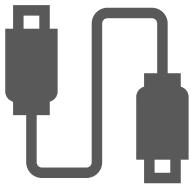
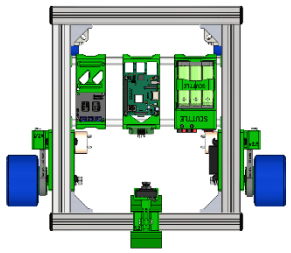
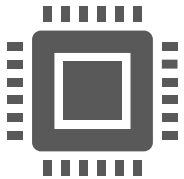






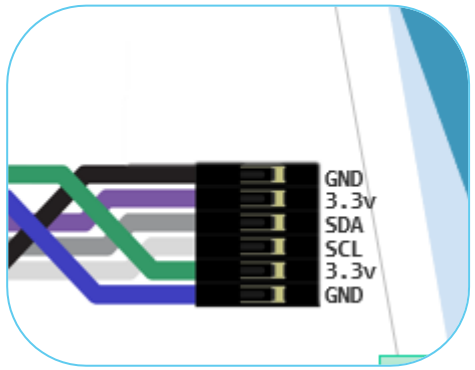
SCUTTLE Robot Wiring Guide

Revision 2023.05.26

Good Practices

1. Keep Wire sets bonded together.
2. Use colors which are found in the common sequence
    1. makes it easy for others to repeat your trials
    2. makes it easy to document
3. Eliminate individual connector housings
    1. replace them with multi-position housings
4. Use black colored wire for ground
    1. whenever possible
5. Dupont Housings: align the arrow to ground pin
    1. whenever possible
6. Use 90-degree headers where appropriate
7. Hot glue backs of through-hole pins
    1. reduce chance of short circuit
    2. hot glue is removable if necessary

2



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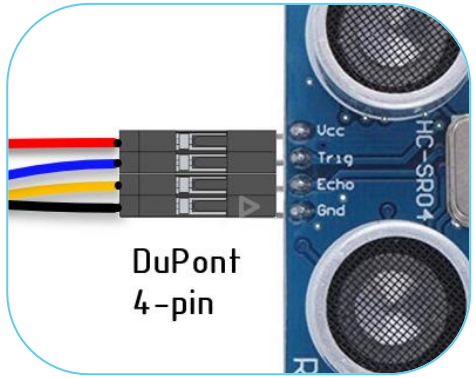

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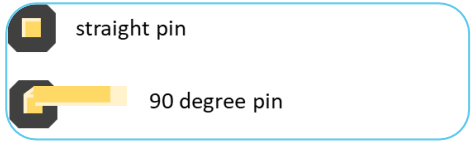

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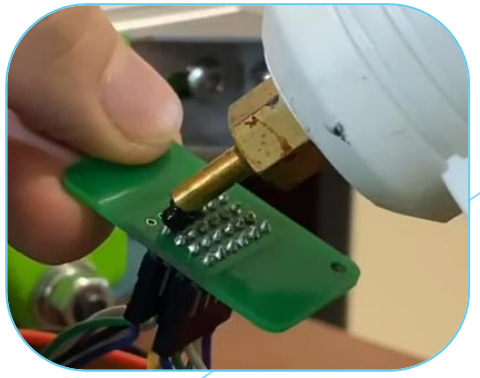
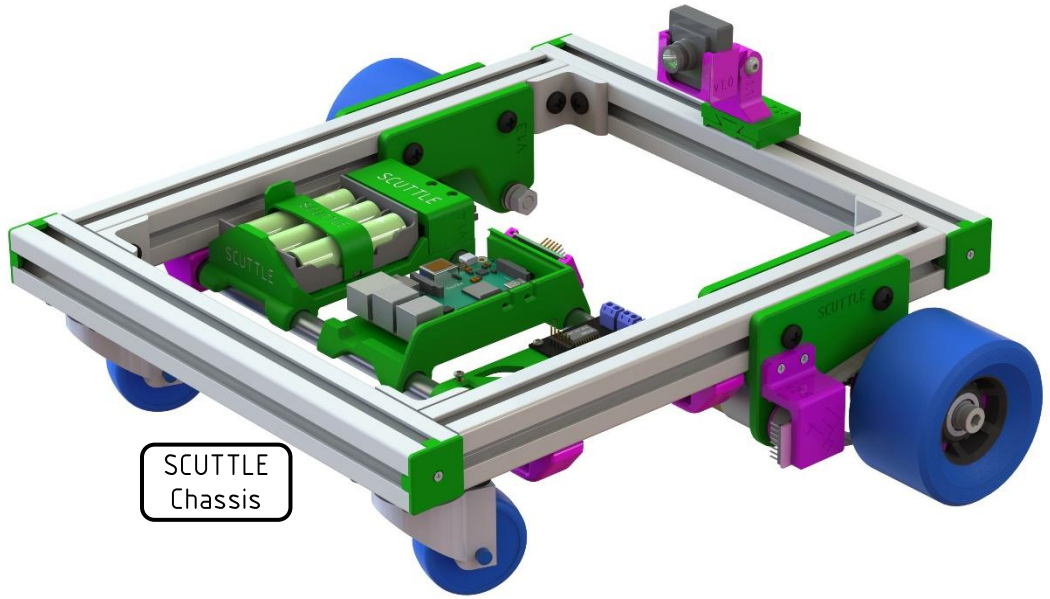
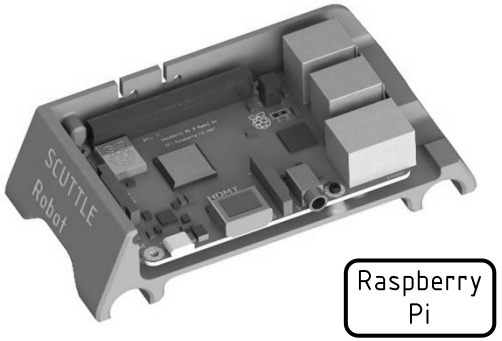
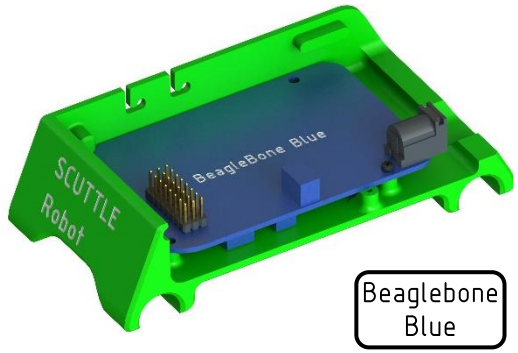
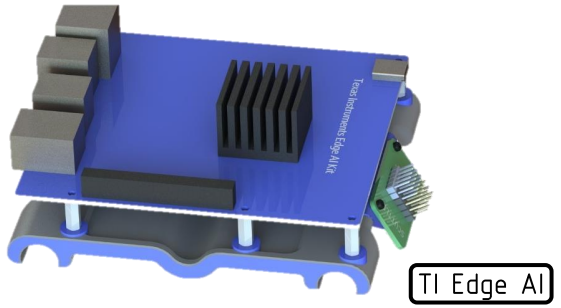


SCUTTLE Supports various CPUs

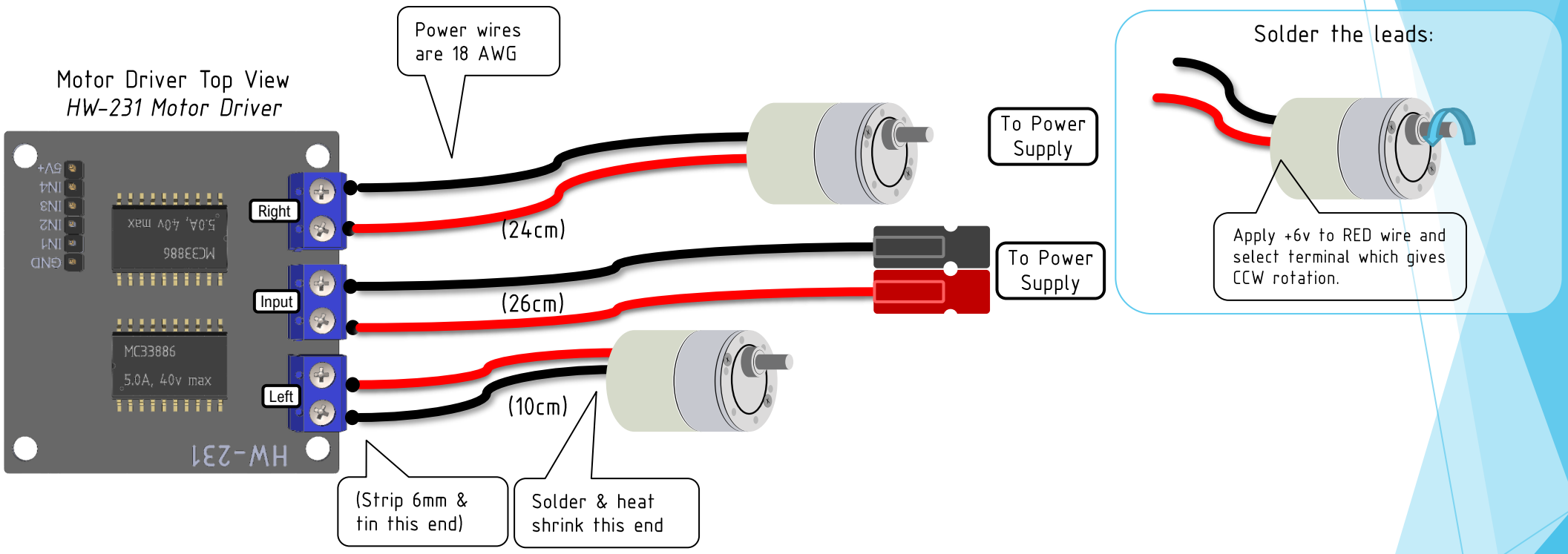








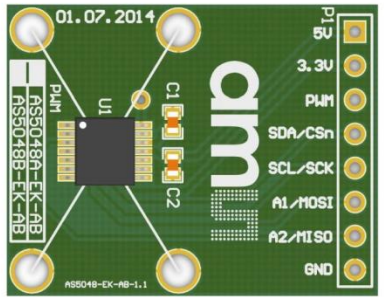
Motor Driver Power Wires



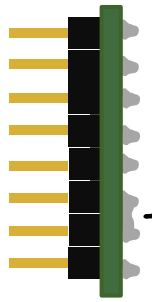
Motor Direction:
Left-hand: Drives CCW on positive command.
Right-hand: Drives CW on positive command

Encoder Details

Left Encoder



Front View



Side View

For the left-hand encoder, A1 AND A2 solder is bridged.

The i2c address is determined by the signals on A1 and A2 pins.

Left Hand Encoder A1 is pulled **down** to GND. I2C address is 0x40

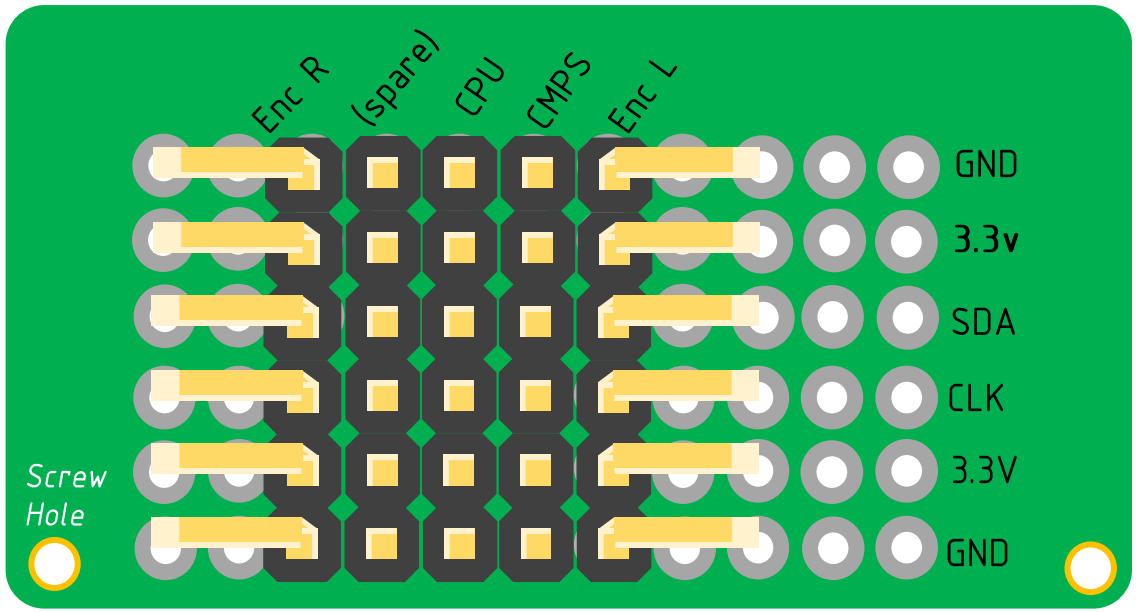
Right Hand Encoder pin A1 is pulled **up** to 3.3v. I2C address is 0x41

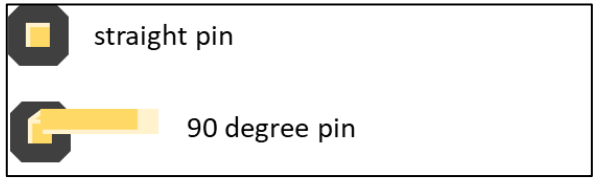
	Pin A1	Pin A2	Resulting i2c address
Left Encoder	LOW	LOW	0x40
Right Encoder	LOW	HIGH	0x41

I2C Bus Board

Option A:
DIY using perfboard / breadboard

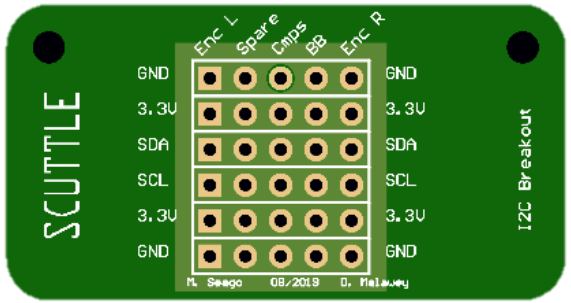
The board is made from a breadboard and soldered manually. The board can be cut between rows J & K. The solder bridges all pins from left to right.





Option B:
Order the custom PCB

You can order the custom PCB from JLCPCB.com or any other service. We have posted the design files on our github under electronics hardware.



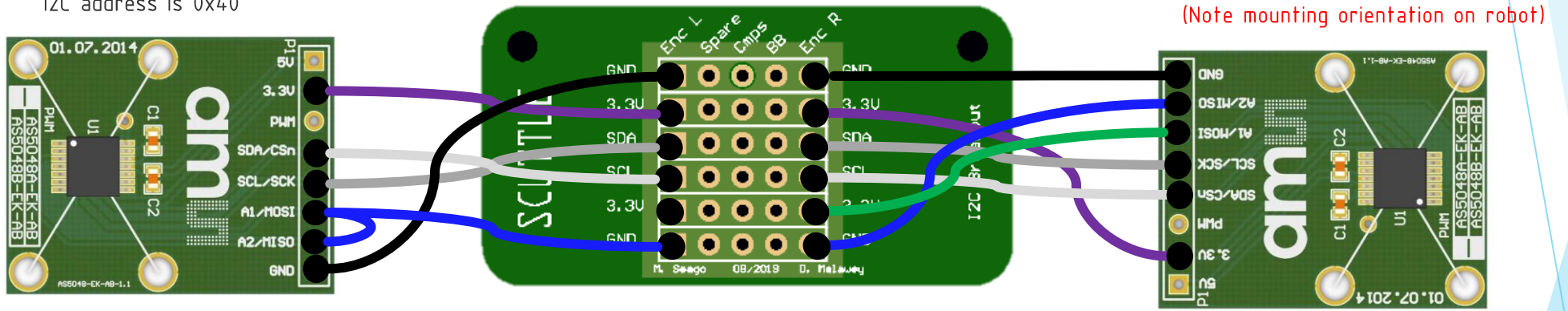
Encoder AMS AS5048 (I2C)

Also see: Encoder Details Slide

Left Hand Encoder
A1 is pulled **down** to GND
I2C address is 0x40

I2C bus board

Right Hand Encoder
A1 is pulled **up** to 3.3v
I2C address is 0x41
(Note mounting orientation on robot)

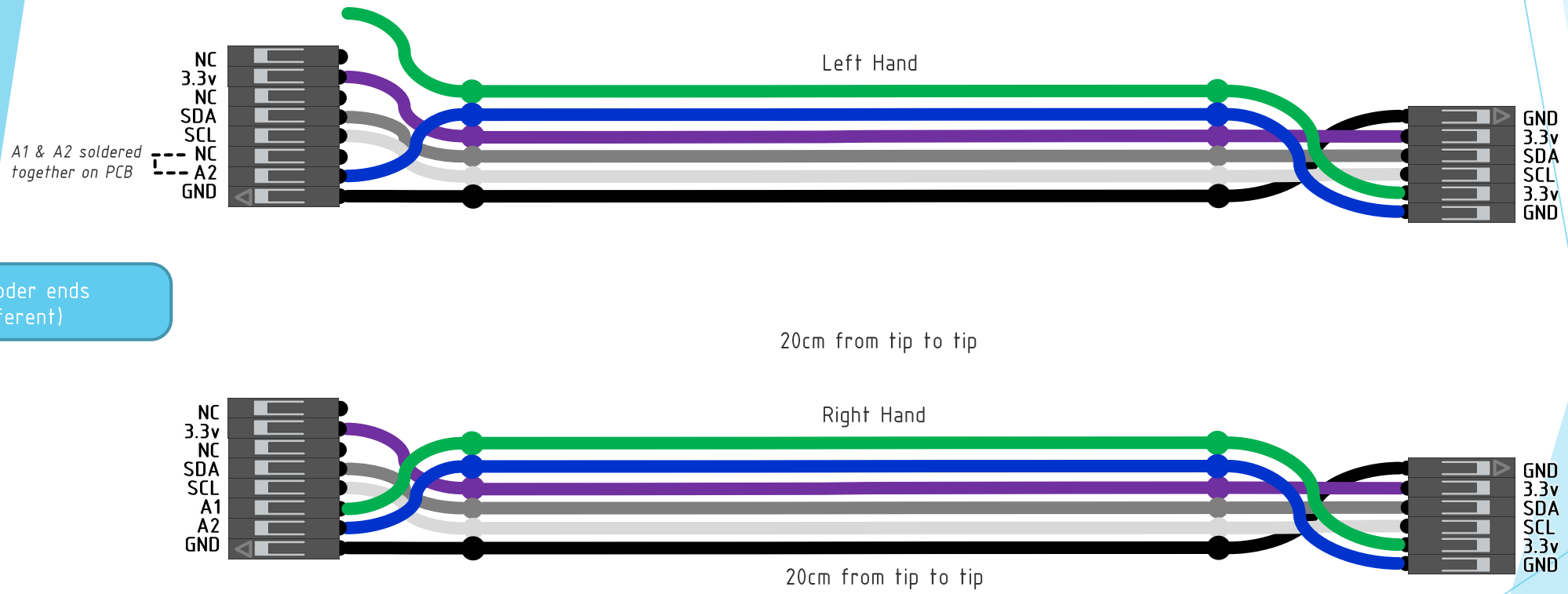


Left

Right

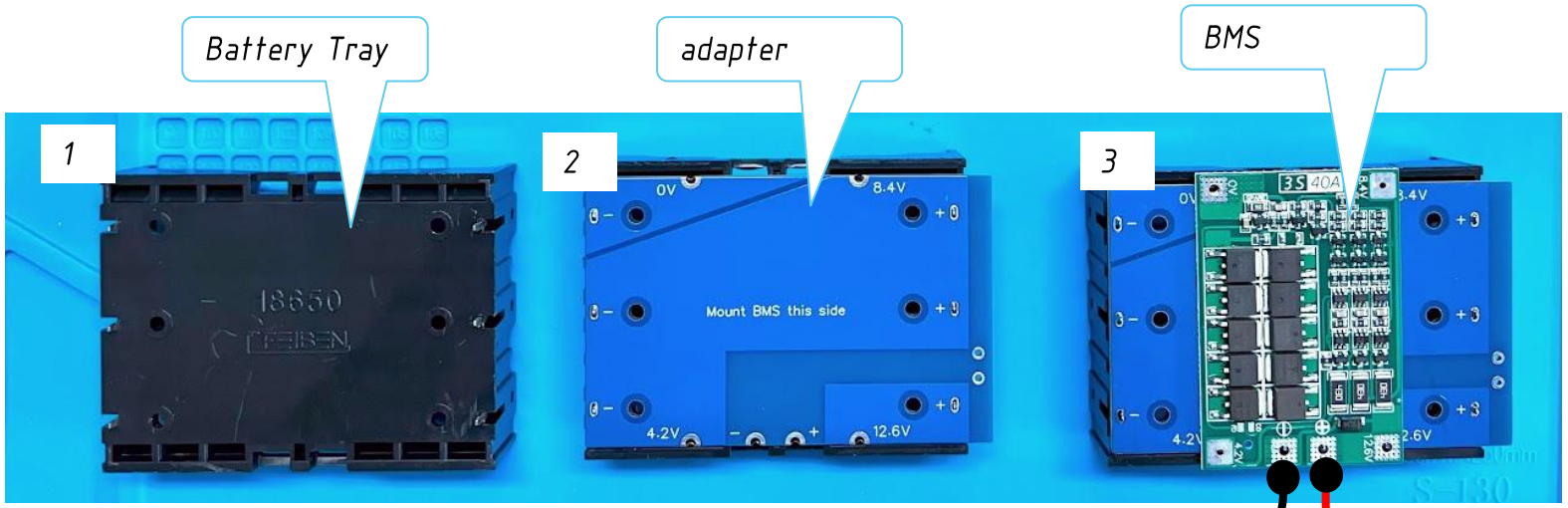
Encoder Cables

Cables modified as of 2020.12
SDA = GREY SCL= WHITE



Battery Pack, Standard (2023)

Steps



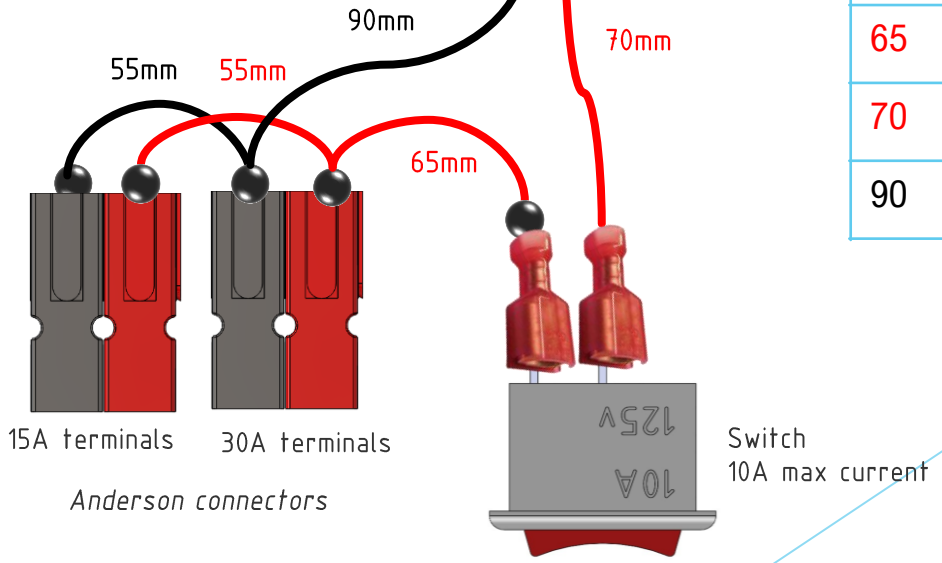


Table of wires to cut (5 total)

Length (mm)
55, 55
65
70
90

Battery Pack (DIY)

The BMS adds several functions to the battery pack. Charge overprotection, cell balancing, over-voltage protection, under-voltage protection, and more.

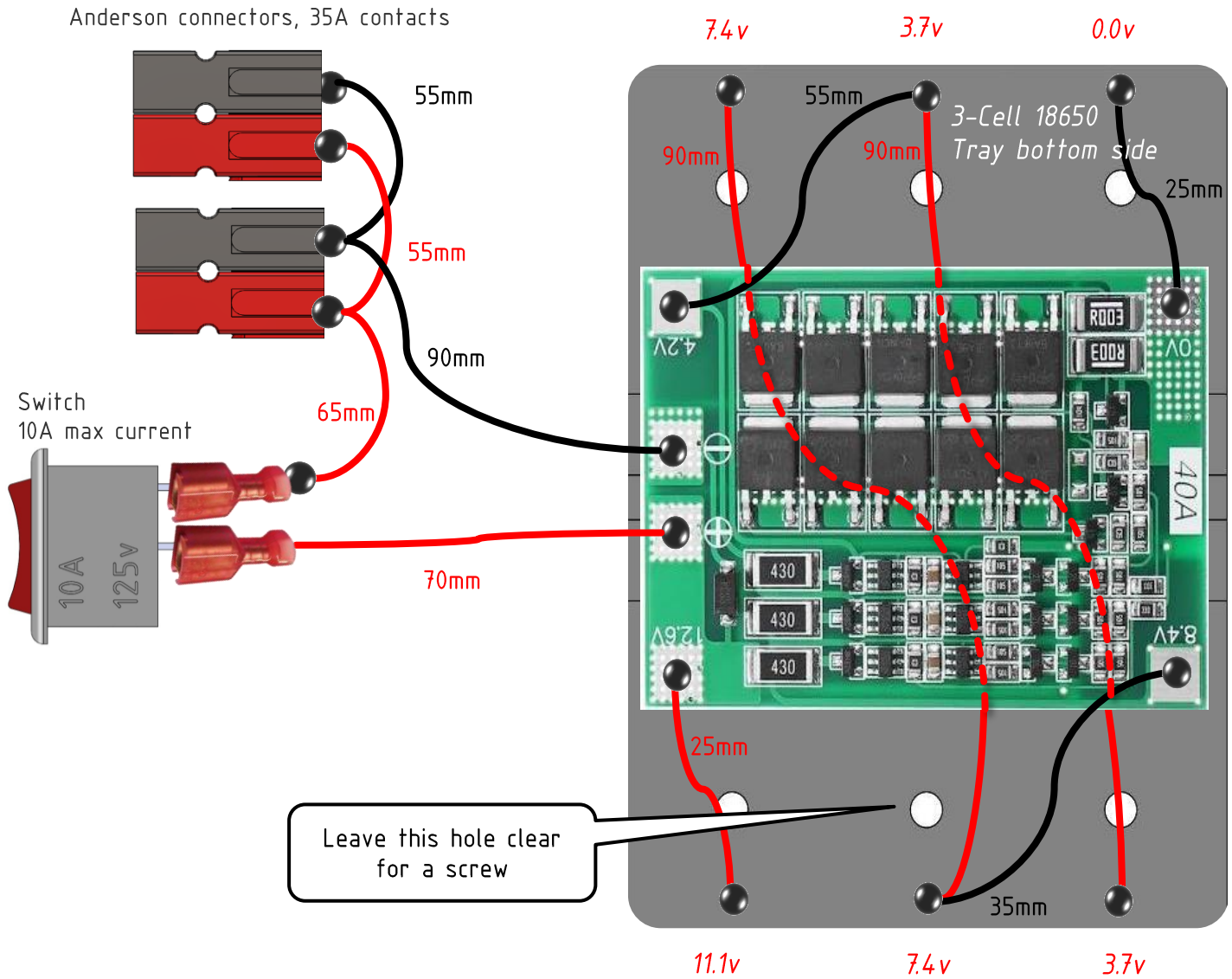
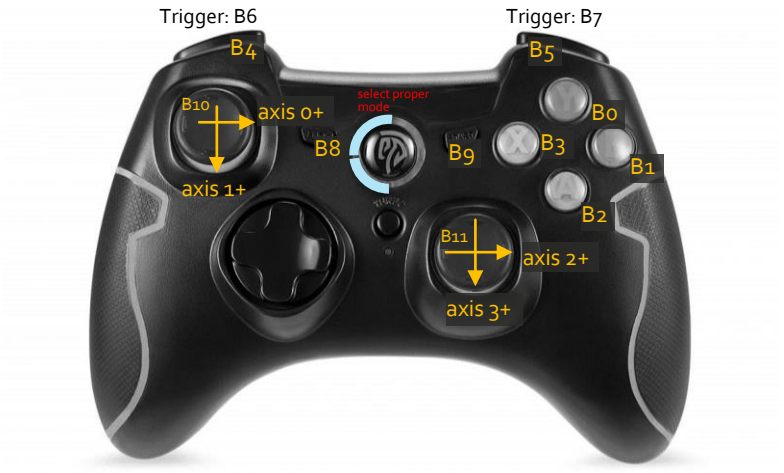


Table of wires to cut (11 total)

Length (mm)
25, 25
35, 35
55, 55
65
70
90, 90, 90

GamePad

Gamepad Controls Mapping



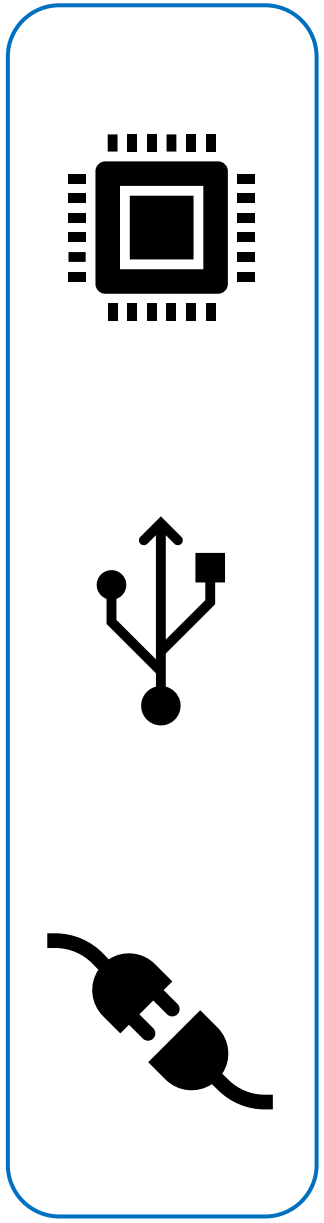
Button Behavior:

- not pressed: 0
- Pressed: 1

Axis behavior:

- Right returns positive values
- down returns positive values

- Outputs:
- Analog axes return values between -1 and 1
- These axes reach their limits before the hard-stop.
- To discover the behavior graphically, visit the html graphical test page here



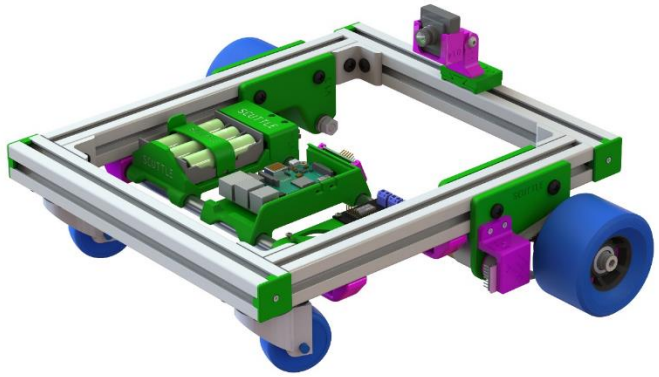
Wiring Guide Section 2

[Raspberry Pi] [Jetson Nano] [Edge AI]

Pi Wiring Guide

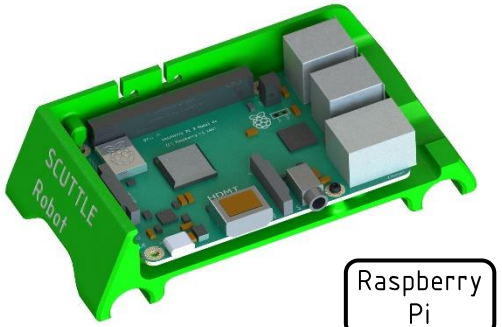
Contents:

This section covers single board computers (SBCs) that conform to the 40-pin header design from Raspberry Pi

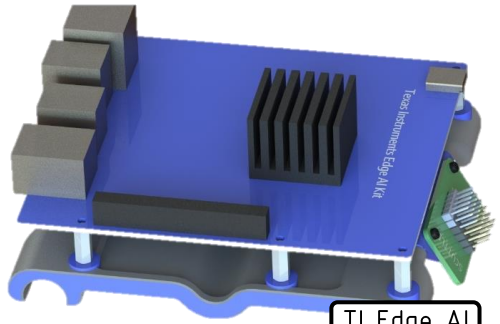


SCUTTLE Chassis

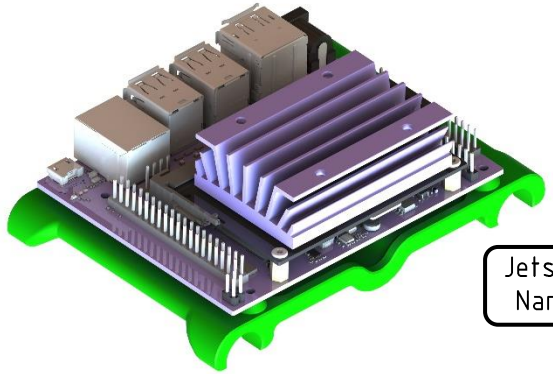
SBCs with 40-pin Pi Header



Raspberry Pi



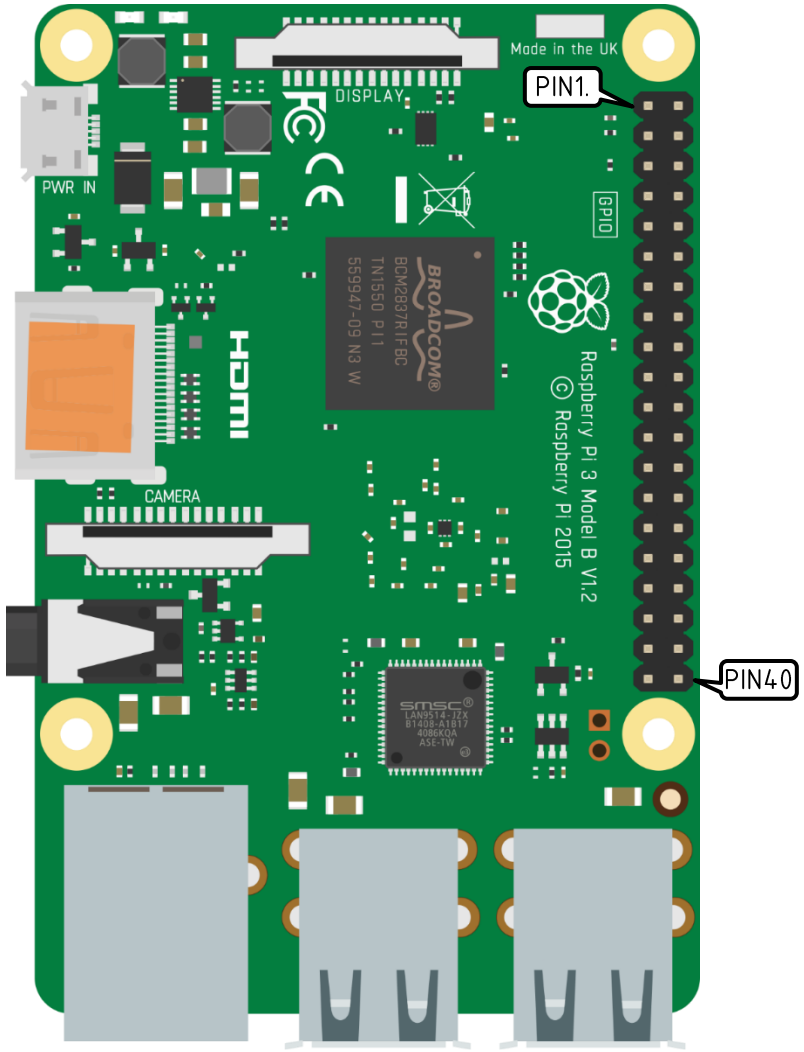
TI Edge AI



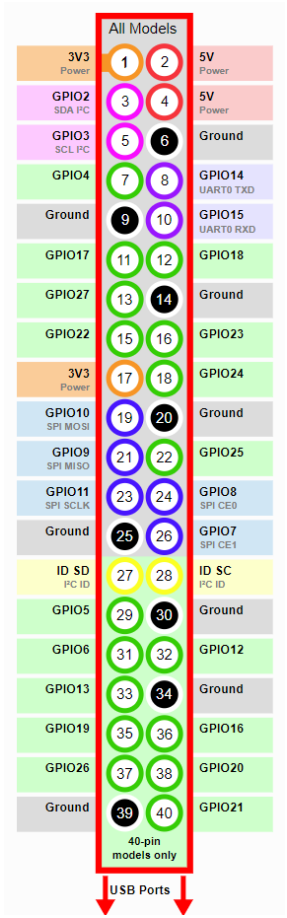
Jetson Nano

SCUTTLE Wiring Guide Pt2

Pi version 3B shown



Pin Number Convention

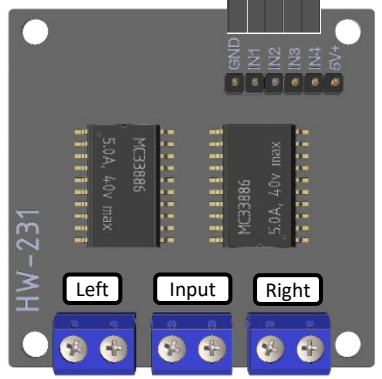


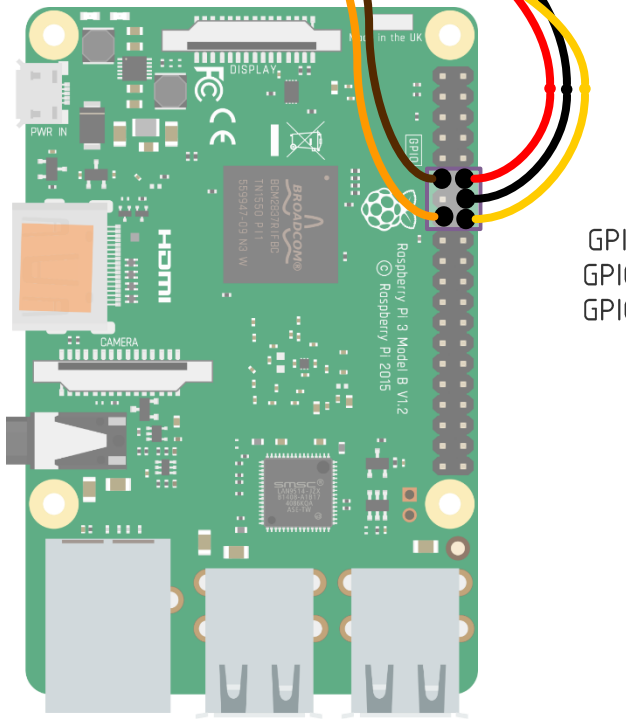
Pi – Motor Driver Signals

Keep the wires bonded together, if possible.

10cm cable

Top View
HW-231 Motor Driver



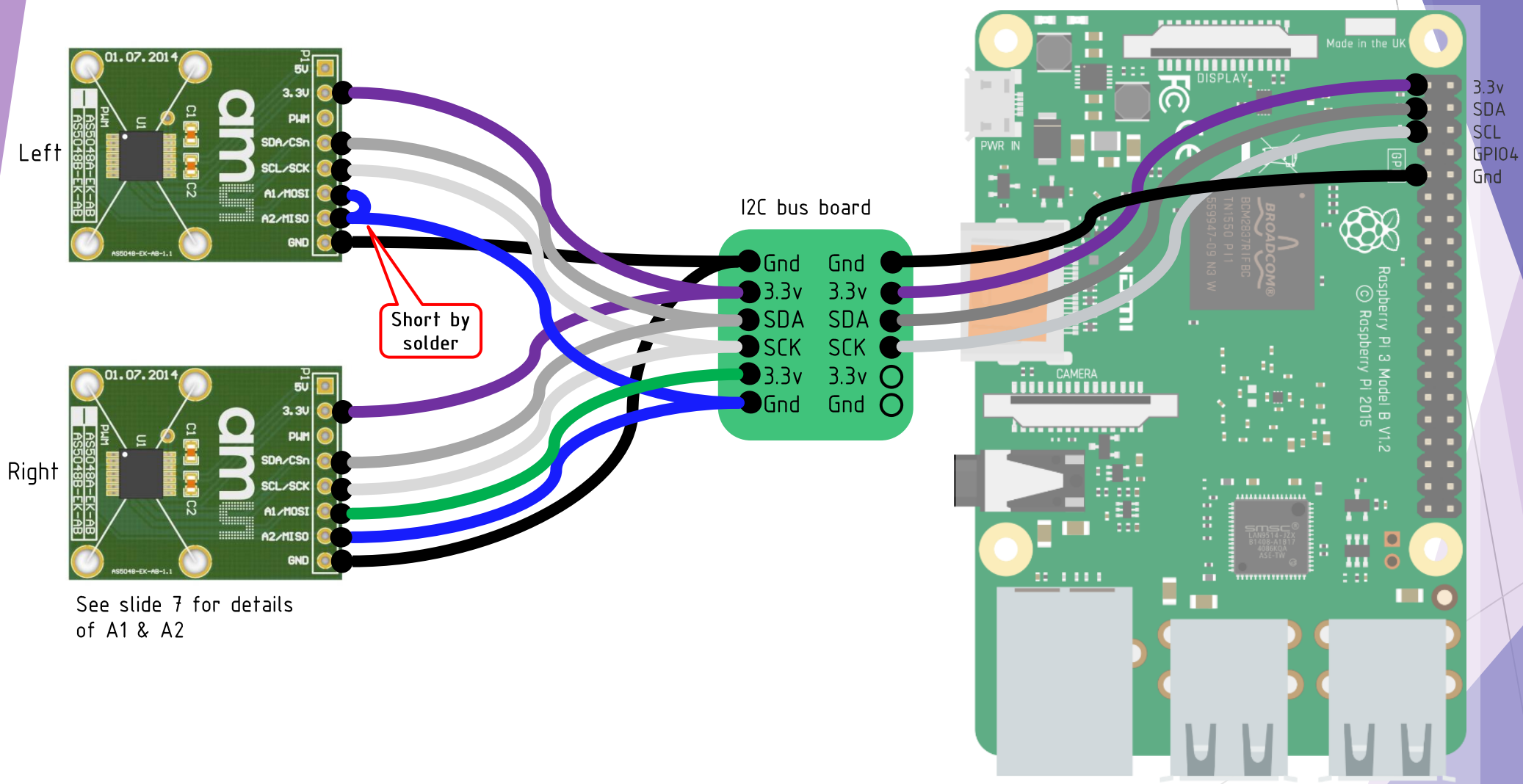


Pins on Pi

GPIO17	11	12	GPIO18
GPIO27	13	14	GND
GPIO22	15	16	GPIO23

See Motor Driver Power Wires slide for these connections.

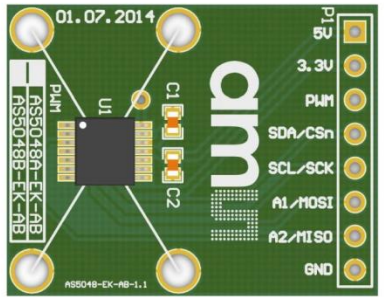
Pi - Encoder AMS AS5048 (I2C)



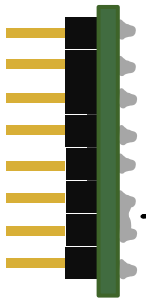
See slide 7 for details of A1 & A2

Encoder Details

Left Encoder



Front View



Side View

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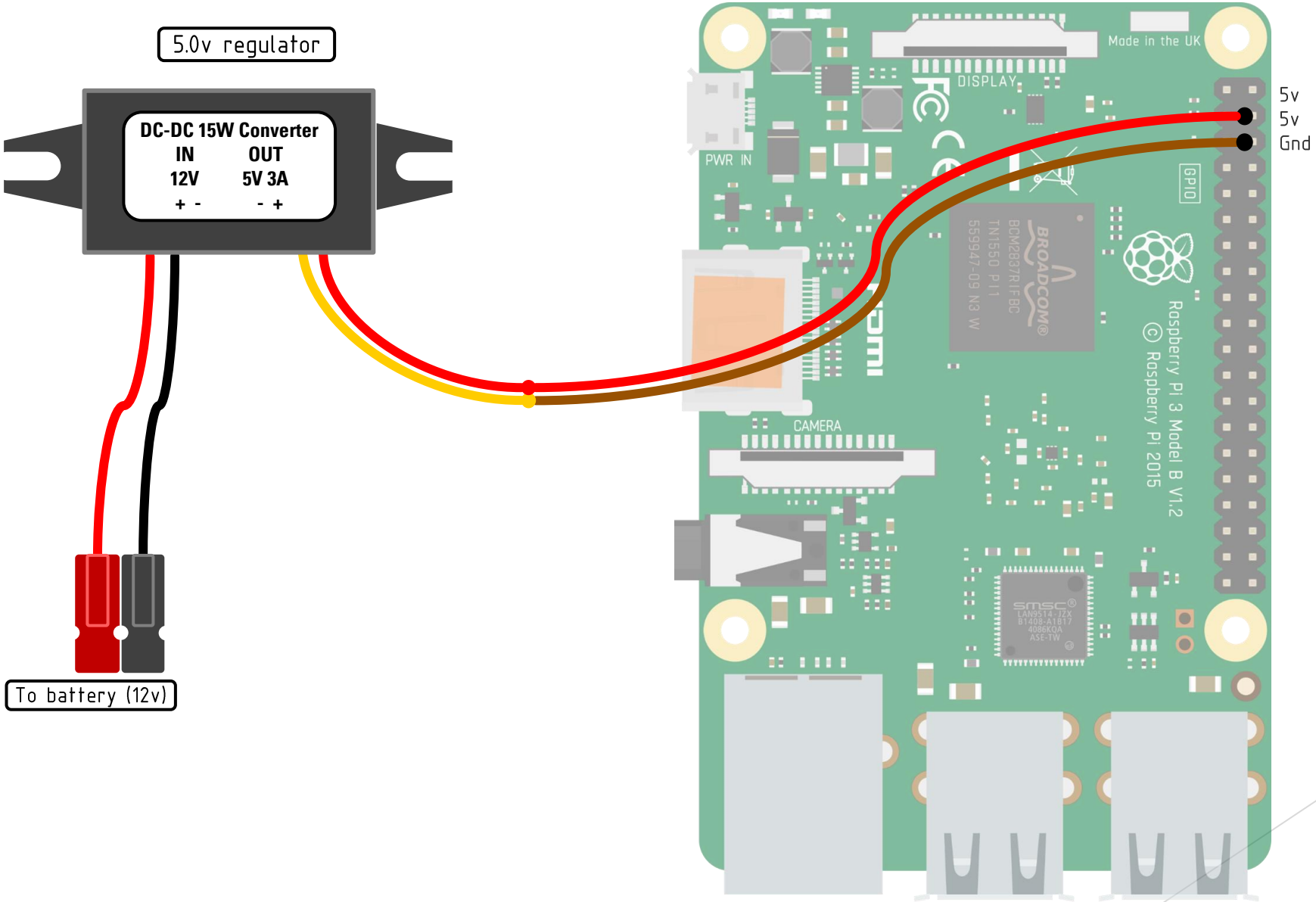
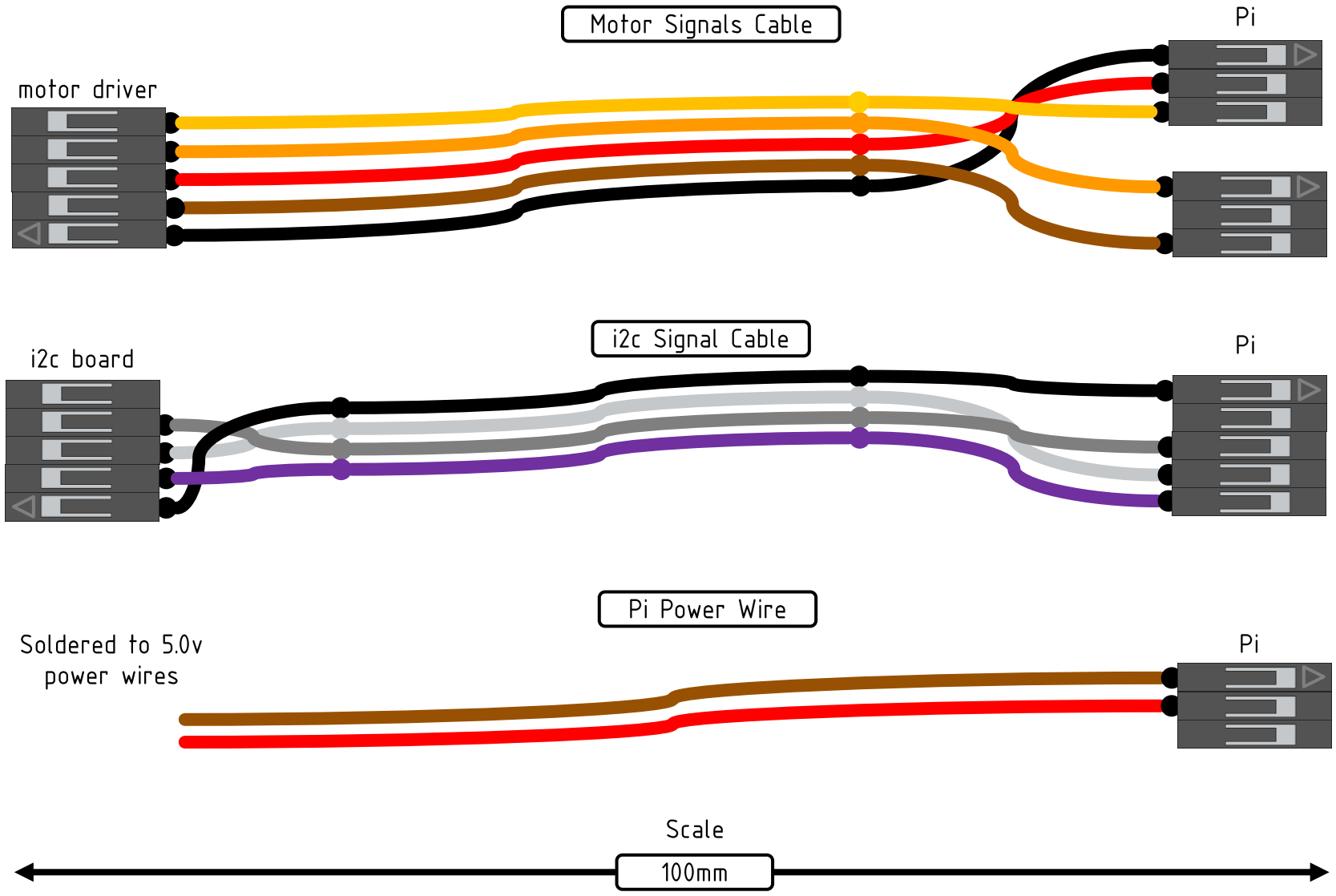
	Pin A1	Pin A2	Resulting i2c address
Left Encoder	LOW	LOW	0x40
Right Encoder	LOW	HIGH	0x41

Pi - Power Supply



Dupont Cables



Guidelines:

Ground: When possible, insert the ground in the housing pin with the arrow.

Opening: Make the opening face the outside of the Pi headers when plugged in. This makes it easier to probe.

Bonding: Do not peel the wires apart unless you must. Keep wires bonded for strength

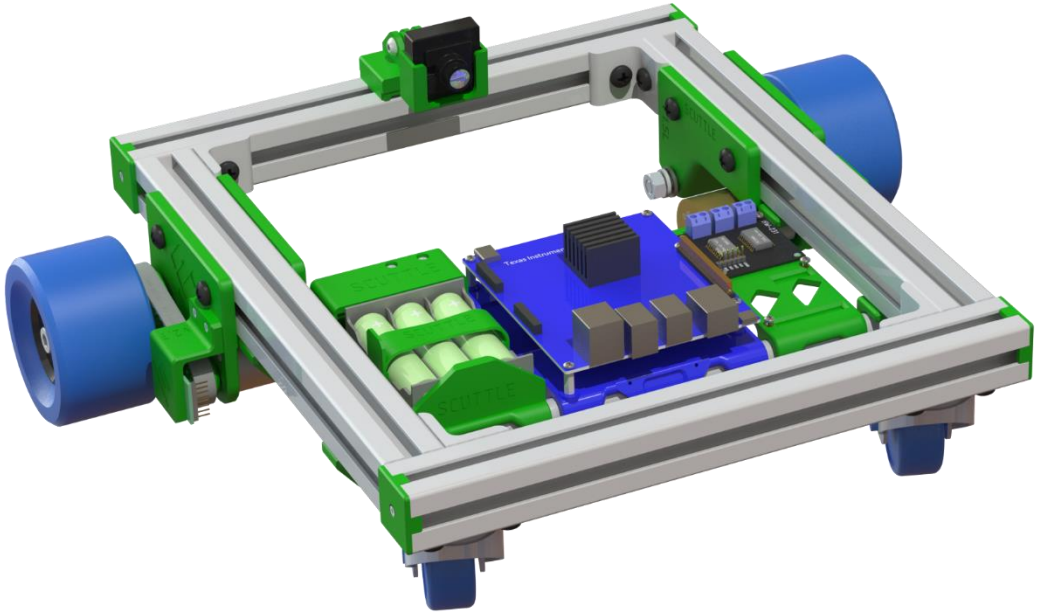
Pin Groups: Always use grouped housings instead of individuals. Then, the cable resists tugging, unplugging, and bending male pins.

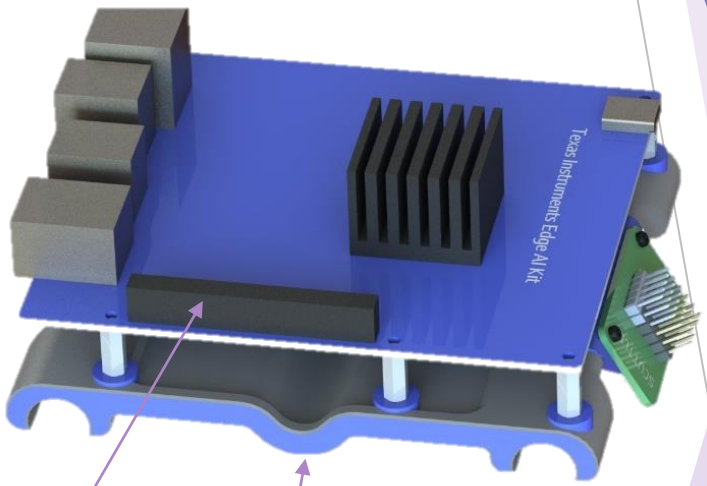
Tug Test: After inserting pins into housings, lightly tug each pin to ensure it is locked in.

TDA4VM Edge AI SK

Jump to Main TDA4VM SCUTTLE Resources

SCUTTLE Equipped with TI TDA4VM kit





SCUTTLE i2c bus board

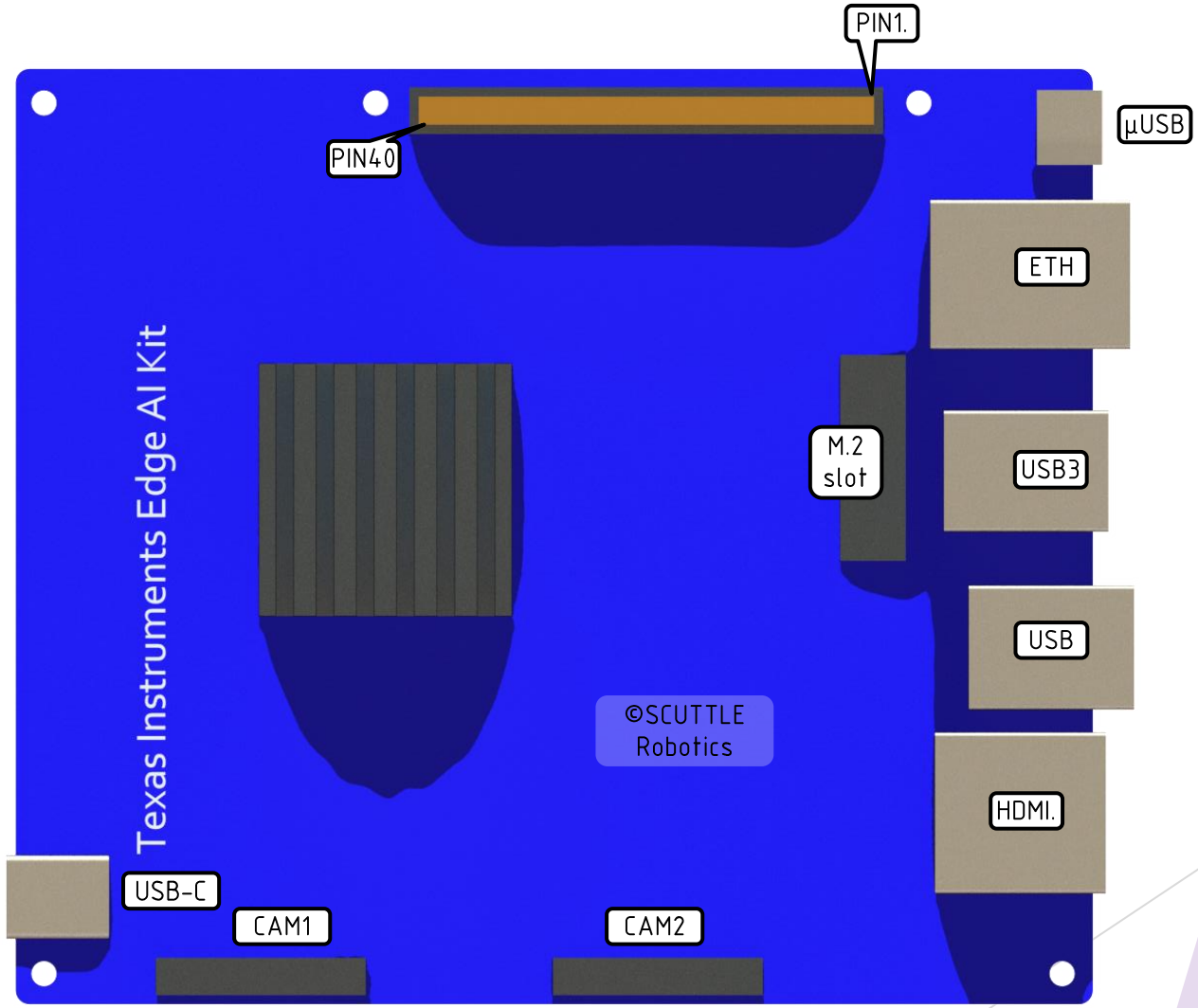
40-Pin Header (matching Pi)

Edge AI Bracket

TDA4VM – Pinout

Main header pinout for TI board matches Raspberry Pi

	PIN		
Power_3.3	1	2	Power_5.0
I2C_SDA	3	4	Power
I2C_SCL	5	6	GND
GPIO	7	8	UART_TXD
GND	9	10	UART_RXD
GPIO	11	12	I2S_SCLK
GPIO	13	14	GND
GPIO	15	16	GPIO
Power_3.3	17	18	GPIO
SPI_MOSI	19	20	GND
SPI_MISO	21	22	GPIO
SPI_SCLK	23	24	SPI_CS0
GND	25	26	SPI_CS1
ID_SDA	27	28	ID_SCL
GPIO	29	30	GND
GPIO	31	32	PWM0
PWM1	33	34	GND
I2S_FS	35	36	GPIO
GPIO	37	38	I2S_DIN
GND	39	40	I2S_DOUT



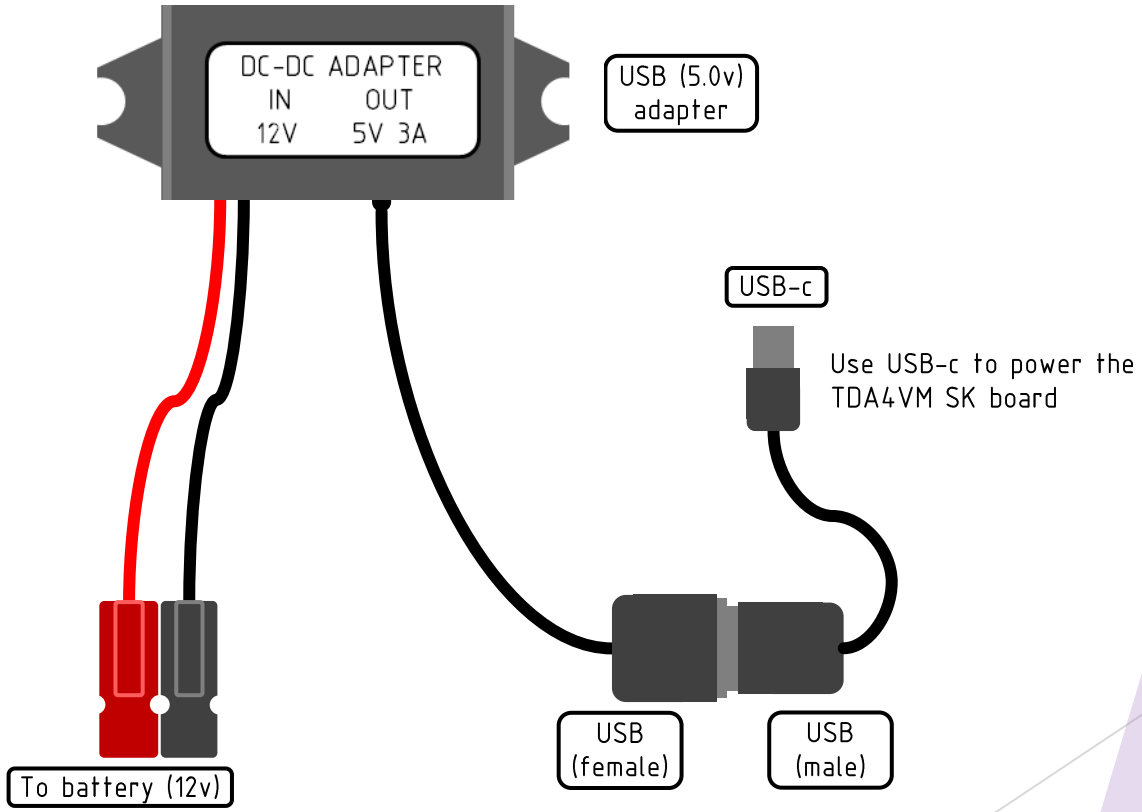
TDA4VM – Power

You can use the standard SCUTTLE battery pack and adapter to power the TI board, but power will be limited. The battery pack can generate up to 60 watts, but the standard adapter is limited to about 10watts effectively.

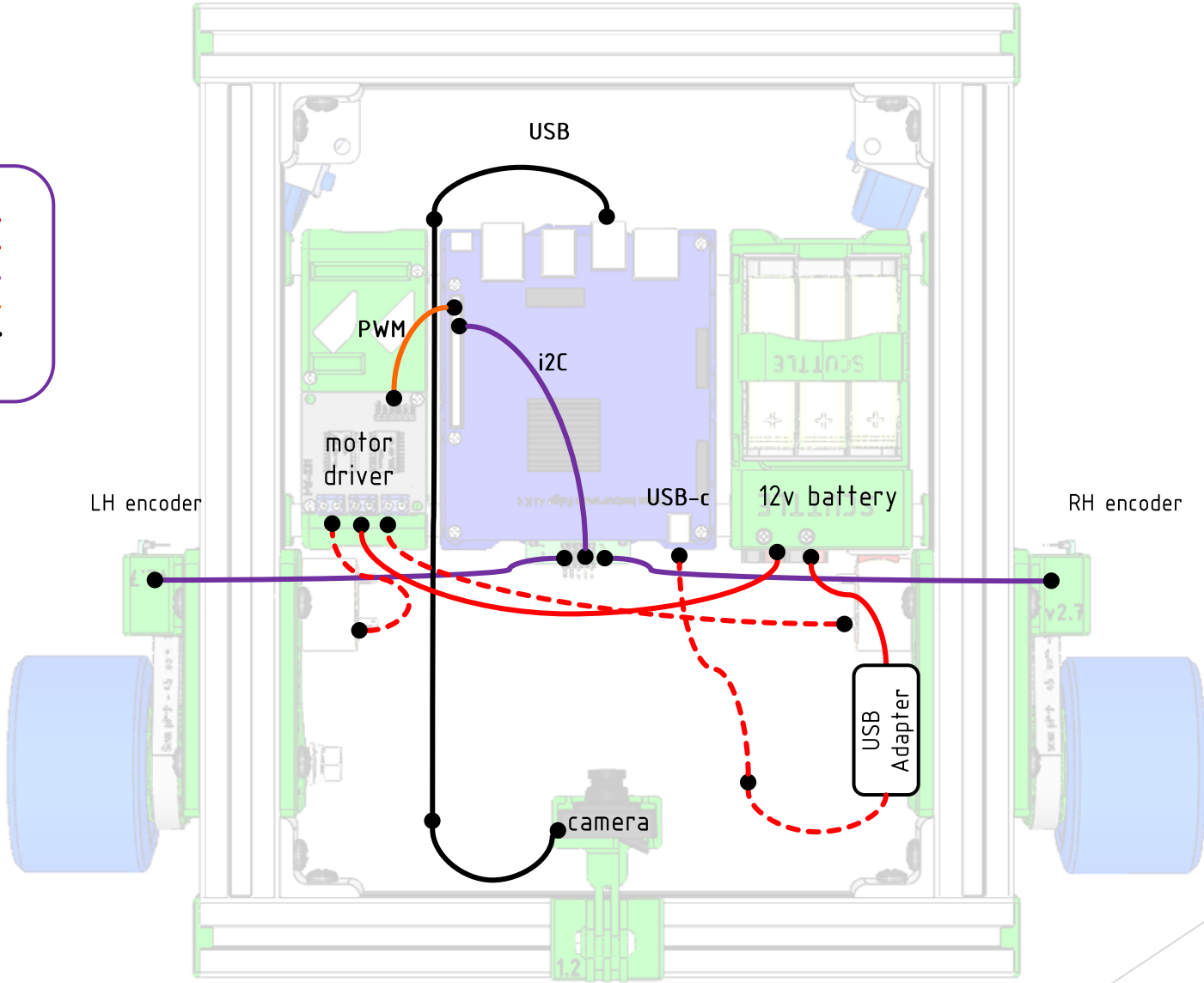
Note on usb-c: you can shop for USB-c power adapters that deliver 9 to 12v over usb-c for peak performance. The setup shown is limited to 5v output.

Example Power supply selected by TI engineering team on Amazon

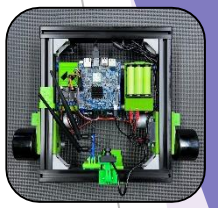
Diagram for powering Edge AI Board



TDA4VM – SCUTTLE Wiring

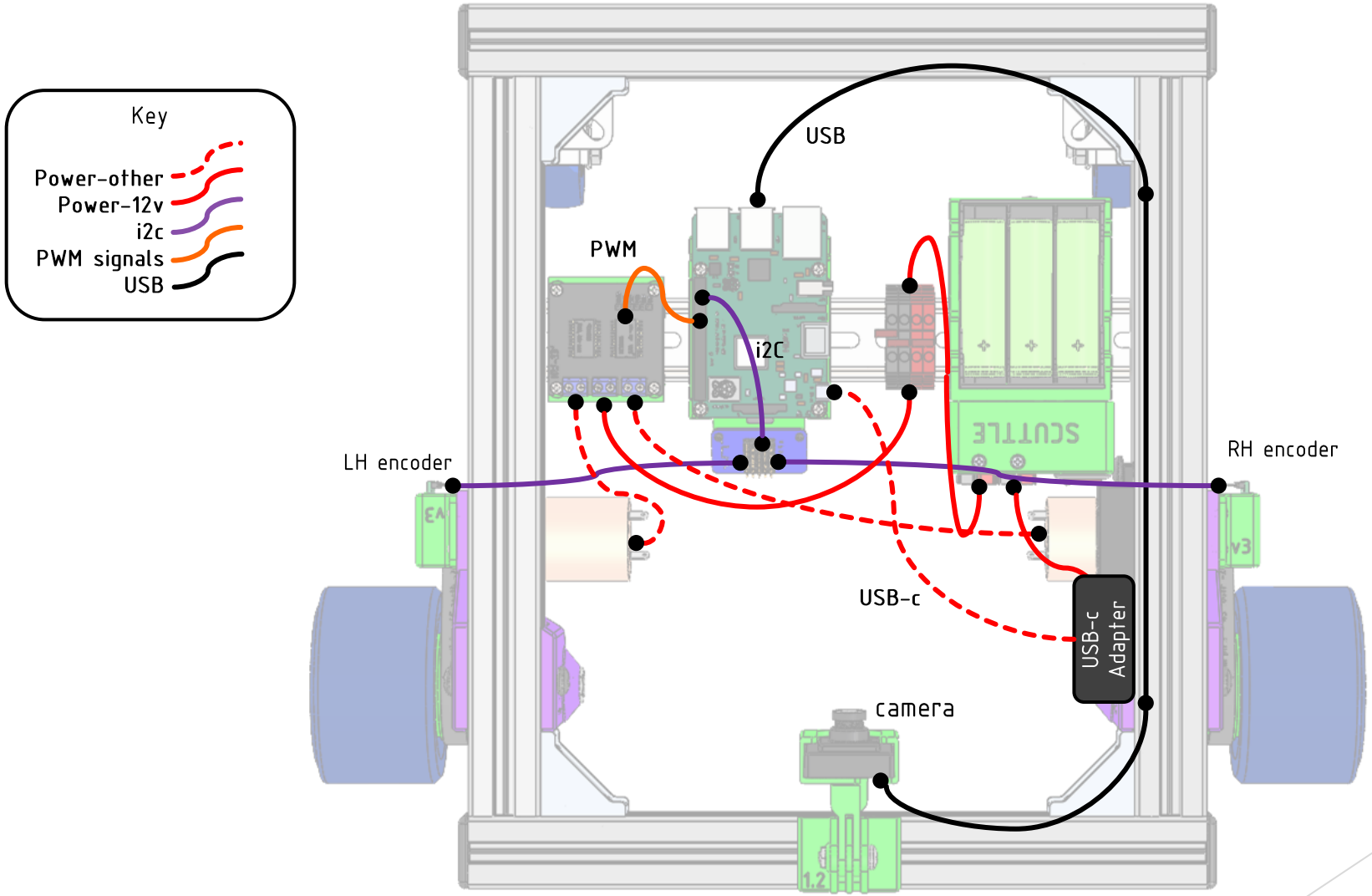


Hi-res Photo



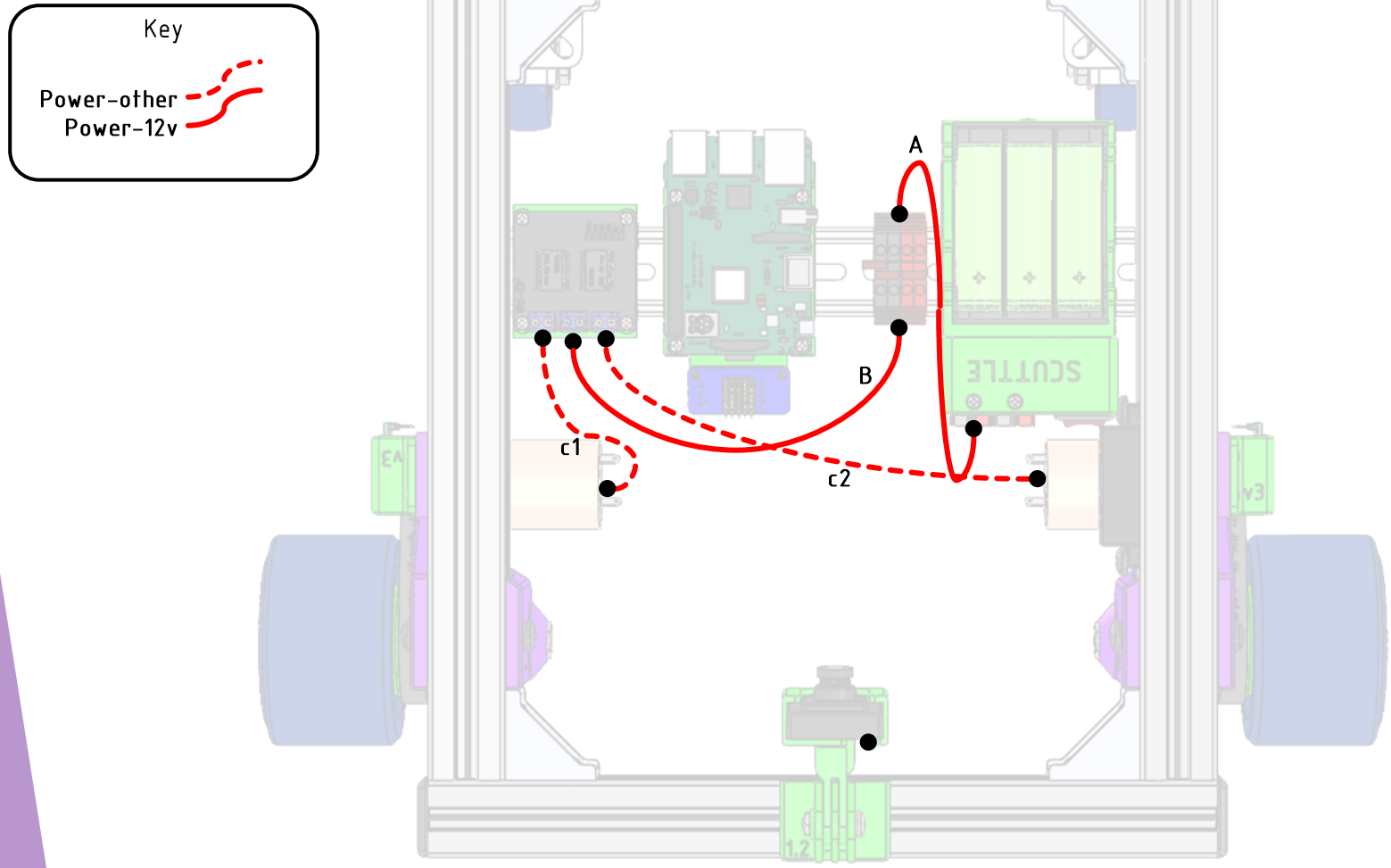
SCUTTLE v3 Wiring

Wiring Overview



SCUTTLE v3 Wiring

Power Wires: 18awg, paired 2-conductor wire



Cut lengths:

	From	To	Cut Length (cm)
A	Battery	DIN terminals	24
B	Din Terminals	Motor Driver	20
C1	Motor Driver	Motor, LH	10
C2	Motor Driver	Motor, RH	24