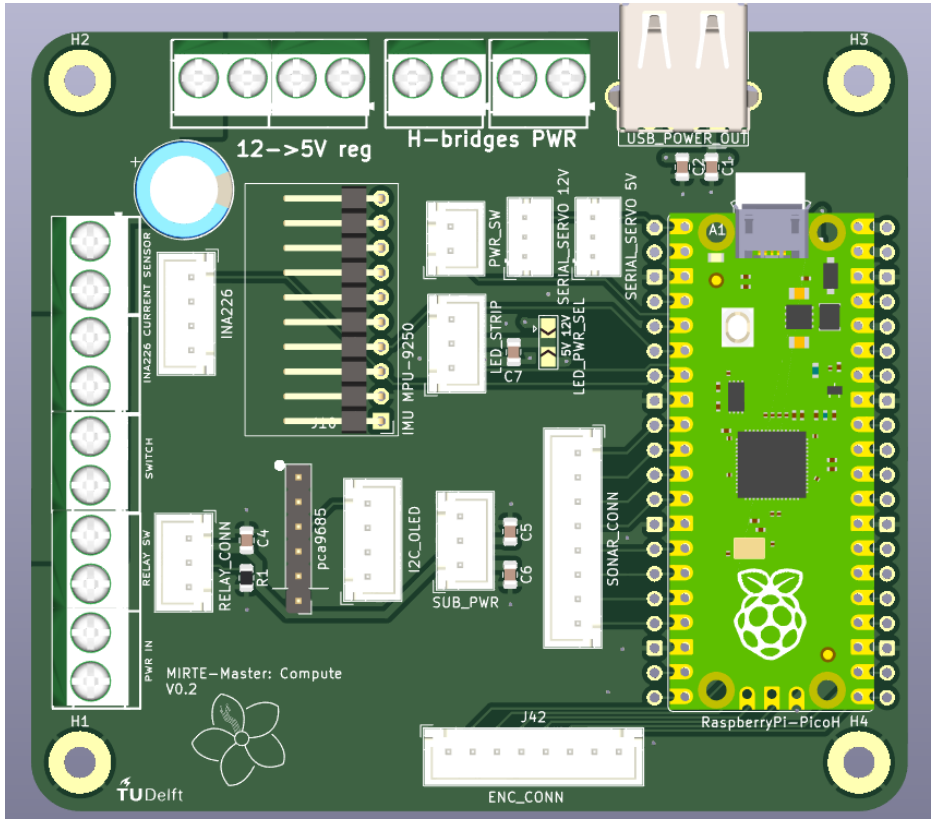
Updates

- 2024-12-16: Updated wiring, removed relay and bms part

Mirte master main pcb

- Under pico also small transistor
- ~~R1: 680R~~
- C1, C4-7: 100nF
- C3(round one): 1000uF
- C2: 10uF
- All connectors JST-XH,
  except servos (jst ph)

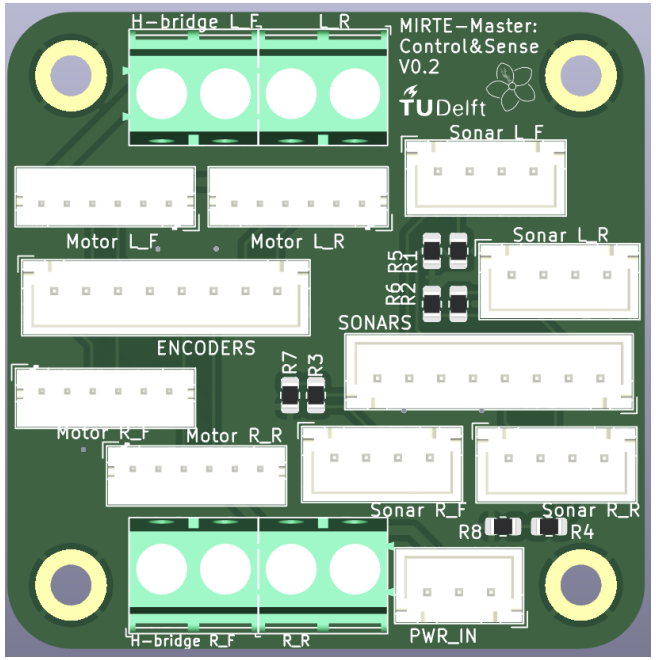
- **FIXES**: Relay, R1 and C4 don't work
  - IMU connector is a normal female header



Mirte-master control&sense board

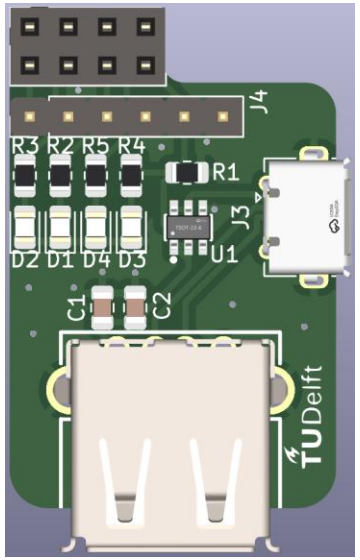
- Distribute signals to motors and sonars
- Saves wiring from top to bottom
- R1-4: 4k7
- R5-8 : 10k
- All connectors jst-xh, except motor connectors(jst ph)

- **Fixes**:
  - Sonar (seen from top), just the closest connector to the sonar:
    - Left rear is in L_F connector
    - Left front is in R_F connector
    - Right rear is in L_R connector
    - Right front is in R_R connector
  - Motors:
    - Left rear is in L_F connector
    - Left front is in R_F connector
    - Right rear is in L_R connector
    - Right front is in R_R connector



USB switch pcb

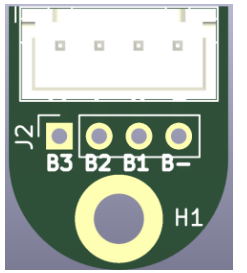
- Switches power to astra camera bc boot issue
- 3 more io for fun, diodes for visualization
- Uses Orange pi GPIO4_A4
- R1: 10k
- R2-5: 220R
- U1: SIP32509DT-T1-GE3 (switch ic)
- C1: 10uF
- C2: 100nF
- J4 not needed (kicad rendering error)
  - L->R: 3V3, GPIO4_B4, GPIO4_B5, GPIO0_D1, **GPIO4_A4**, GND
- Header should point downwards (kicad err)
- J3: usb b-micro connector with hooks at bottom



BMS PCB

- Connects to jst xh connector of battery
- Solder cable from bms to J2

- Fixed: BMS removed as they tended to smoke



Other fixes

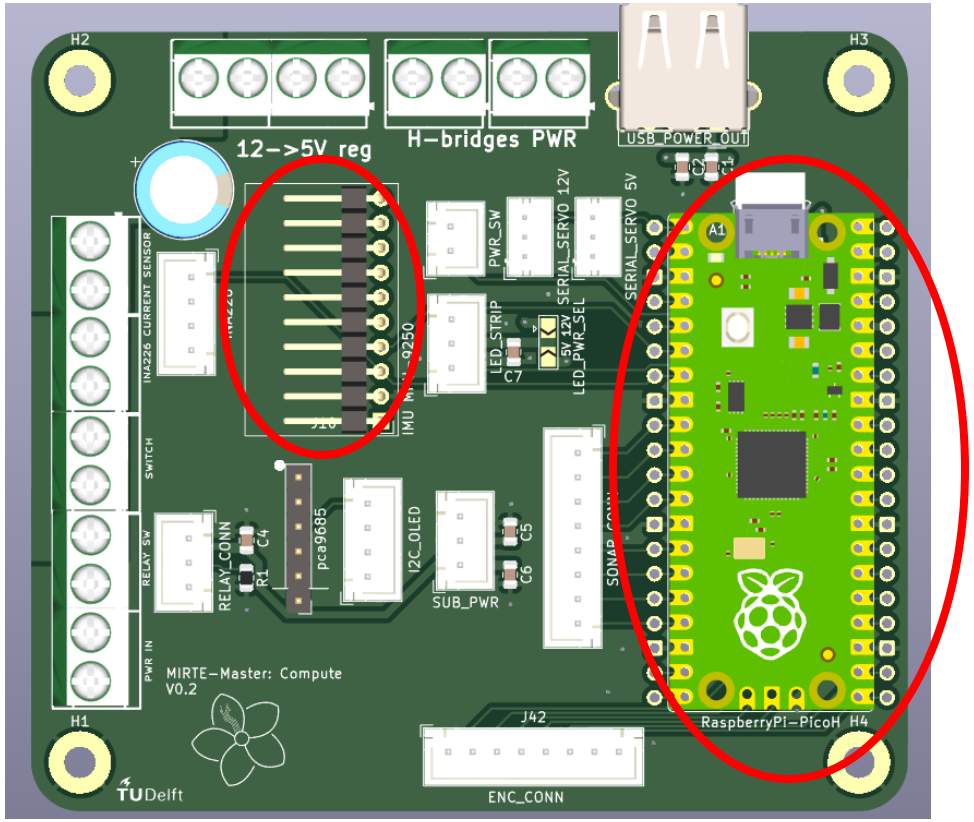
- Added diode in power cable from main pcb to h-bridge to not back-feed when the system is off.

- **Rest of the slides are how to connect, will add photos later. Ordering might be wrong.**

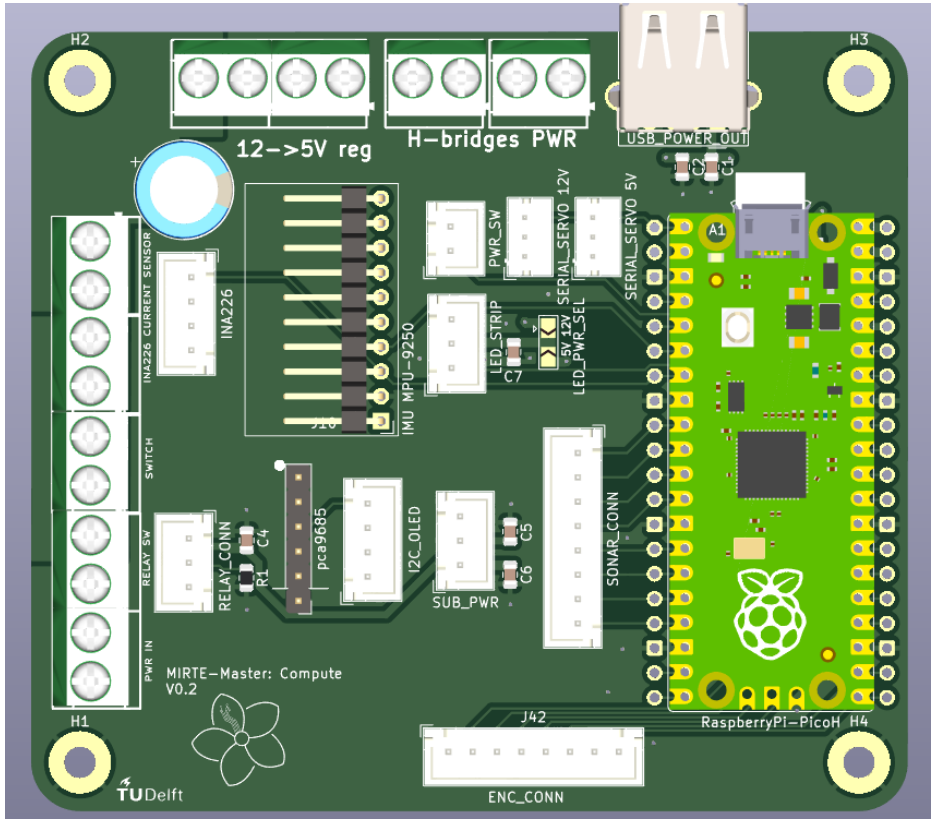
Requirements

- Pcbs soldered
- Cables
  - Usb cables (2x b micro, 1x C)
  - JST XH 4 PIN (INA226)
  - JST XH 3 pin (relay)
  - Jst xh 4 pin (oled)
  - Jst ph 3 pin (servo), included
  - ....
- Custom cables
  - Switch cable, 180mm
    - + jst xh 2 pin cable
  - Relay cable
  - PSU cable 95-120mm
  - INA226 cable 2x 160mm
  - Power cable
  - Hbridge cables
- Other parts:
  - Pico
  - Imu (not really, it's not great)
  - 12->5v converter with wires(95-120mm length)
  - Ina226
  - ~~Relay module~~
  - Orange pi with emmc and OS installed

- Fit the IMU and Rpi Pico on the PCB
- Pico usb pointing to the top

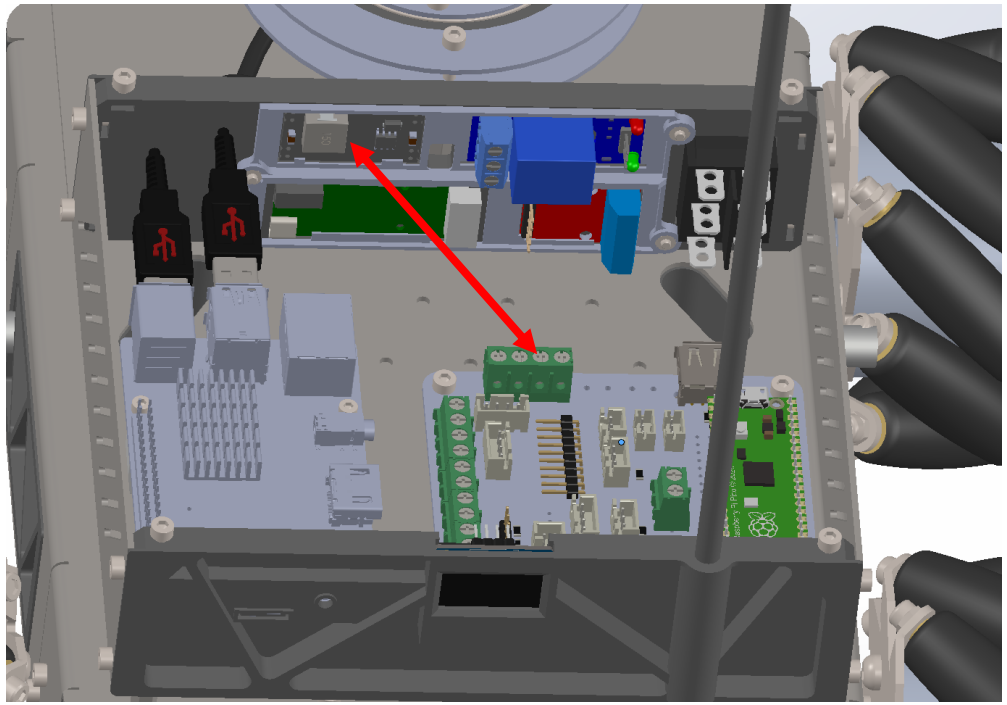


- Screw in the PCB into the frame
  - Nylon/metal standoffs
  - M3 bolts

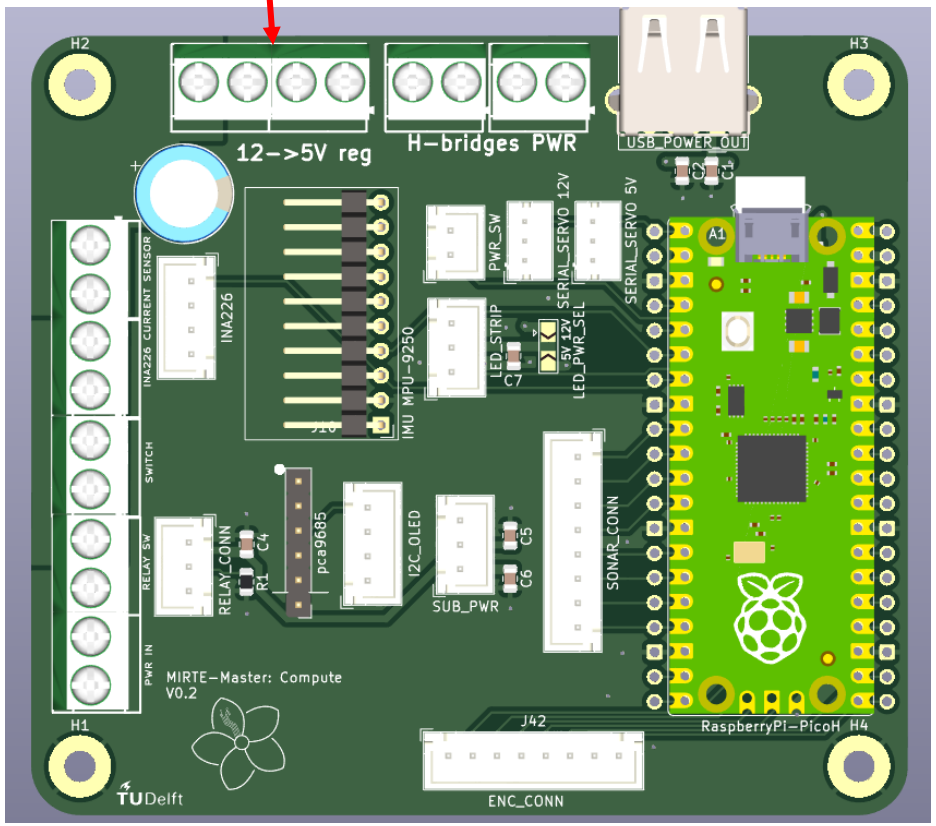


Connect 5v regulator

- Connect all 4 wires

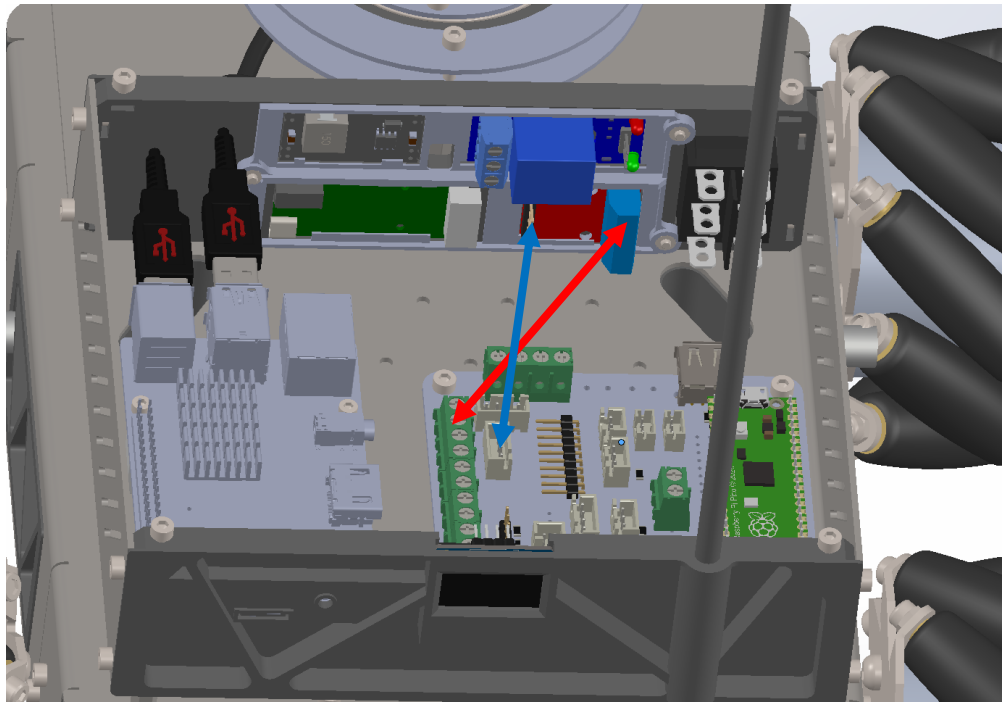


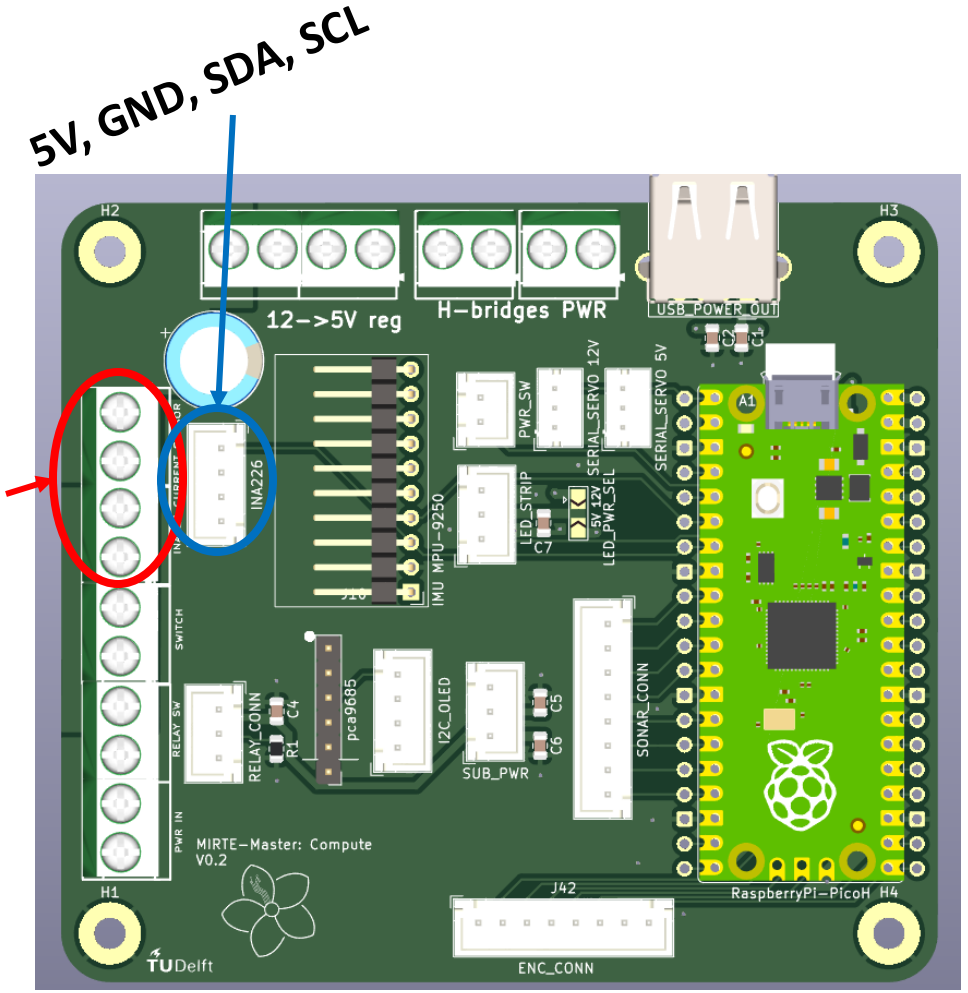
12V, GND, GND, 5v



Connect INA226

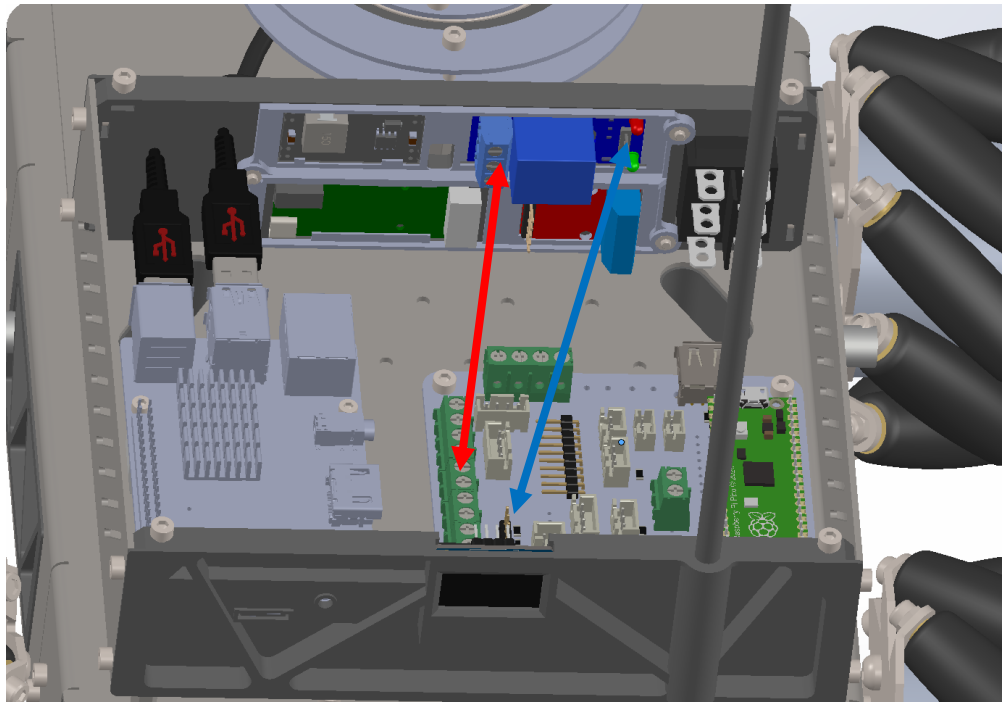
- Power
- Signal, hooks away from INA226 pcb





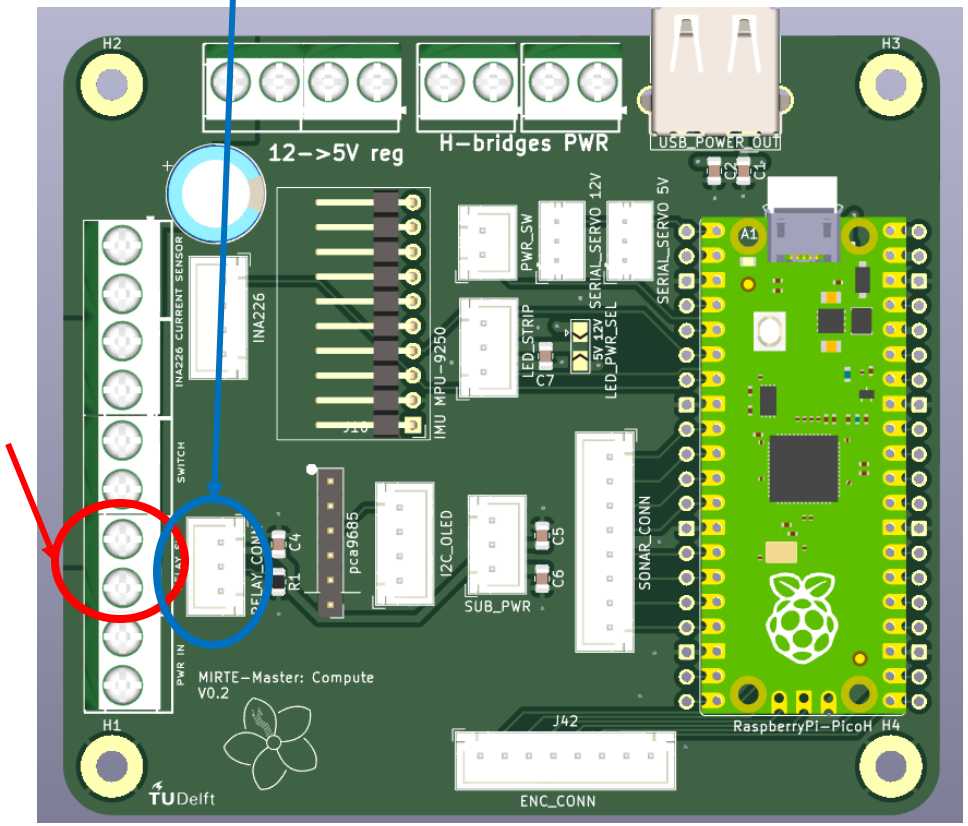
~~Connect relay~~ (Don’t, it doesn’t work)

- Power, **connect to NO and COMM**
- Signal, hooks away from relay pcb



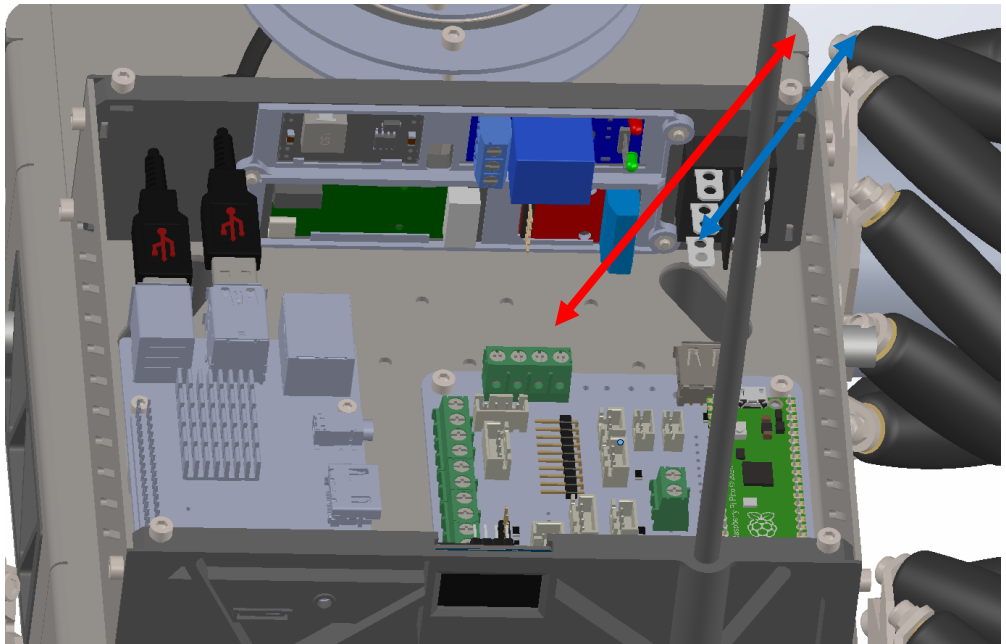
GND, SIG, VCC

COMM, NO

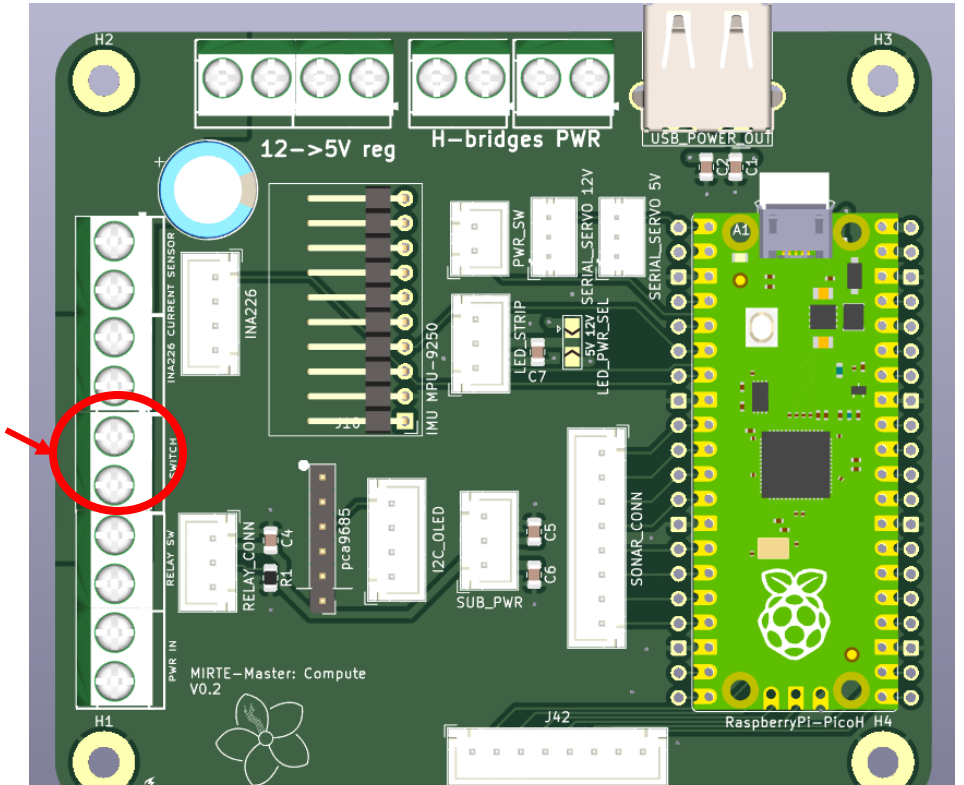


Connect switch

- Power, use 2 tabs on one side of black divider switch
- ~~Data: use other 2 tabs, not used anymore~~
- Put switch in that the 2 used tabs are up, as otherwise the usb cable doesn't fit anymore.

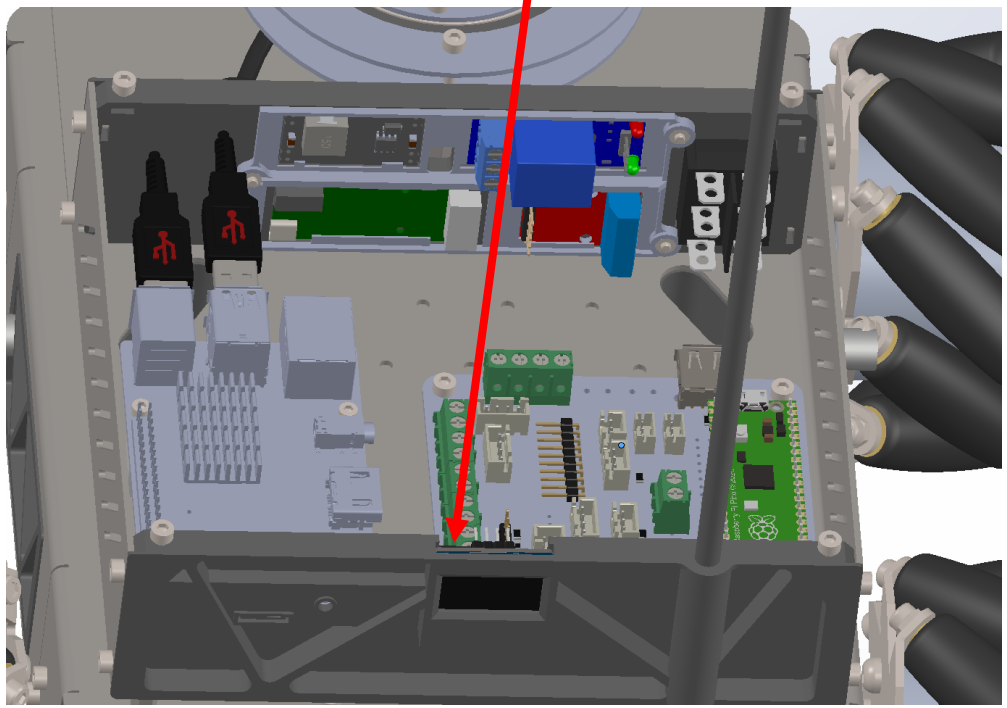


COMM, NO

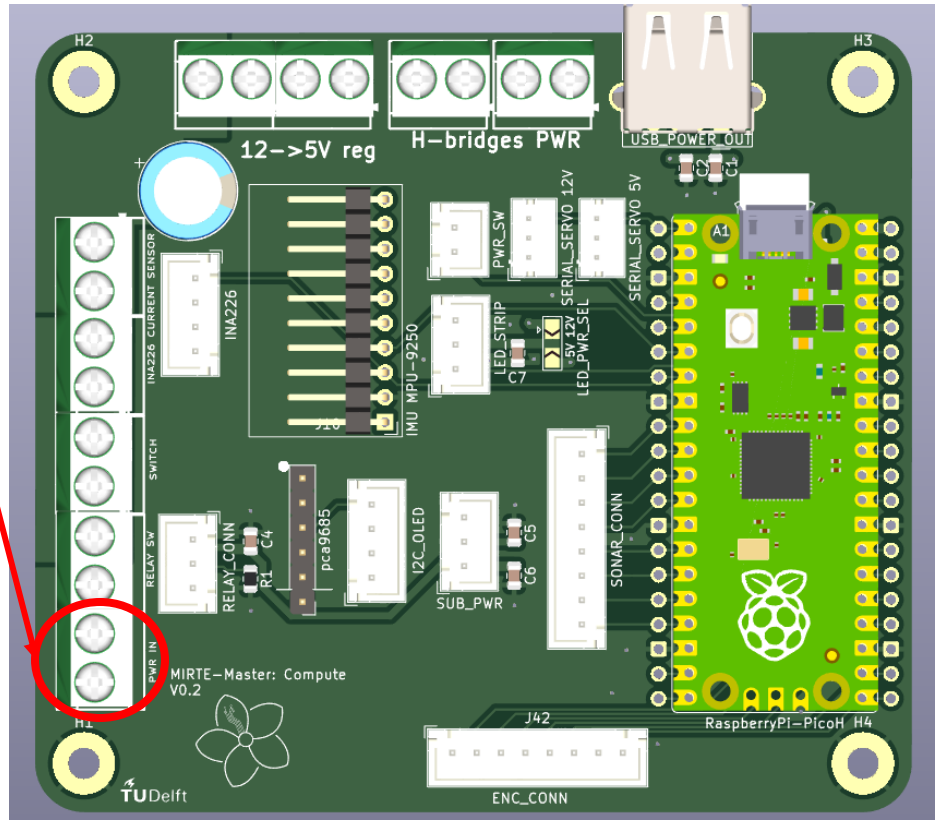


Connect power

- Power
- Add a fuse in there for safety.

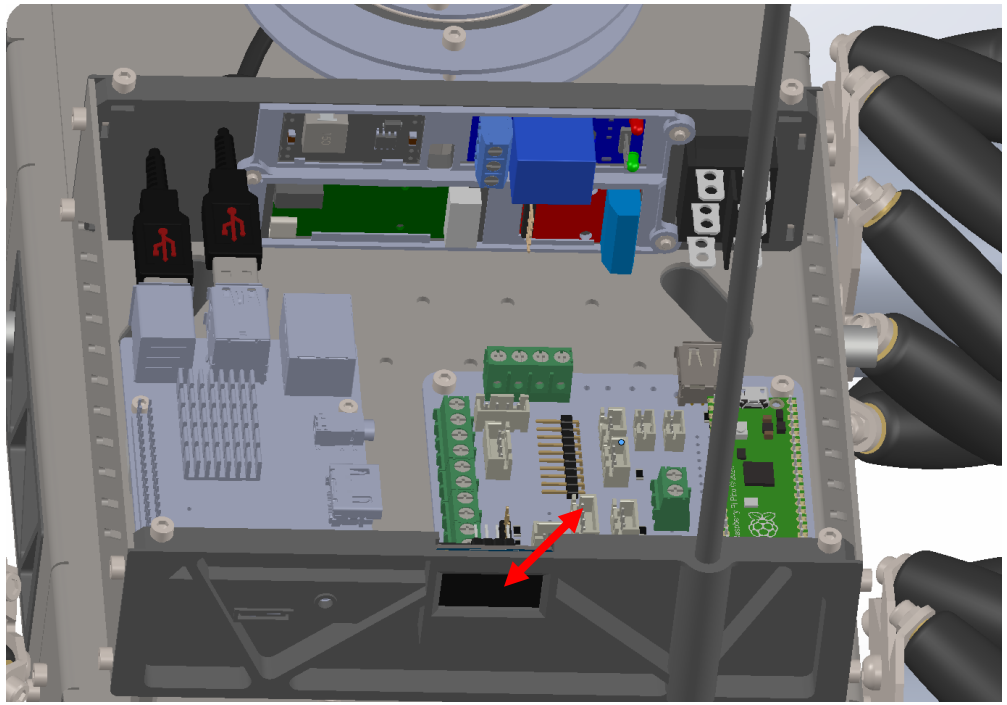


GND, 12V

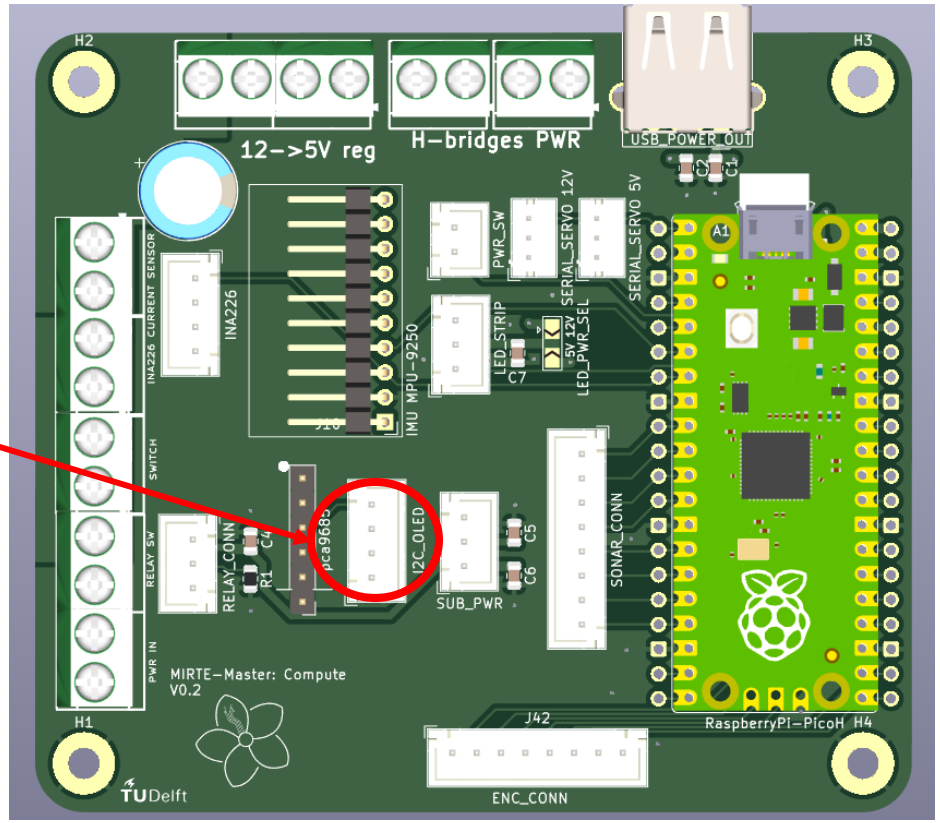


Connect oled

- Like on normal Mirte
  - Hooks pointing up

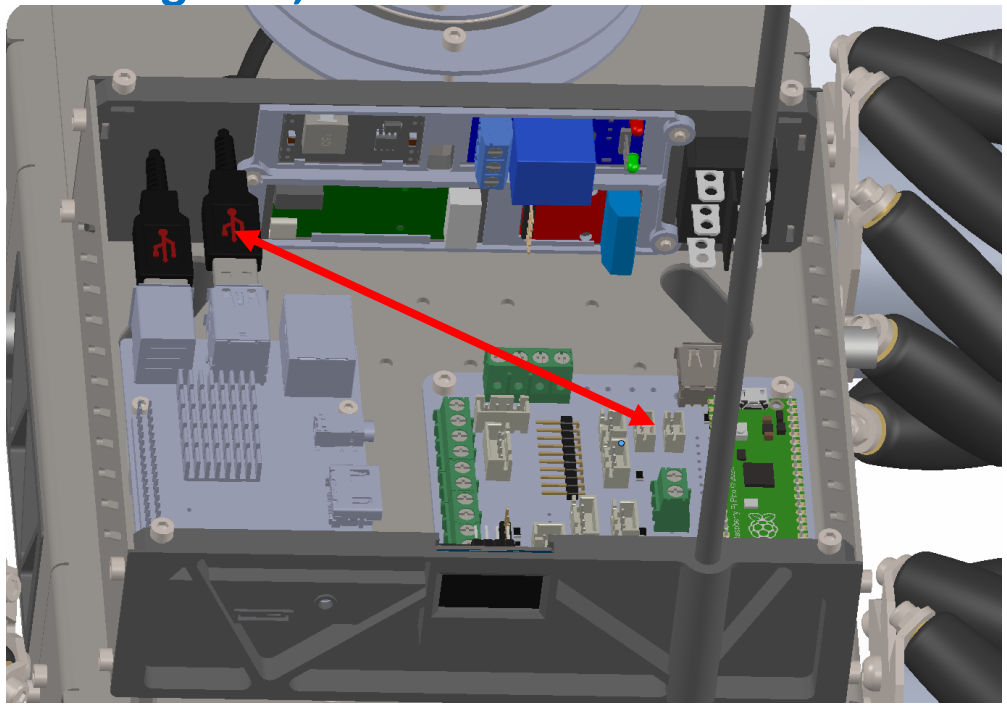


GND, 5v, SCL, SDA

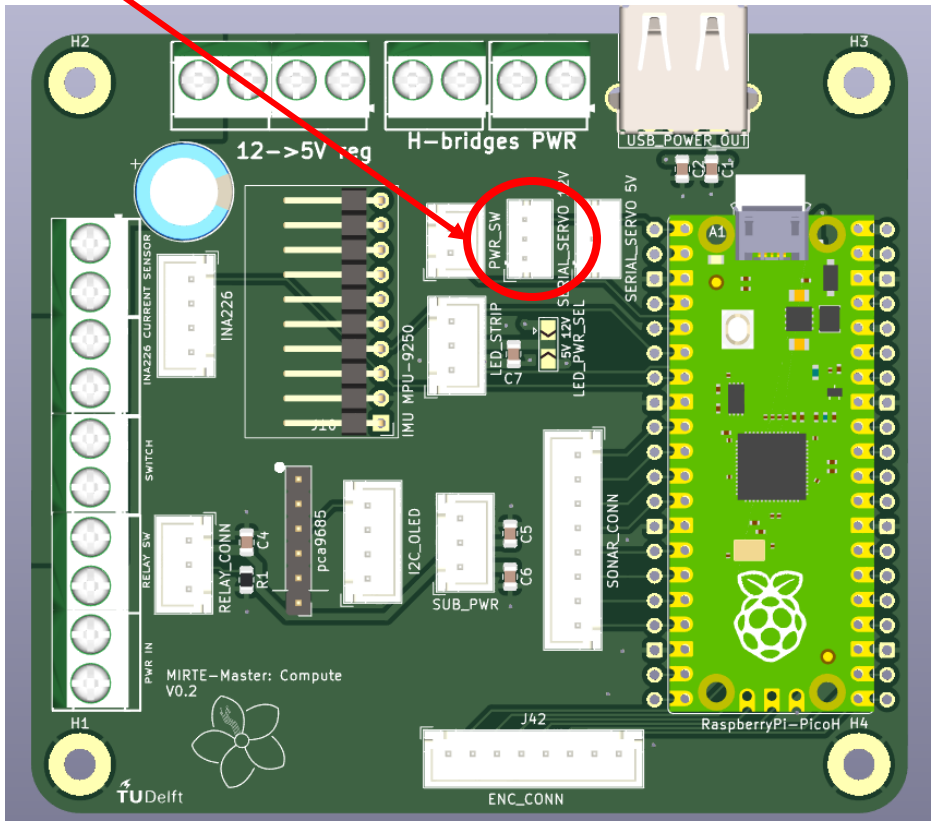


Connect servo cable

- Jst **ph** cable to outside
- Use 12V connector
- **It's a tight fit, but should be doable**

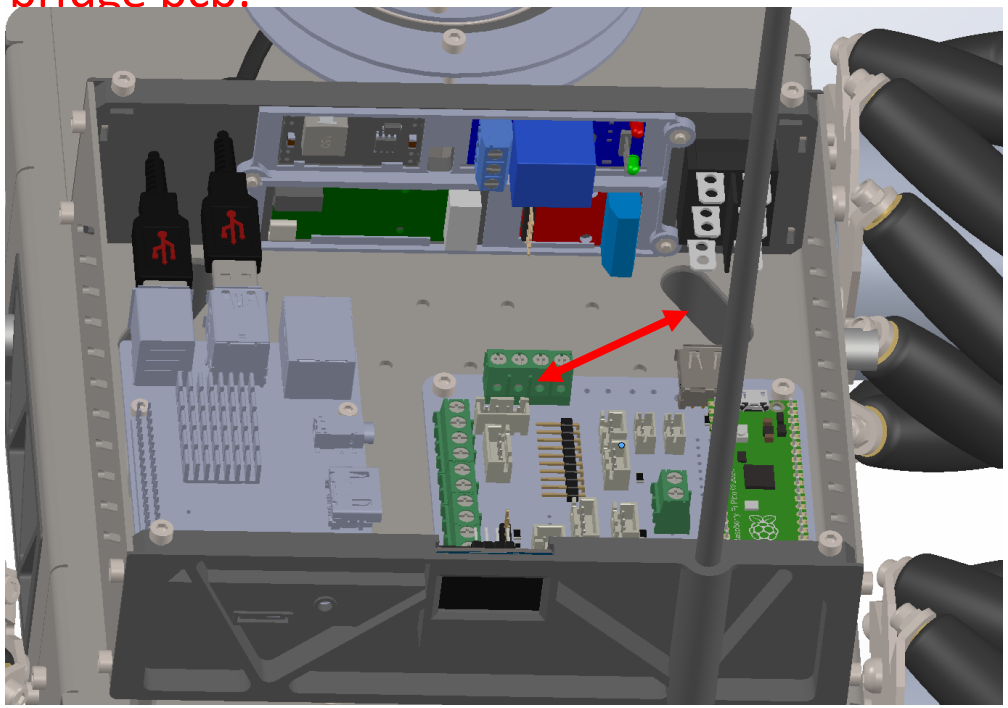


GND, 12v, DATA

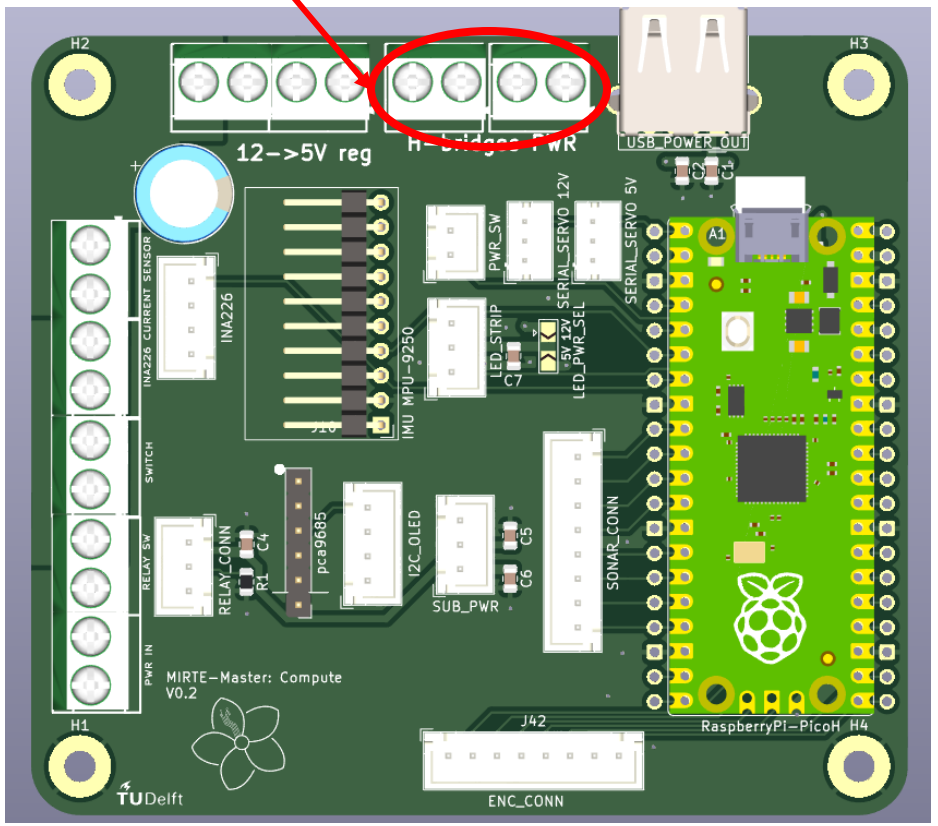


Connect hbridge power

- Connect 2x 2wires to the H-bridges power screw terminals
- Loop them down to the hbridge
- Don’t forget the diodes in the cable pointing the correct way.
- 5v pin is unused as long as all the jumpers are on the h-bridge pcb.

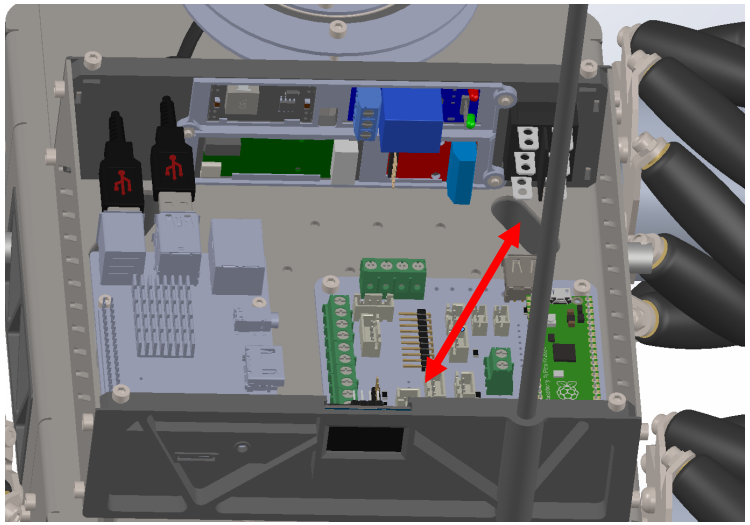


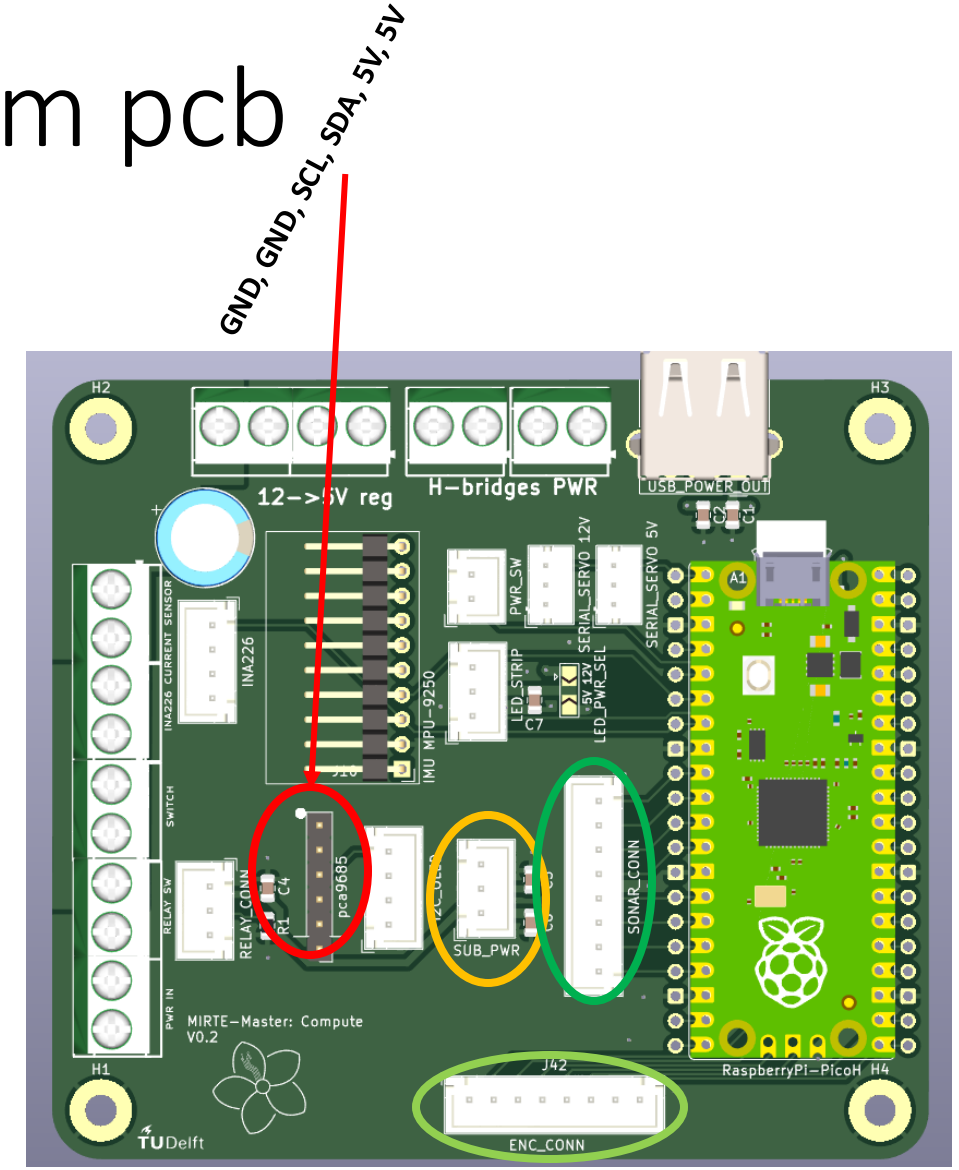
2x {12V, GND}



Connect cable for bottom pcb

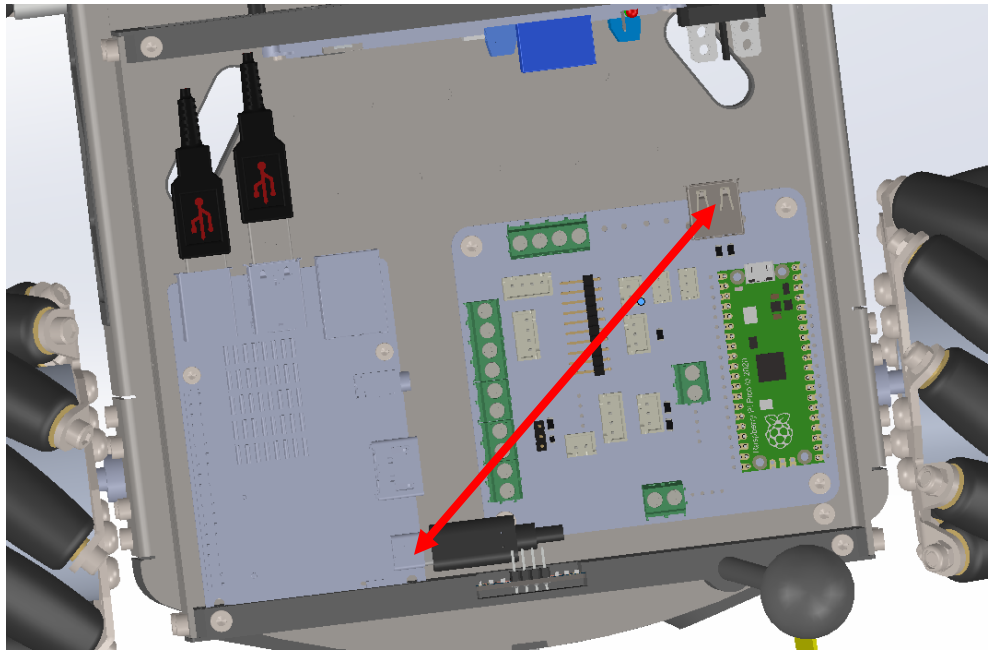
- PCA9685 use jst ph 5or6 pin cable
  - Hooks to pico
  - When using 5 pin, skip top pin.
  - Use left hole
- Sub power, jst xh 3 pin
- Encoder cable & sonar cable
  - Jst xh 8 pin, mark sonar cable
- Loop cables thru hole next to pcb

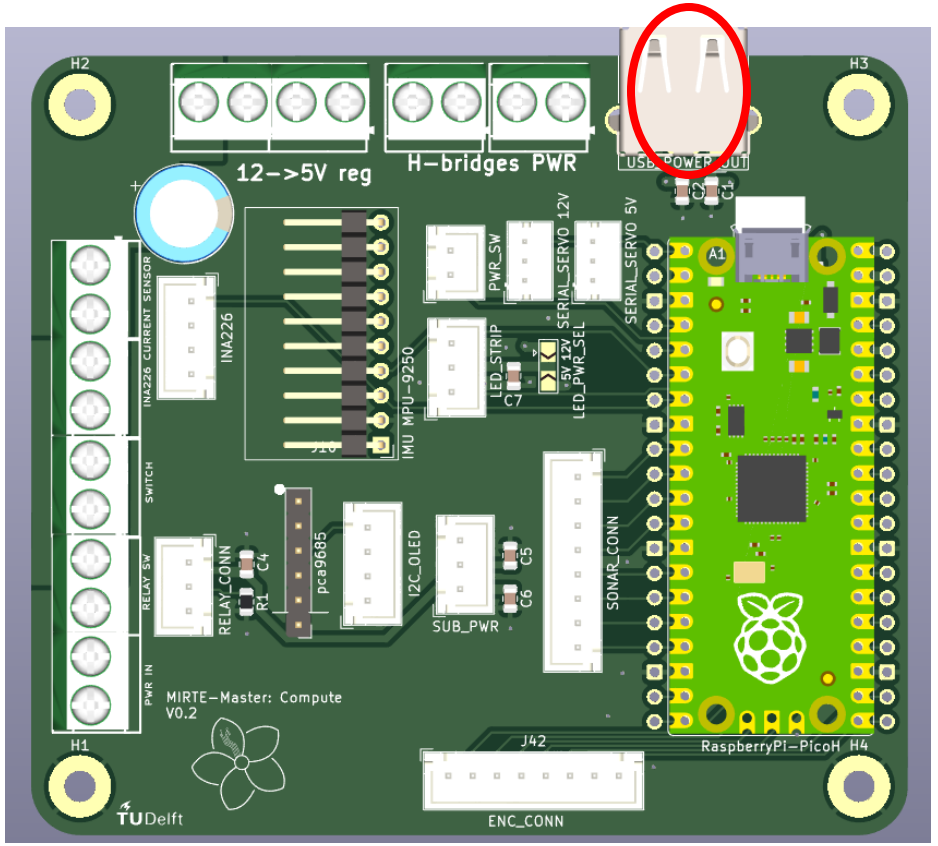




Connect power orange pi

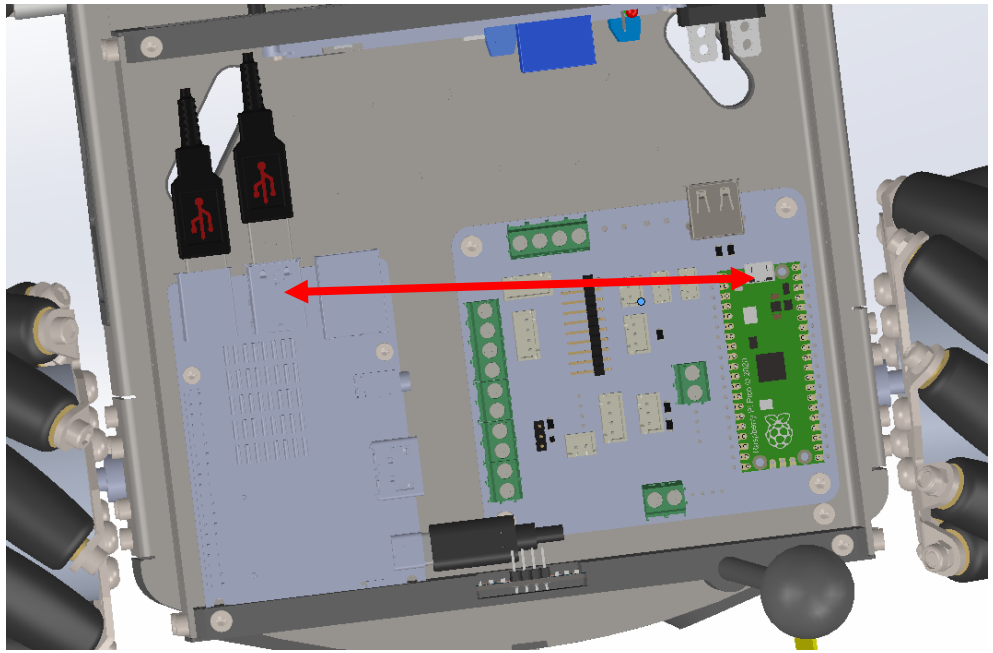
- Connect usb c cable to orange pi and pcb
- Route it beneath the pcb (around the pico)

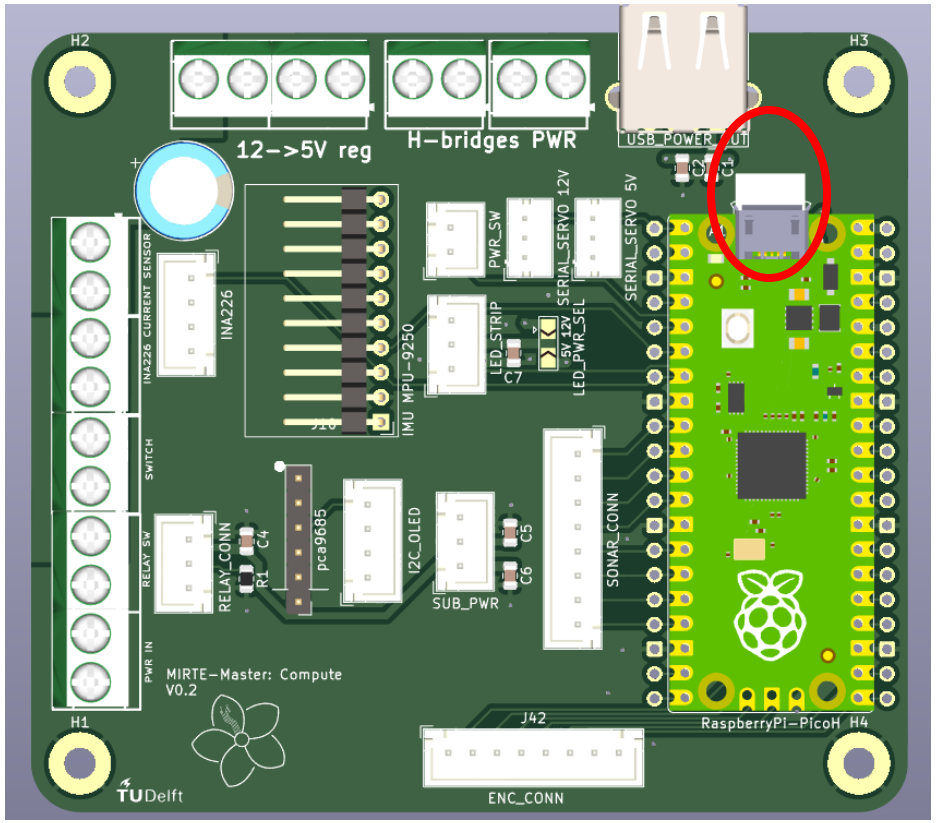




Connect Rpi pico

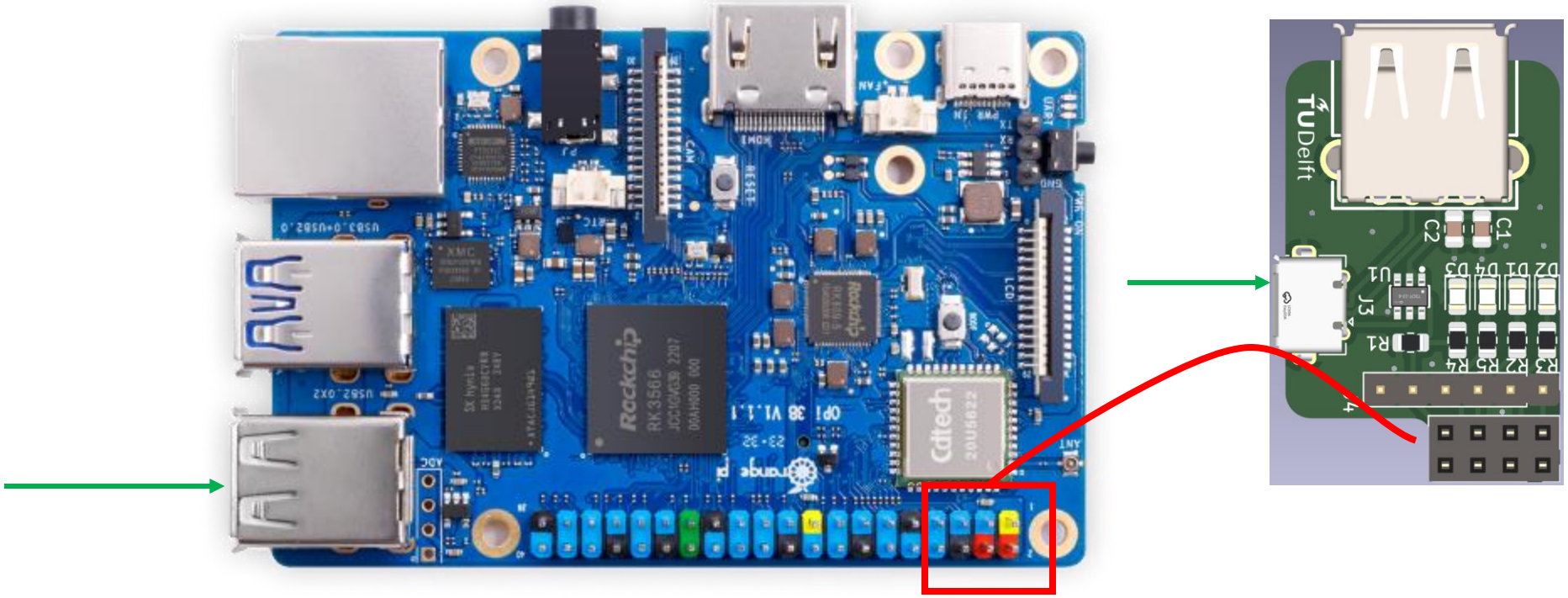
- Connect usb b-micro cable to orange pi and pico





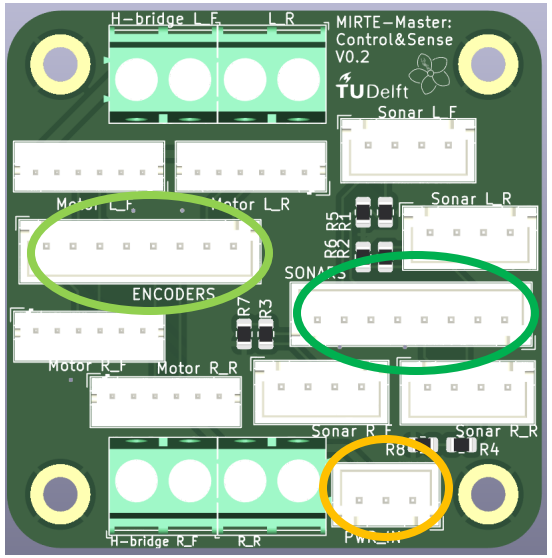
Add usb power switch

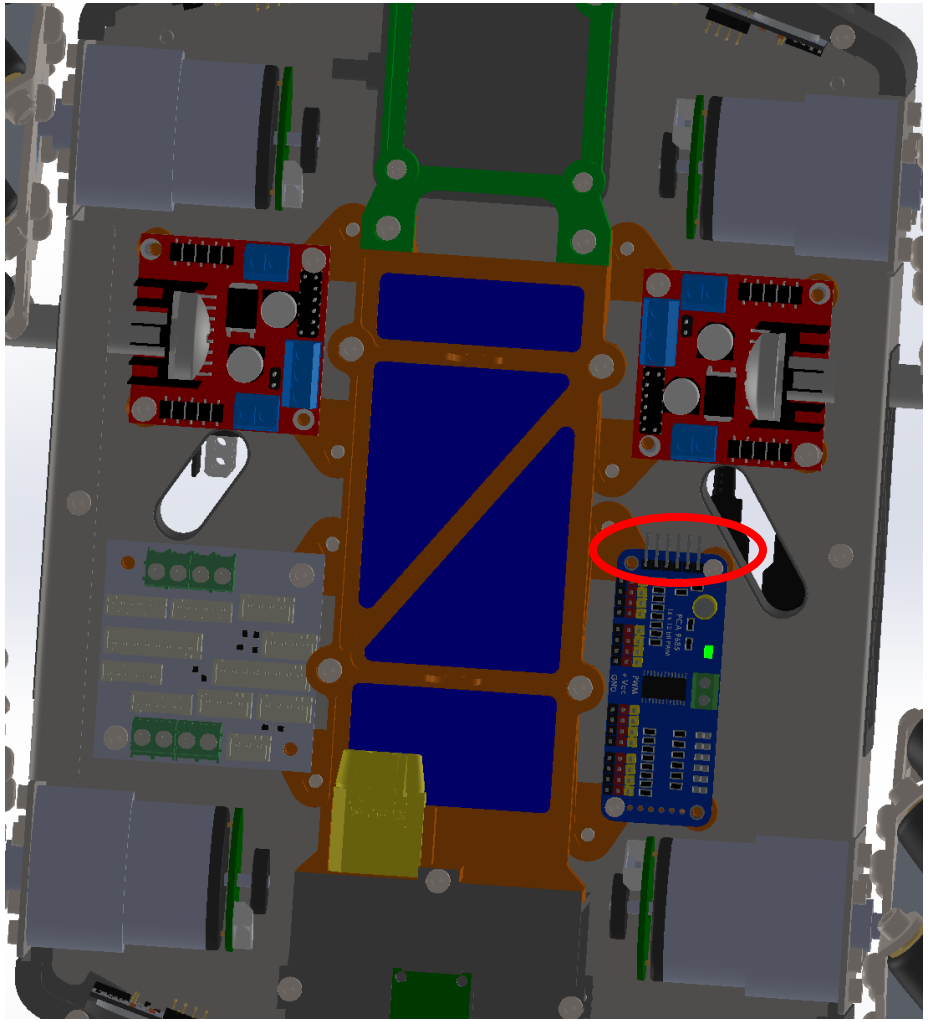
- Put the usb power switch pcb on top of the orange pi, the pins most away from the usb ports.
- Connect usb A -> B-micro cable from orange pi to switch pcb
  - Hooks down



Connect signals from main pcb

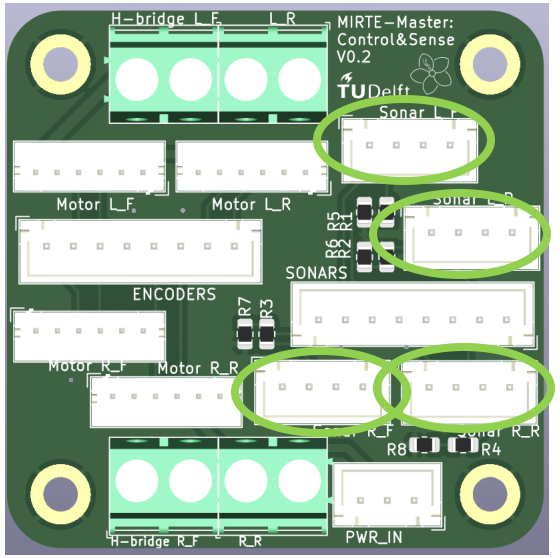
- Connect marked cable for sonars to sonar connector
- Connect other 8pin cable to encoder connector
- Connect 3 pin cable for power
- Connect pca9685 cable, hooks up

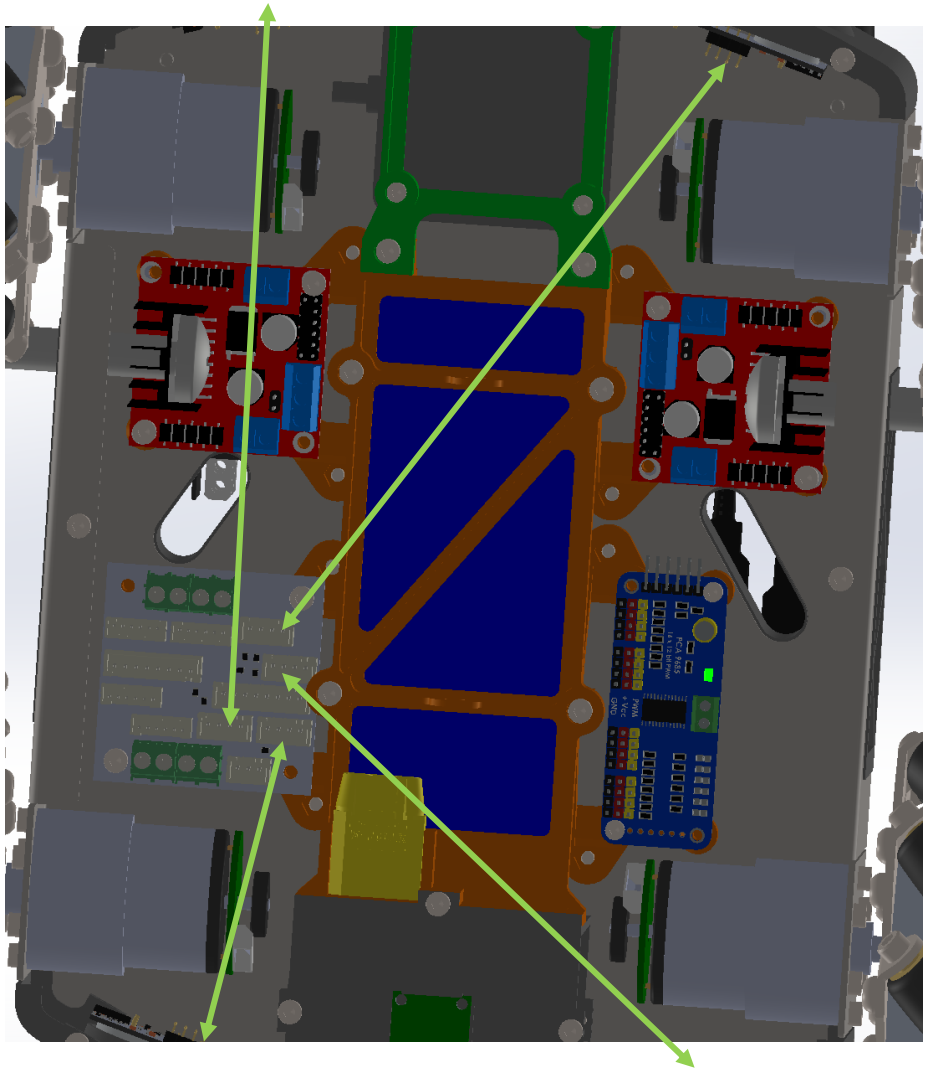




Sonar wiring

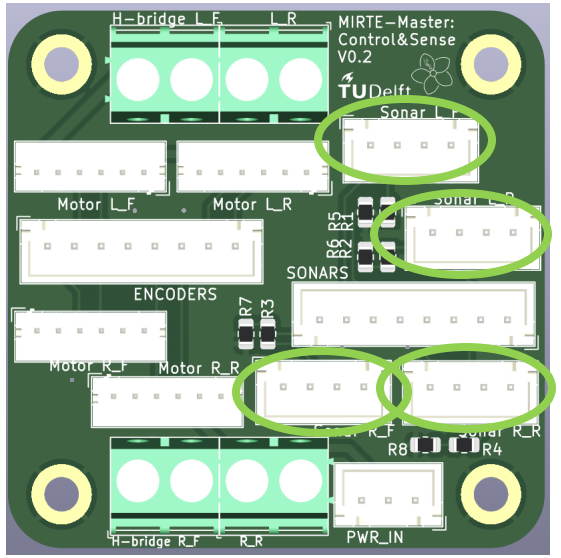
- Connect each sonar connector to a sonar
  - Hooks pointing away from sonar pcb

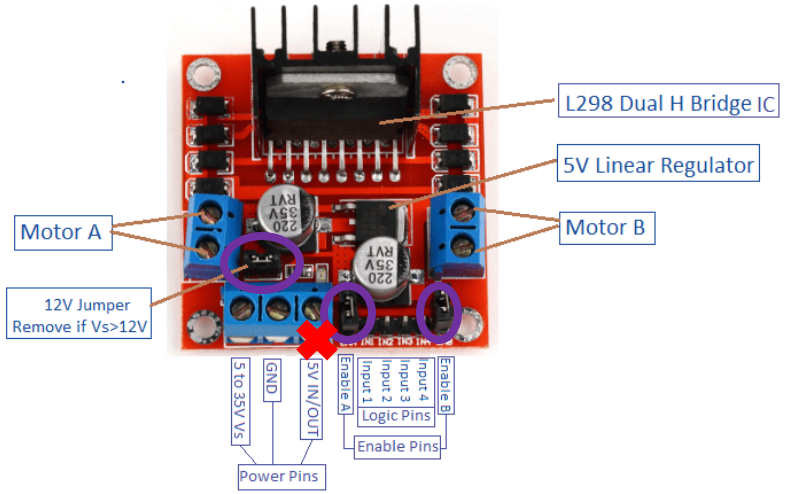


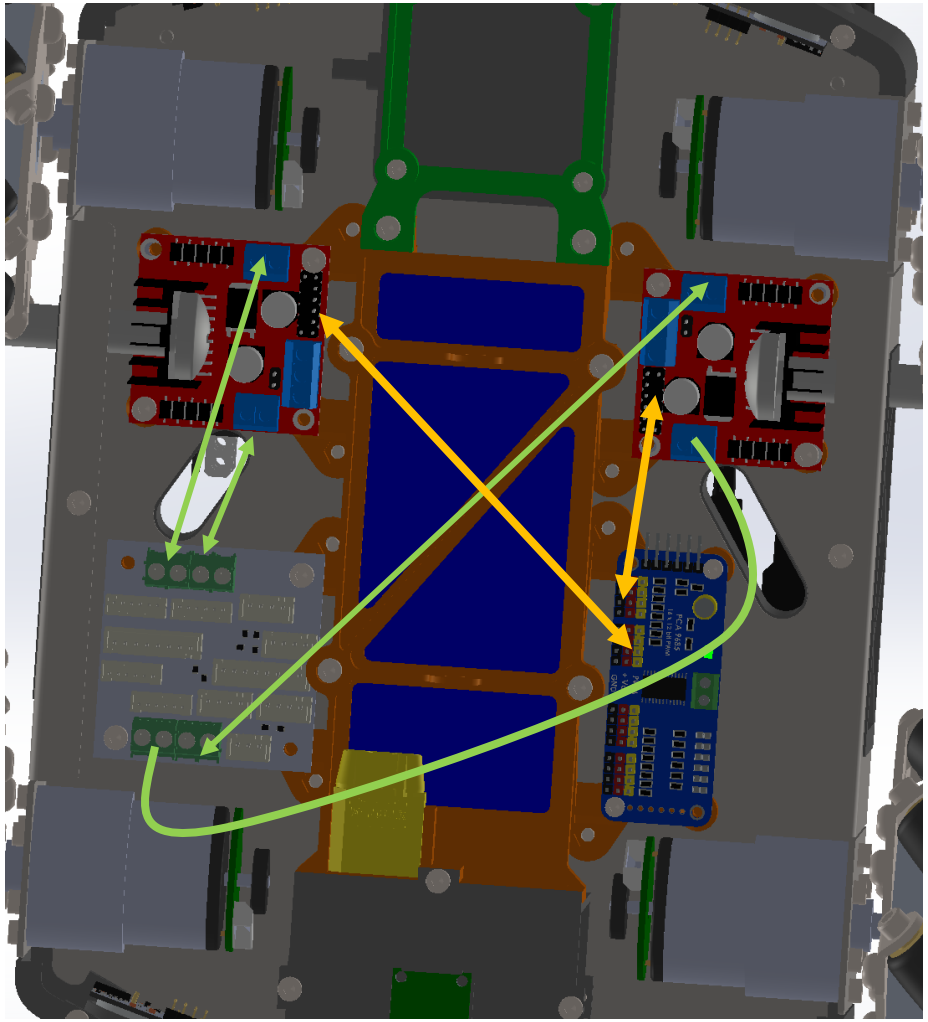


Hbridge wiring

- Connect power from top pcb to screw terminals
  - 12V and GND, leave 5V unconnected
- Connect outputs to pcb
- Connect inputs to PCA9685 pcb
  - Input 1 on first output yellow row
  - Left hbridge on 1:4, right one on 5:8
- Add jumpers EN1&2 & 5V

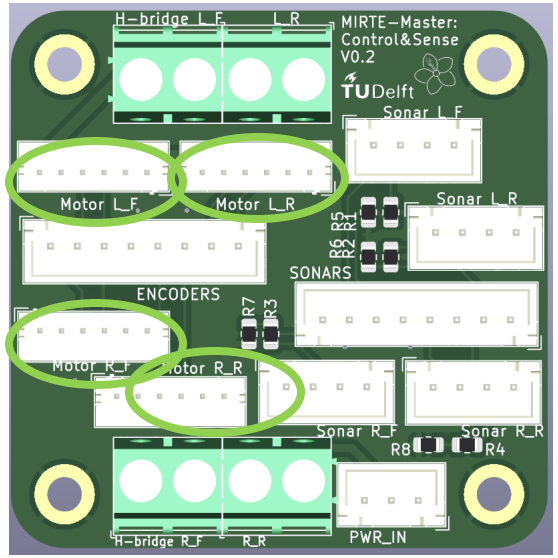


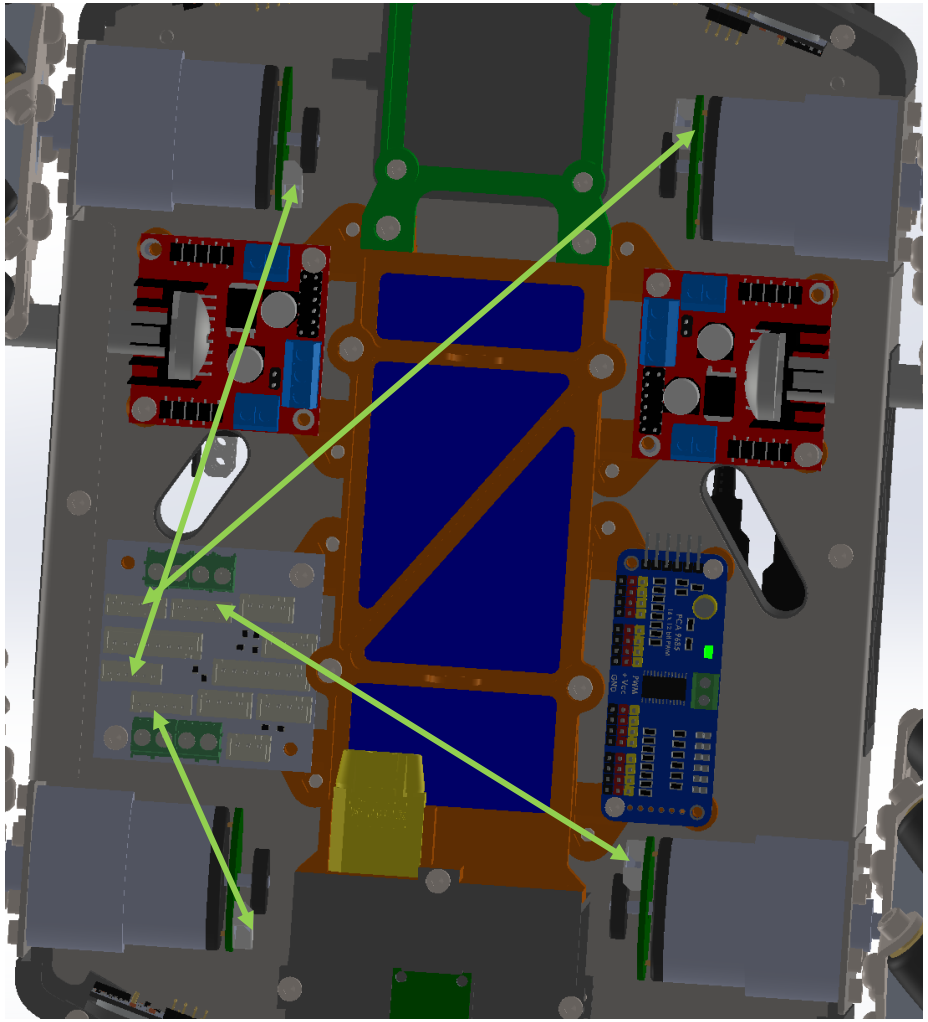




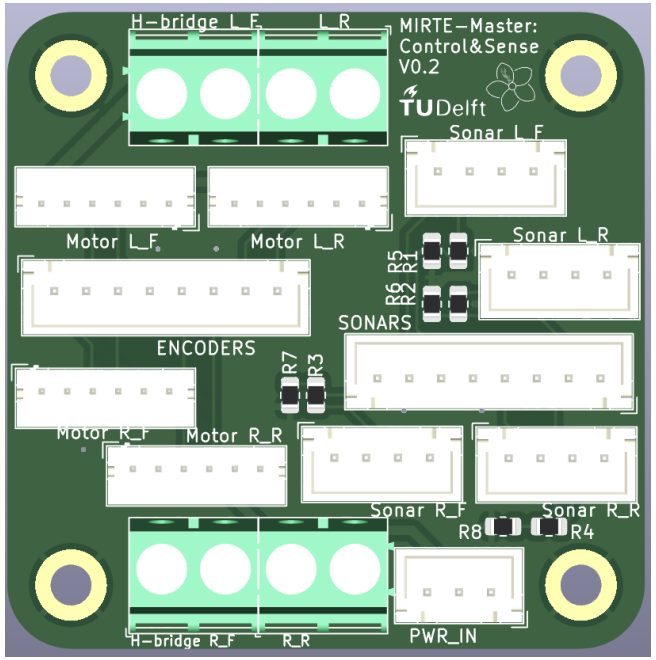
Motor wiring

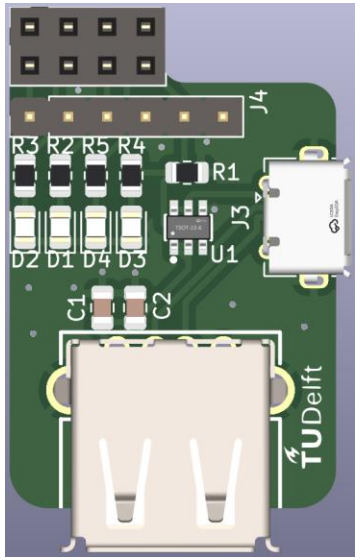
- Connect each motor to the pcb
- Jst ph 6 pin

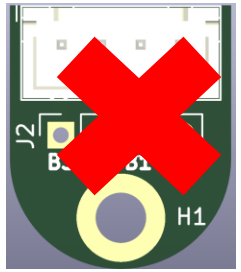


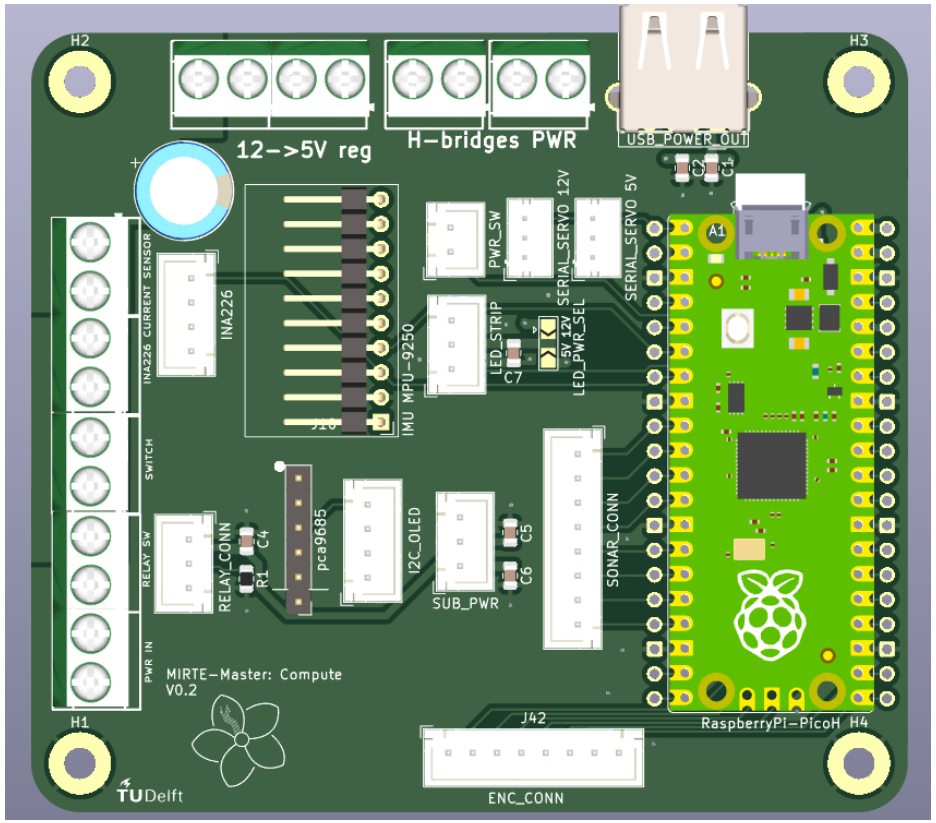


pcbs

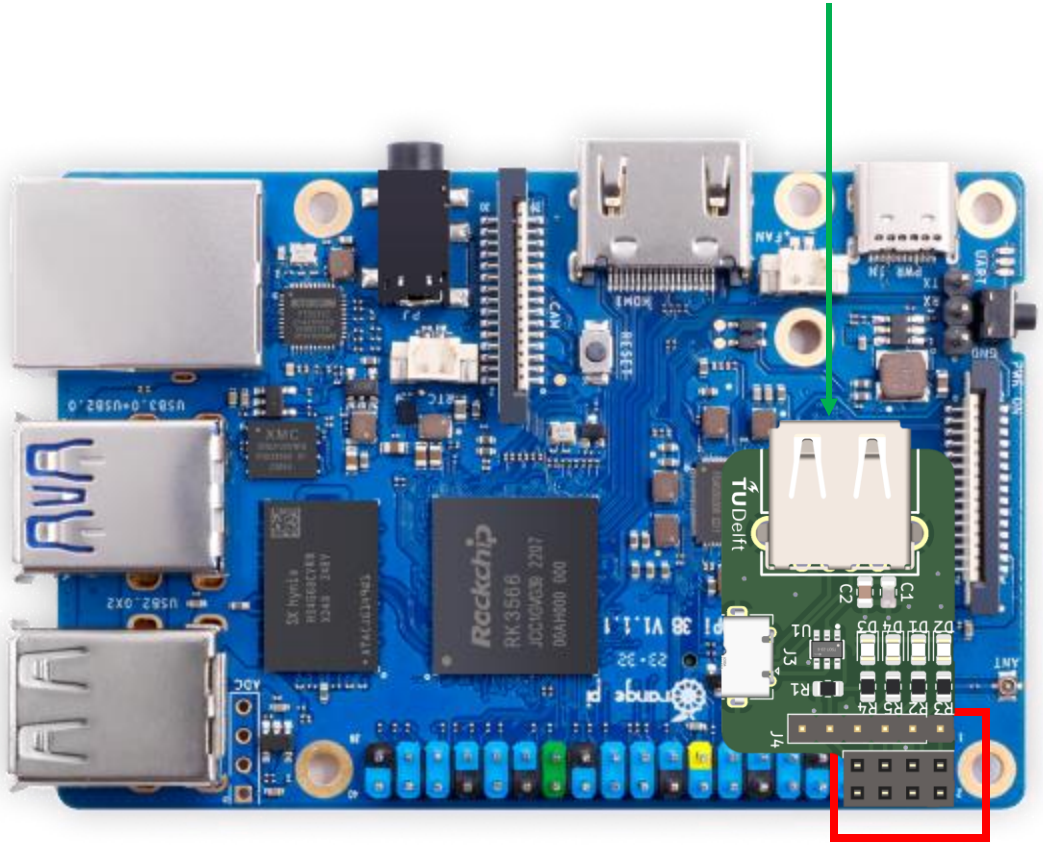

H-bridge L_F
L_R
MIRTE-Master:
Control&Sense
V0.2
TUDelft
Sonar L_F
Motor L_F
Motor L_R
Sonar L_R
R5
R1
R6
R2
SONARS
ENCODERS
R7
R3
Motor R_F
Motor R_R
Sonar R_F
Sonar R_R
R8
R4
H-bridge R_F
R_R
PWR_IN


J4
R3 R2 R5 R4
R1
J3
D2 D1 D4 D3
U1
C1
C2
TUDelft


J2
H1

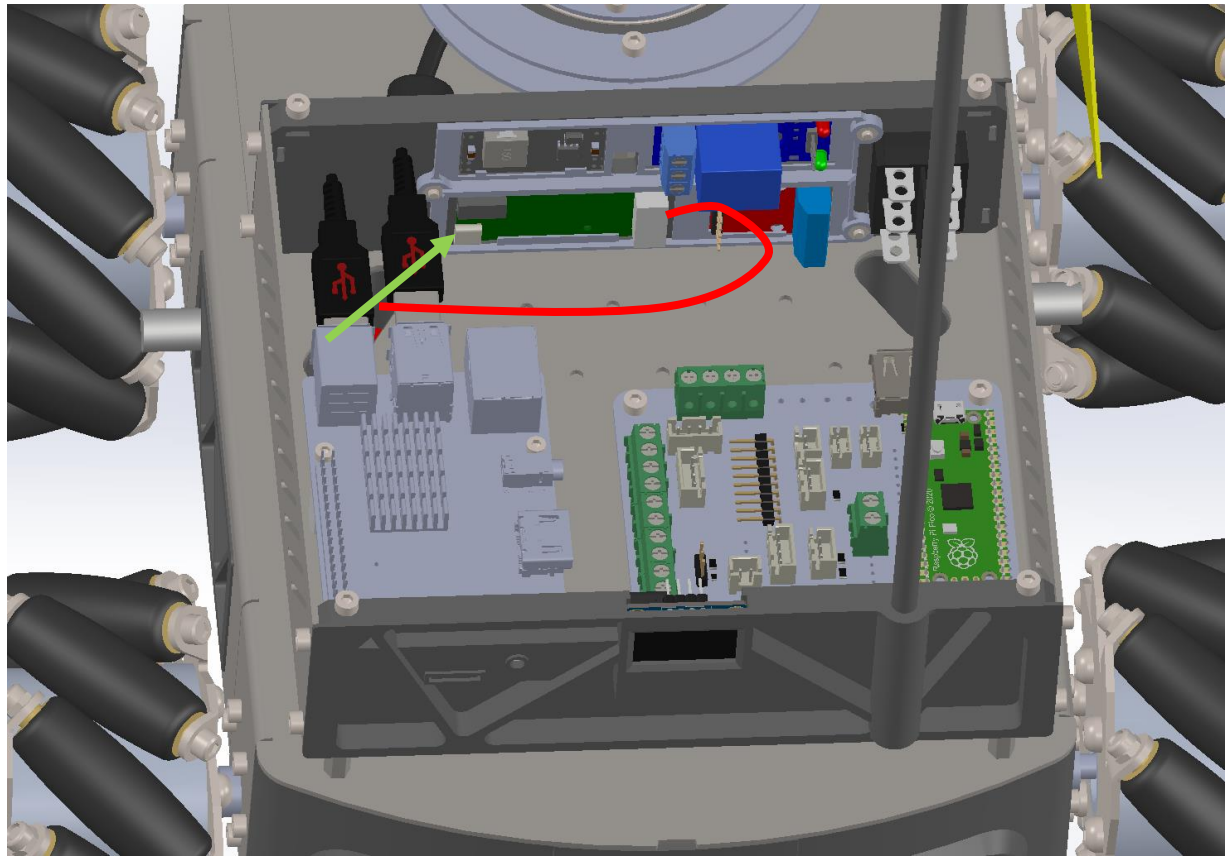

H2
H3
12->5V reg
H-bridges PWR
USB_POWER_OUT
INA226 CURRENT SENSOR
INA226
IMU MPU-9250
PWR_SW
SERIAL_SERVO 12V
SERIAL_SERVO 5V
LED_STRIP
5V 12V
LED_PWR_SEL
C7
SWITCH
RELAY SW
PWR IN
RELAY_CONN
C4
R1
pca9685
I2C_OLED
SUB_PWR
C5
C6
SONAR_CONN
MIRTE-Master: Compute
V0.2
H1
TUDelft
J42
ENC_CONN
RaspberryPi-PicoH
H4

Connect astra to usb switch pcb



Connect lidar

- USB A -> B-micro from orange pi to lidar board
- Lidar cable to lidar pcb
  - Loop thru bottom frame



BMS

- Connect bms ca[redacted]to pcb) to BMS board

Setup servos

- Before connecting arm to pcb or to eachother
- #1: Give servos their correct ids and min-max range
  - Set to home position
- Build arm
- #2: Start check script, move arm to home position
  - Offsets will be written to servos automatically

Servos

- Daisychain rotation servo to shoulder, elbow, wrist and gripper servos.
- Rotation servo

Name	Type	ID	Typ Min	Typ Max	Home angle
Rotation	HX12	2	?	?	?
Shoulder	X	3			
Elbow	X	4			
Wrist	HX12	5			
Gripper	HX12	6			

Orange pi

- 1 sd card required per build setup
- Flash flasher system image
- Put emmc in orange pi(opi) you want to flash (combo)
- Put sd card in opi
- Power on opi
- Sd card will flash emmc and spi flash automatically
- When the orange pi shuts down automatically, it’s done

Pico

- Flash pico with picotool or normal windows usb-disk method
- LINK

Test

- Disconnect opi power from pcb and pico from opi
- Upload test script
- Turn on