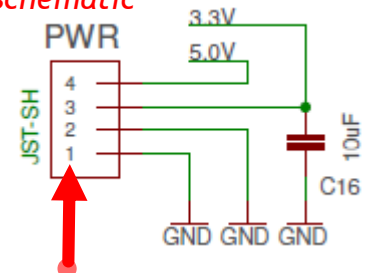
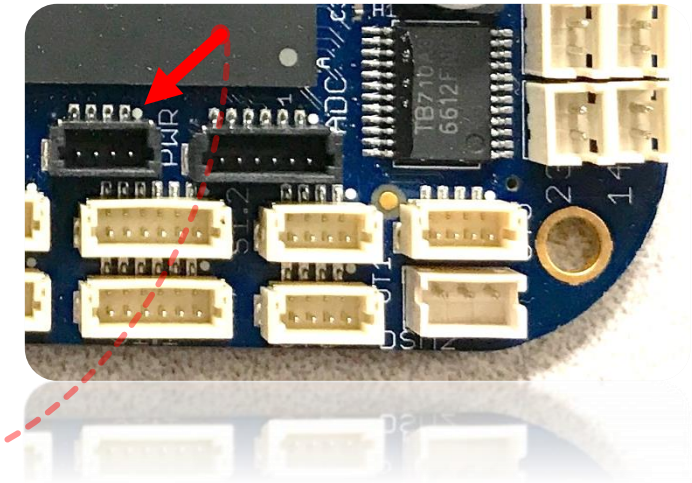
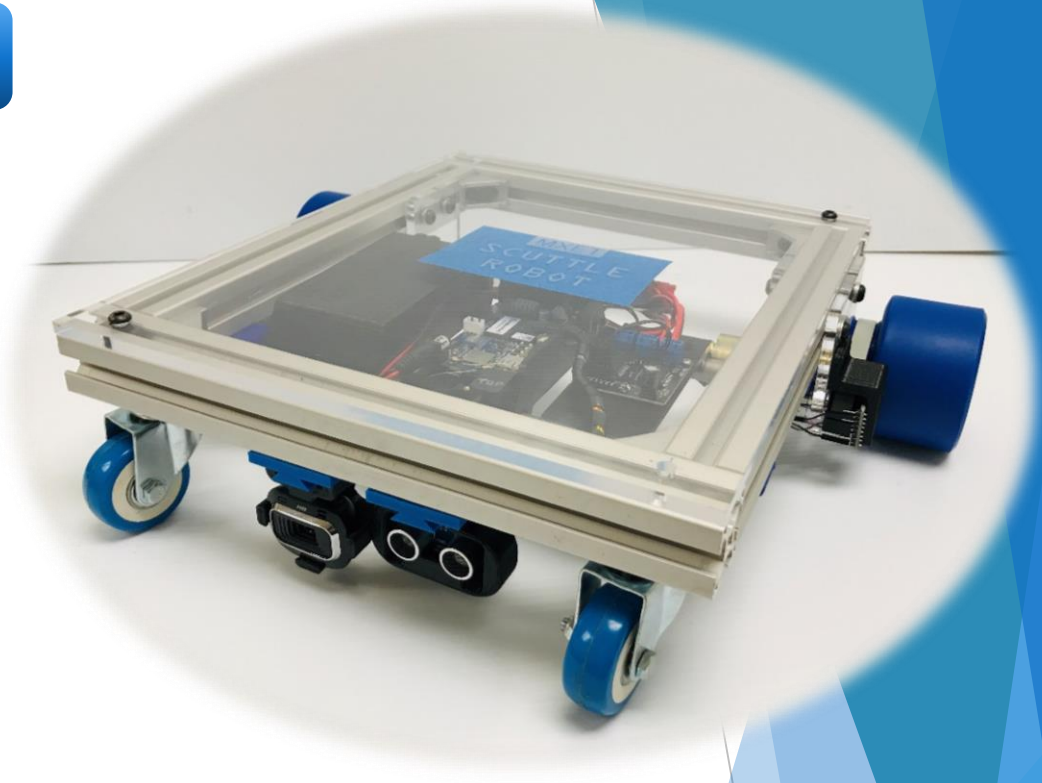
Scuttle robot Wiring Guide (rev 2019.12.18)

<u>Important Info:</u>
To match the beaglebone pins to the pin numbers on the diagram:
The tiny white circle on the silkscreen at each connector indicates “pin1”

All images of this style are copied directly from the beaglebone schematic







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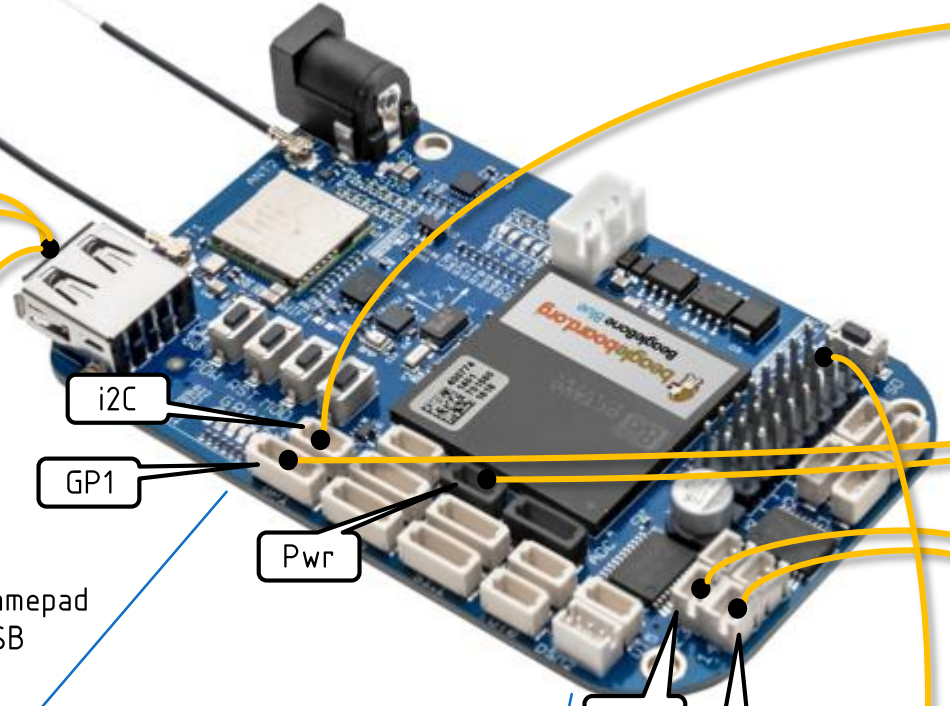
Verified Sensors & Actuators

Microsoft camera

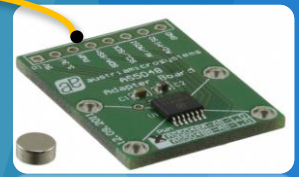
Audio Amplifier

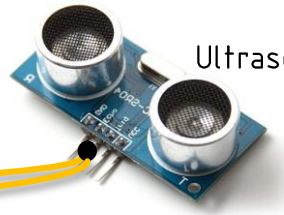
Gamepad Controller

Gamepad USB

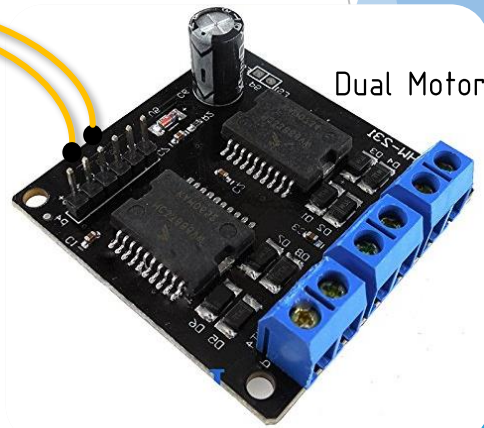


Encoders





Ultrasonic Sensor



Dual Motor Driver

Servos

Connection Map

I2C	4 GPIOs (GP0)	SPI (S1.2)	UART (UT1)	UART (UT5)
4 GPIOs (GP1)	UART (GPS)	SPI (S1.1)	UART (UT0)	UART (DSM)

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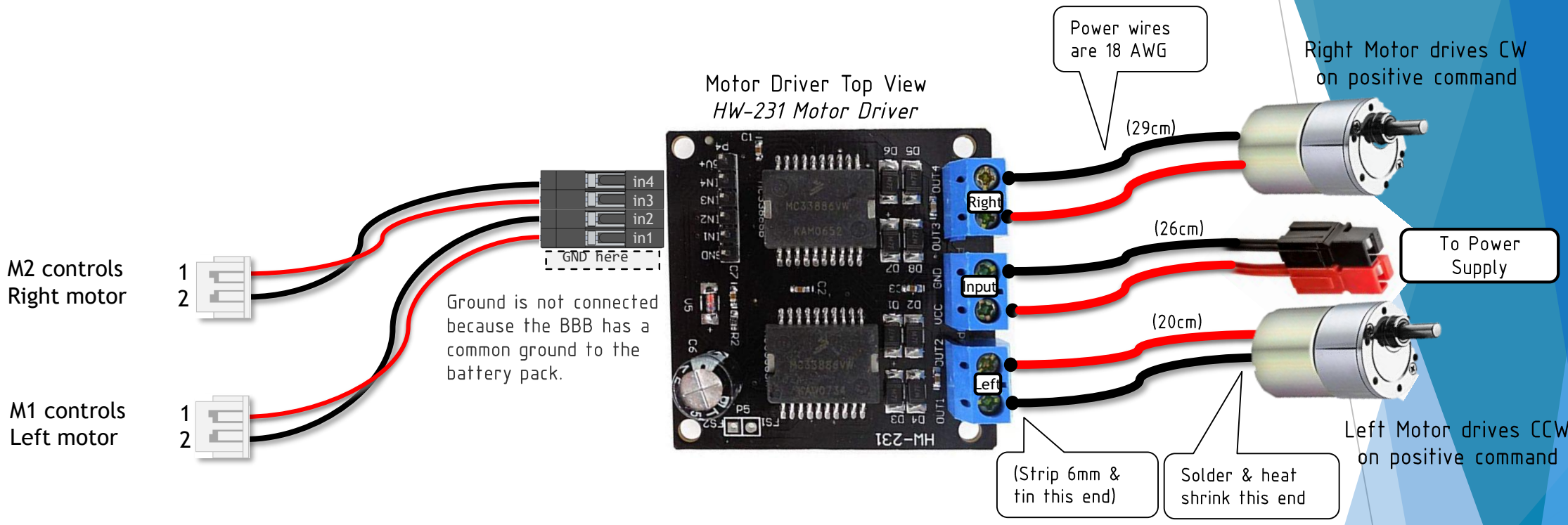
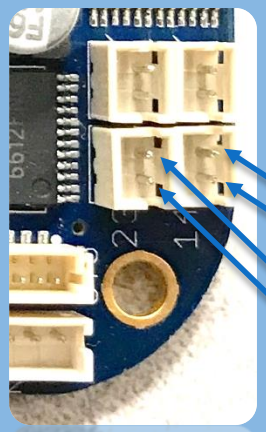
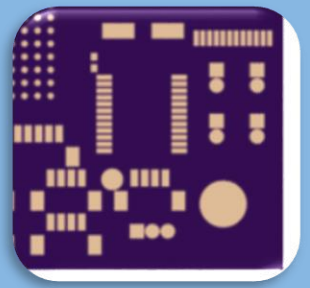
Motor Driver Signal Cables





Pin 1 should be HIGH when motor is driven FORWARD

Hardware design convention:
Pin 1 uses the square solder pad.



Connector vector image reserved.

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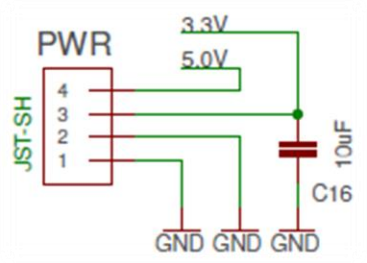
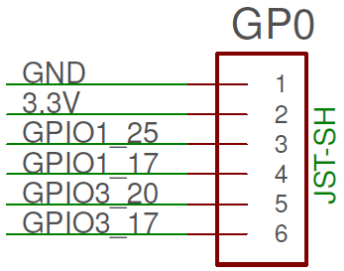
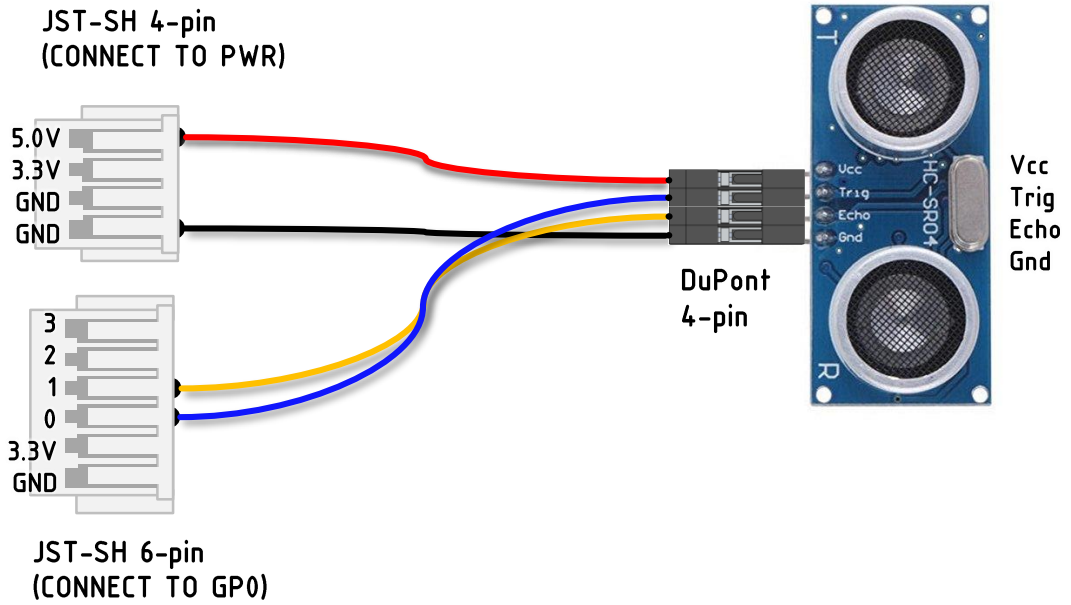
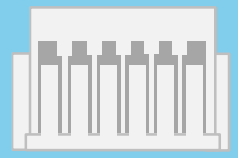
Ultrasonic Distance Sensor (GPIO)







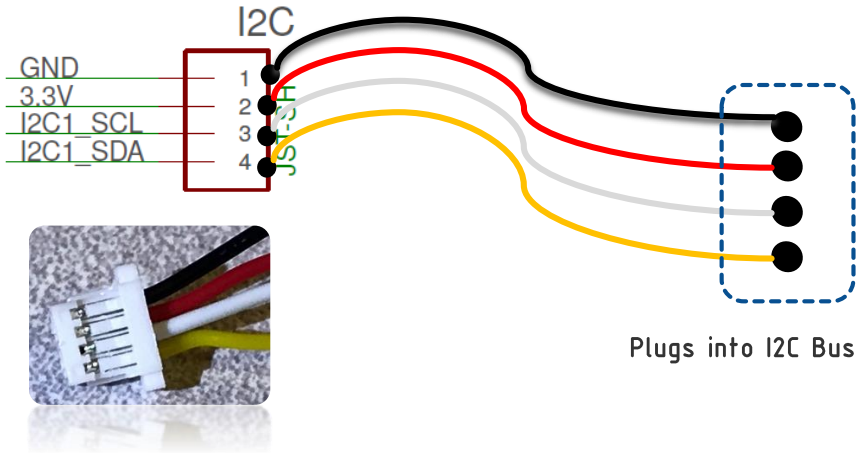
NOTE: For JST connectors out-of-box, the colors are not in the correct order. You need to rearrange them.



Beaglebone to I2C bus cable

Diagram

BeagleBone I2C Connector
Style: JST-SH 4-pin

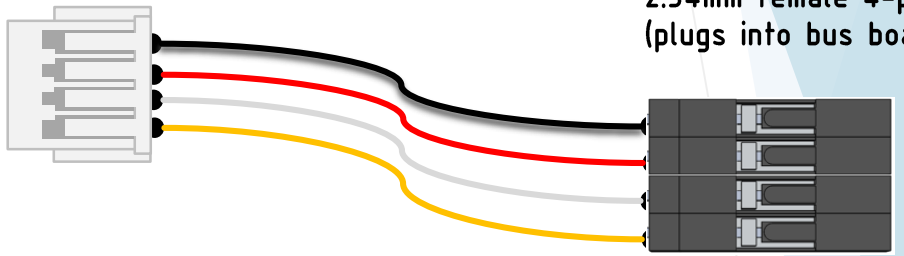


Plugs into I2C Bus PCB

Cable Design

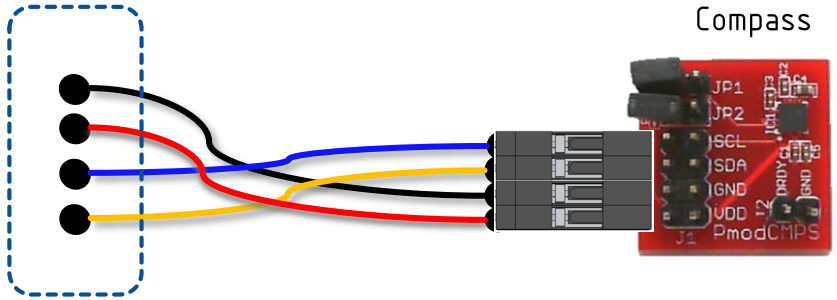
(I2C port on Beagle)
Style: JST-SH 4-pin

DuPont style
2.54mm female 4-pin
(plugs into bus board)



Compass CMPS or CMPS2 (I2C)

Plugs into I2C Bus Board



Compass

This compass is not necessary since you can access the compass on the beaglebone blue. Be sure to calibrate the compass on the blue since it lies within close proximity of magnetic hardware on the robot.

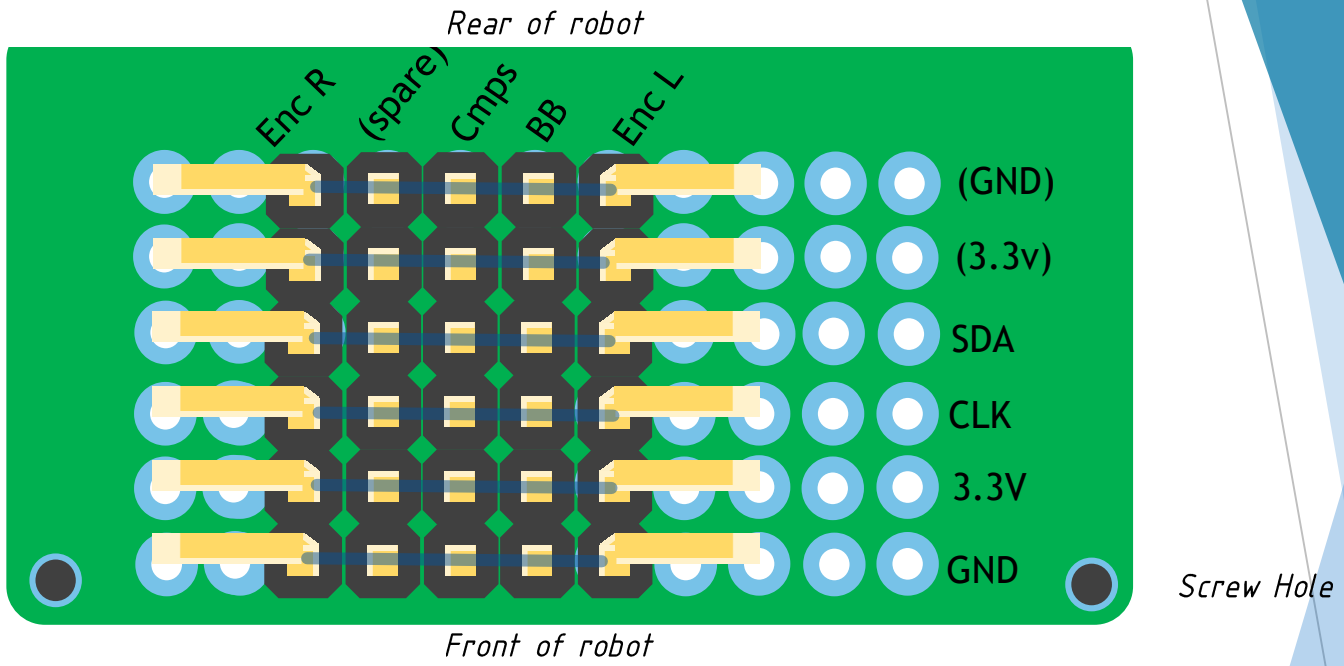
I2C Bus Board

straight pin

90 degree pin

solder connections (on bottom)

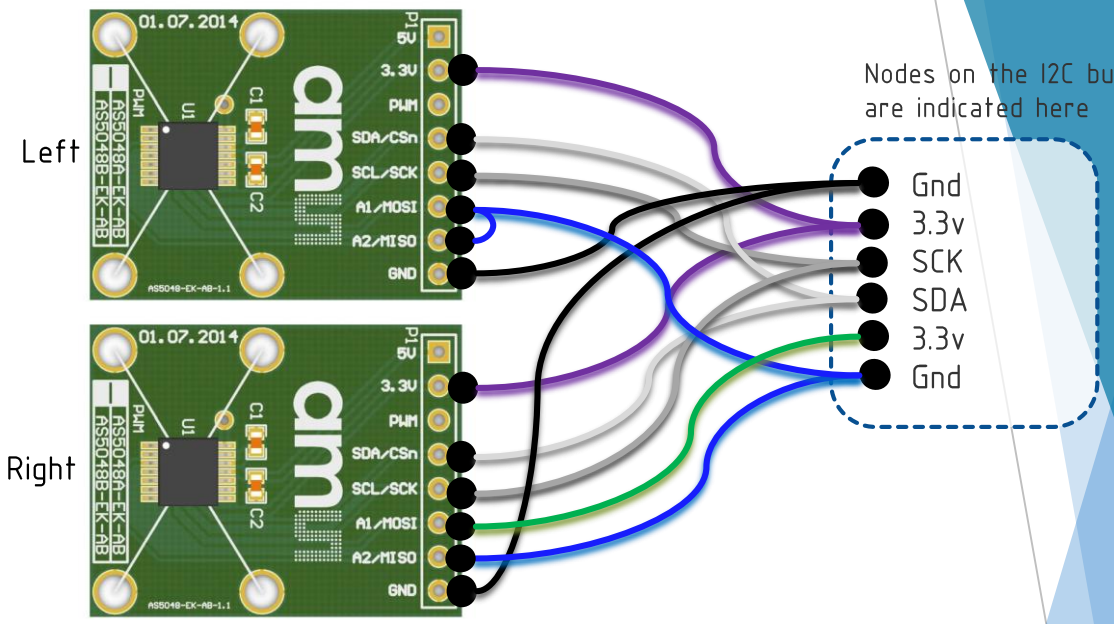
The board is made from a breadboard and soldered manually. The board can be cut between rows J & K. The solder bridges all pins from left to right.



Encoder AS5048 (I2C)

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

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



PIN	Left	Right
A1	0 (low)	1 (high)
A2	0 (low)	0 (low)
i2C Address	0x40	0x41

On the Left Hand Encoder PCB, bridge the pins A1 and A2 using solder, to each other.

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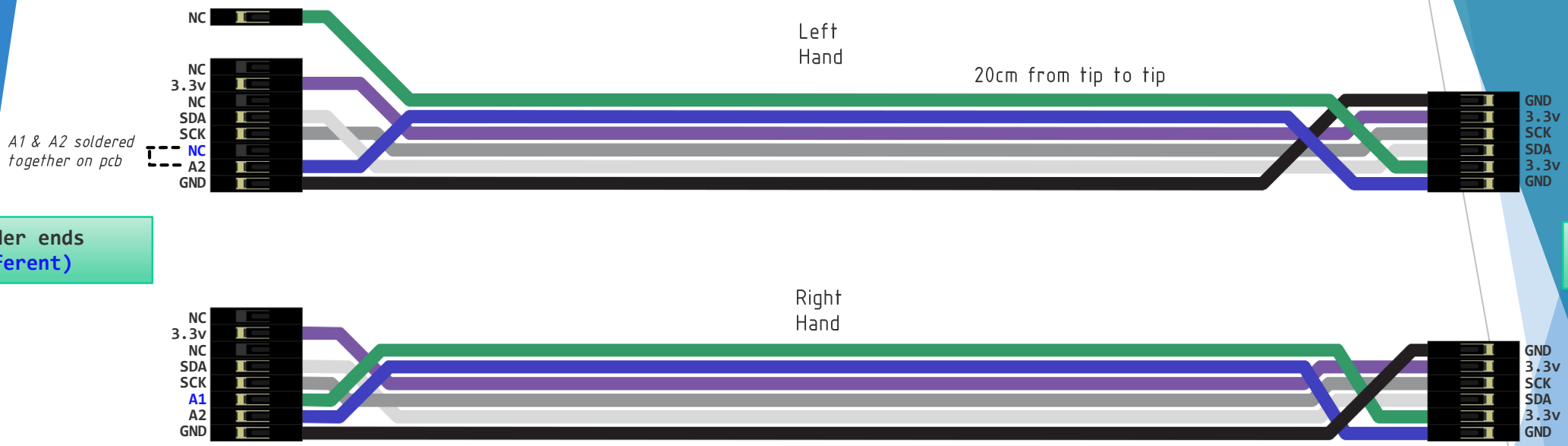
Encoder Cables



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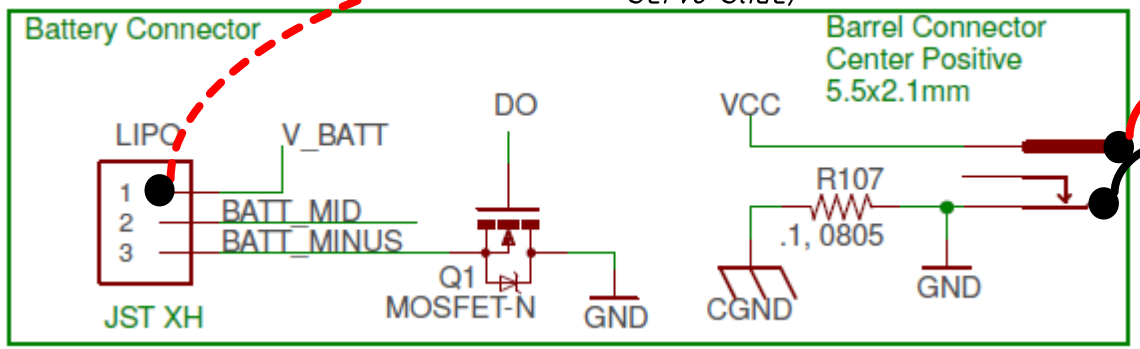
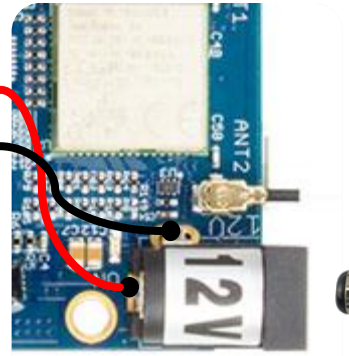
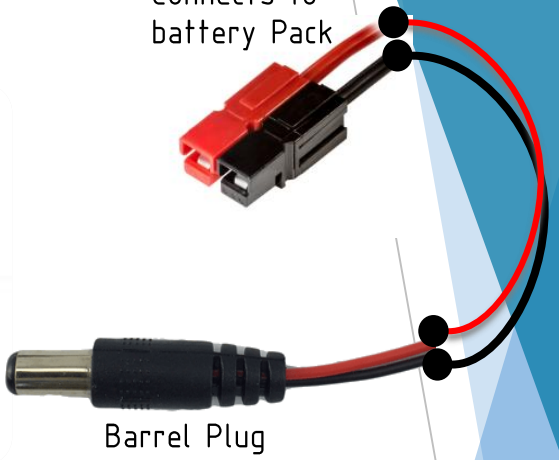
Battery

As an option, bridge LiPo terminal to 12v positive terminal (see Servo Slide)







The "Battery Connector" is disconnected. Actual battery uses Barrel Connector.

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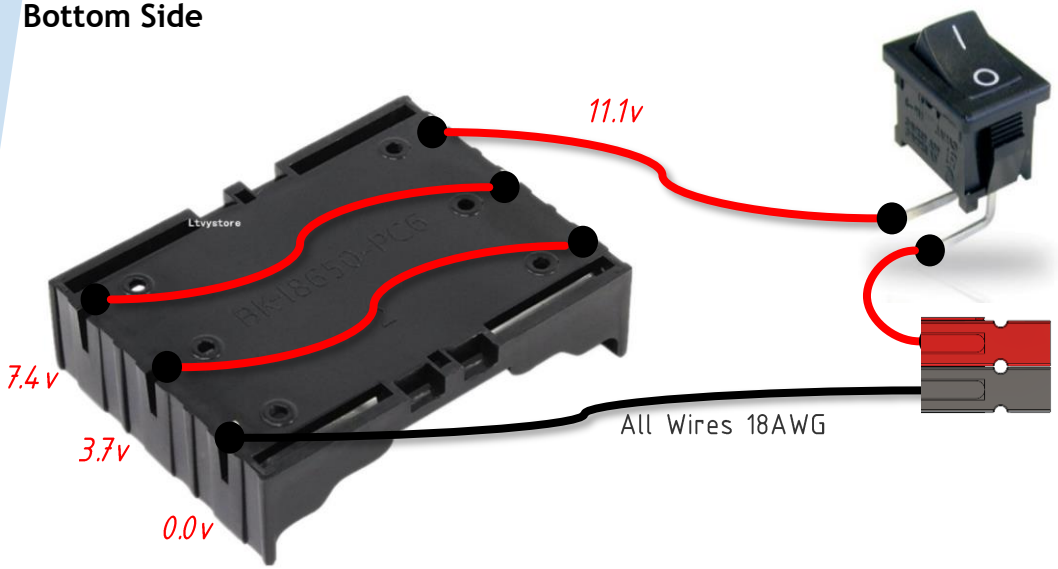
Battery Pack

Bottom Side



3-Cell 18650 holder

Switch PN:SRB22A2FBBNN
Carries 10A max

Two pairs of Anderson connectors are attached here.

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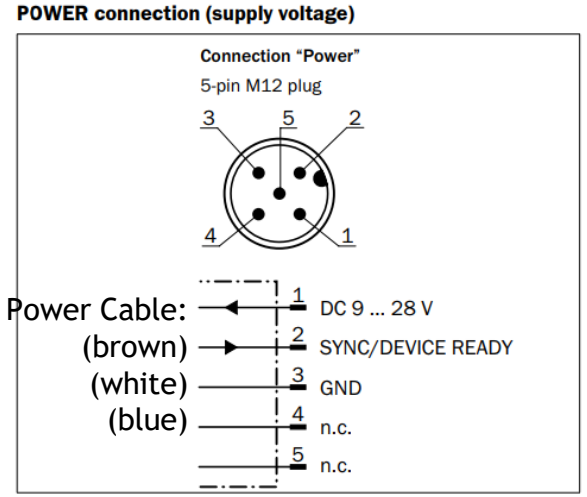
LIDAR

Lidar Device

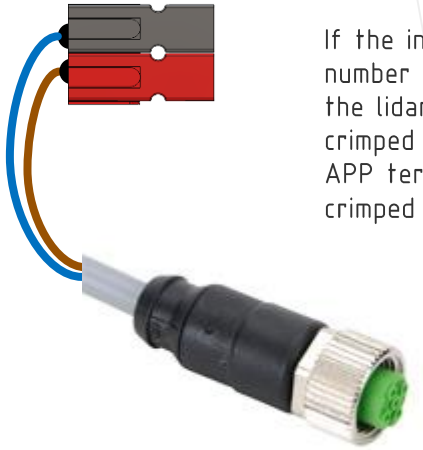
TiM 561

Power Connector Diagram (lidar side)



LIDAR-side connector (male pins)

Power Cable Diagram (plugs into lidar)



If the indicated cable part number is used for power to the lidar, brown will be crimped into the 12v positive APP terminal and blue is crimped into the negative.

Cable: 7000-12241-2150300

Cable-side connector (female pins)

Typical Lidar power consumption: 2.1w

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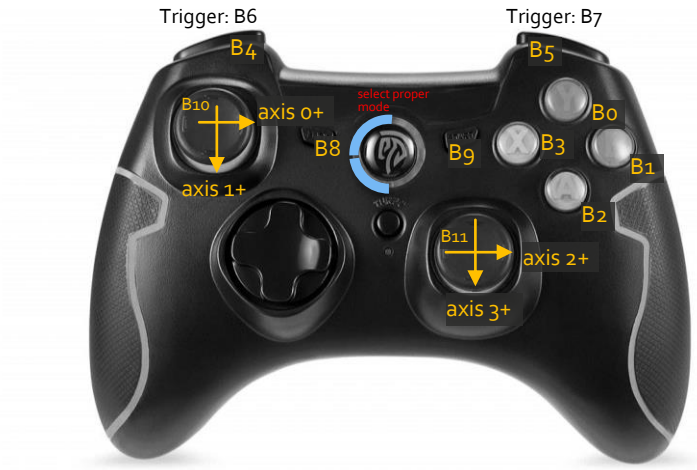
GamePad

Gamepad Controls Mapping



Button Behavior:

- not pressed: 0
- Pressed: 1

Axis behavior:

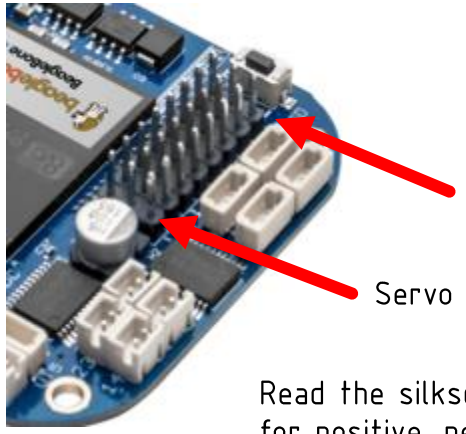
- Right returns positive values
- down returns positive values

Servos

Bridge Power to the liPo connector

Without a power source available at the positive (third pin) input of the liPo connector, the board has insufficient current available to the servos to drive servos at full torque or to drive multiple servos.

A safe fix is to solder the positive terminal of the DC jack to the third pin of the connector shown. When a battery is connected, the pins correspond to 0.0v, 3.7v, and 7.2v terminals of a 2-cell lipo.



Read the silkscreen to see correct connector orientation for positive, negative, and signal.

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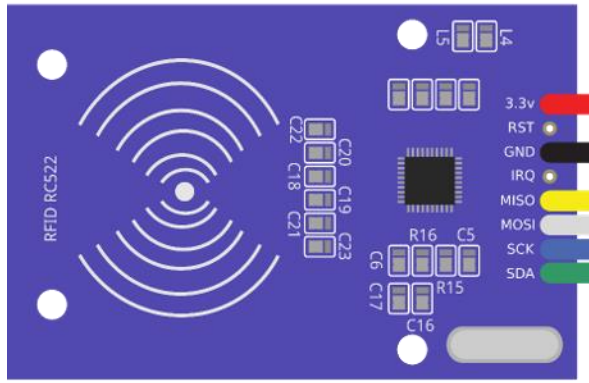
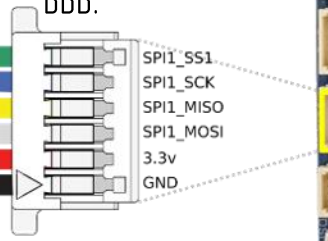
RFID reader

RC522 low-cost
RFID Scanner



Plug into 6-pin
JST-SH port on
bbb.



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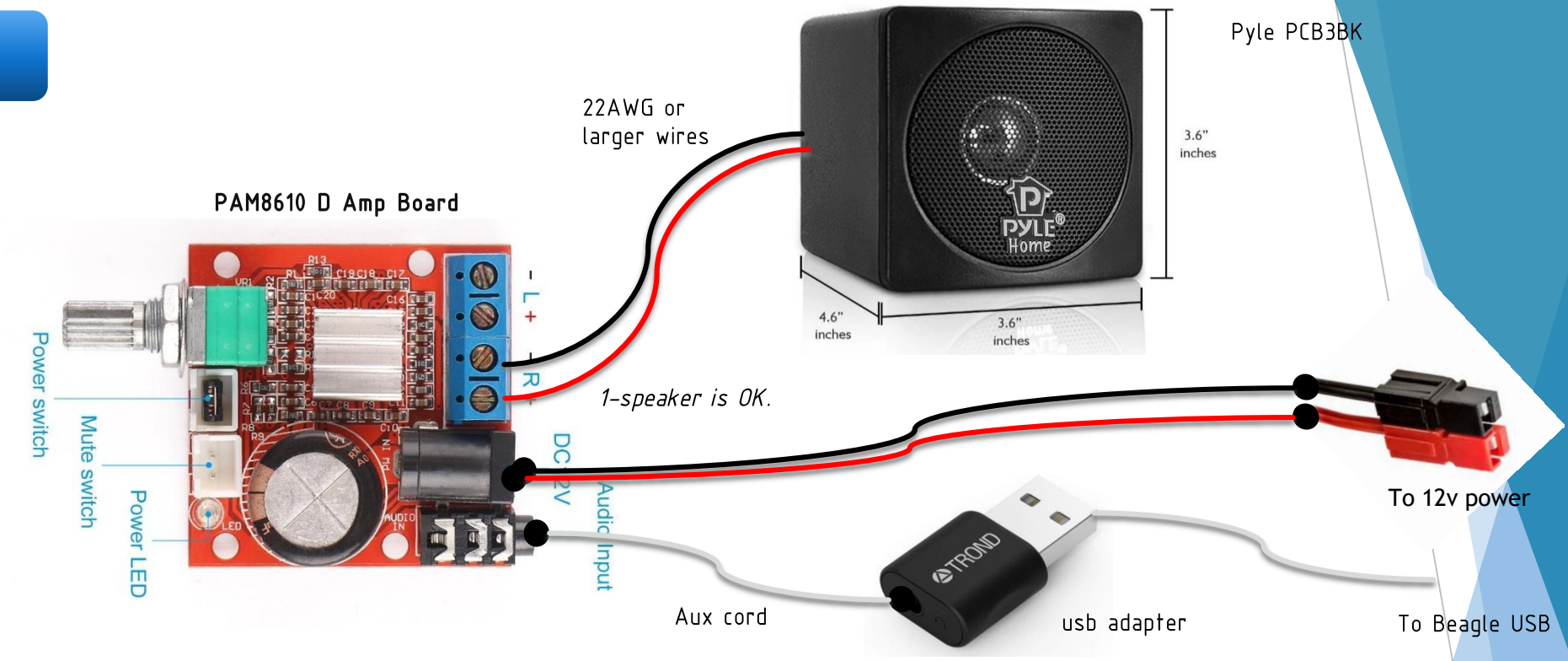
Audio Amp



Alternative:

The above setup will support at least 10 watts (this is actually quite loud – easy to hear in a crowded room).

It is also possible to find a speaker which receives BOTH power AND signal over USB. These will be more compact but less powerful. (The speaker shown is 3w max)

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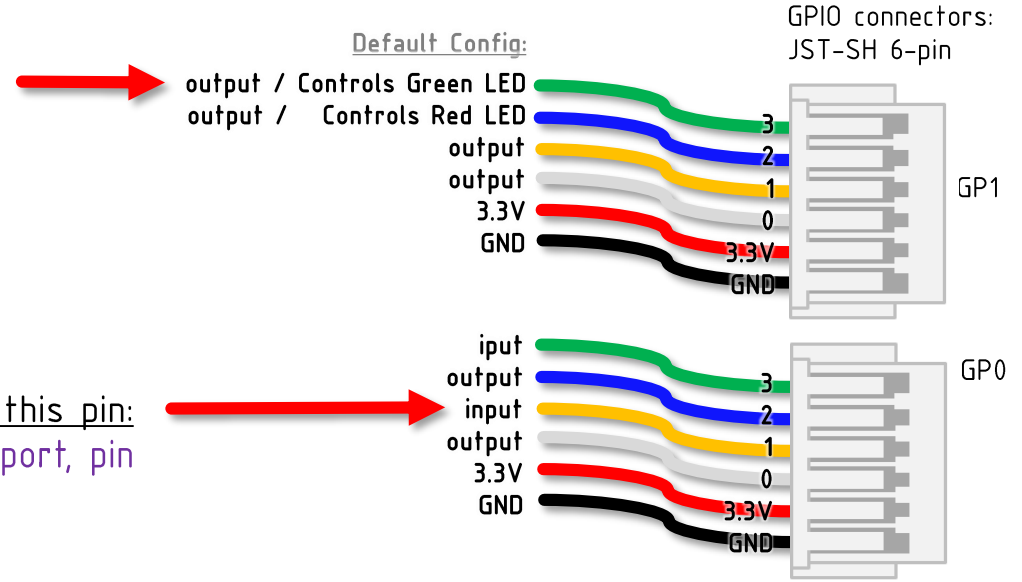
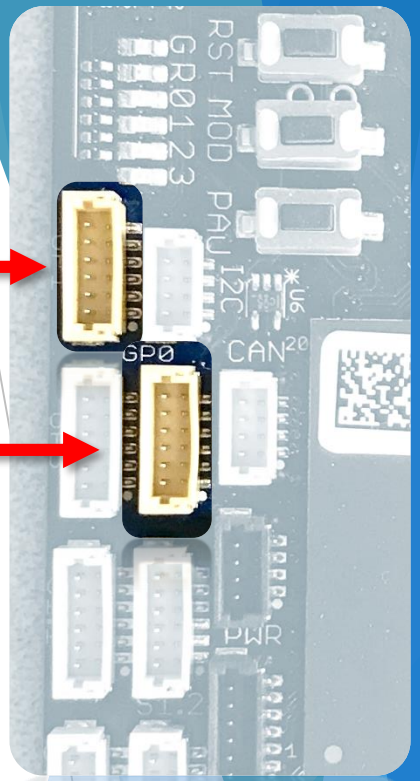
GPIO Connections

Example call for writing to this pin:
write(1,3,1) # arguments: port, pin, state

Example call for reading this pin:
read(0, 1) #arguments: port, pin



GPIO connectors:
JST-SH 6-pin



SCUTTLE naming convention (used in L1_gpio.py)

Note: JST wires don't come with the proper color sequence. They must be rearranged.

Connector vector image preserved for later use.

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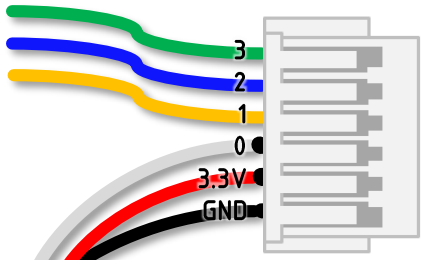
GPIO Example - Relay



GP0 connector
JST-SH 6-pin on
Beagle

Relays are appropriate for switching of high powered devices. For heavy pumps, motors, fans, or floodlights, it may be best to add a dedicated power source such as an ancilliary battery. Then, control the power to the device using logic-level signals and a relay or solid-state relay.

3v Relay with both Normally Open (NO) contact and Normally Closed (NC) contact.

This kind of board usually includes an opto-coupler and your powered device does NOT need to share a ground with your microcomputer. There are two circuits here, isolated from each other.

Heavy Duty Pump

Heavy Duty Power Supply

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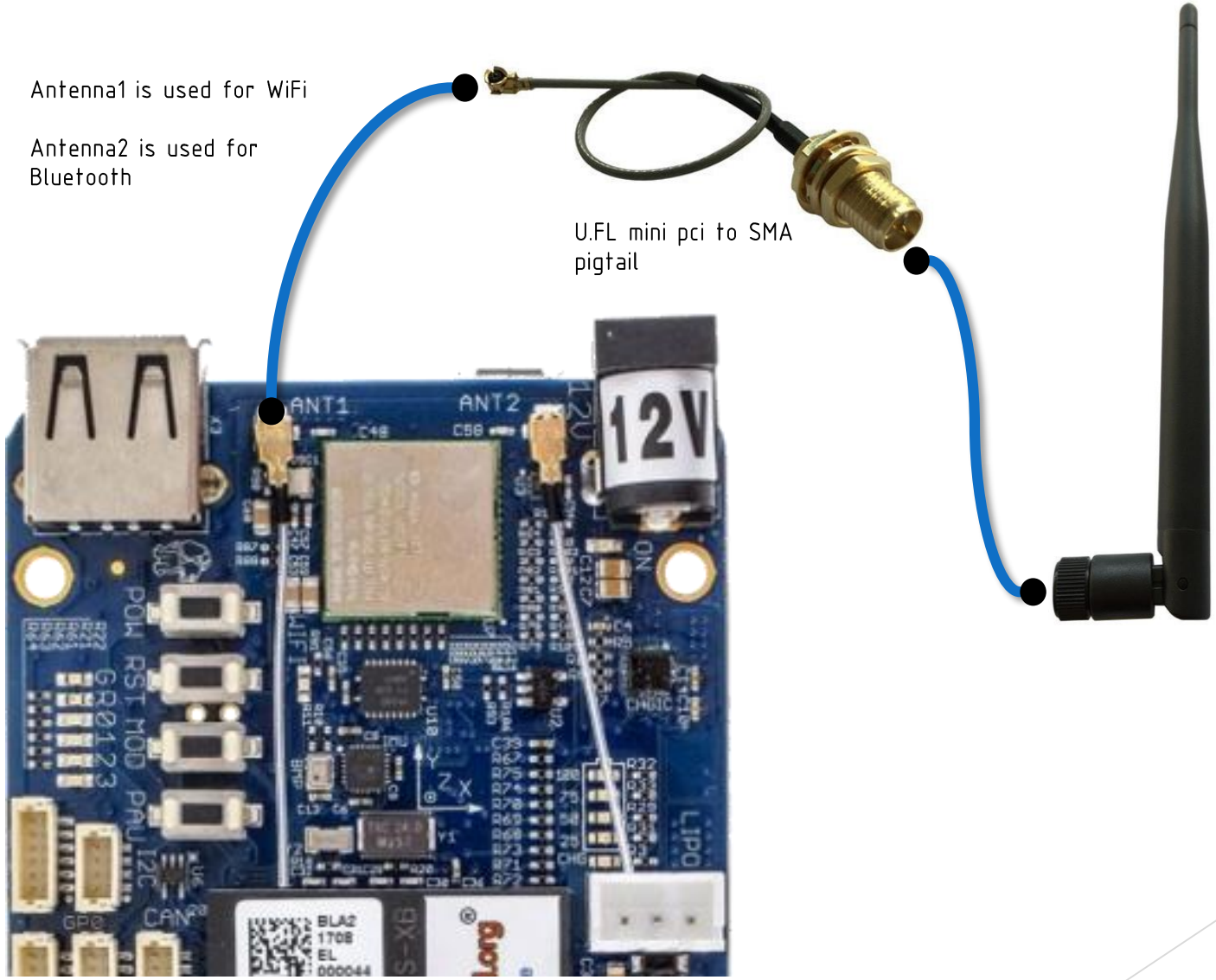
Wifi Antenna

Users can replace the small onboard antenna with their own selected antenna.

Antenna1 is used for WiFi

Antenna2 is used for Bluetooth



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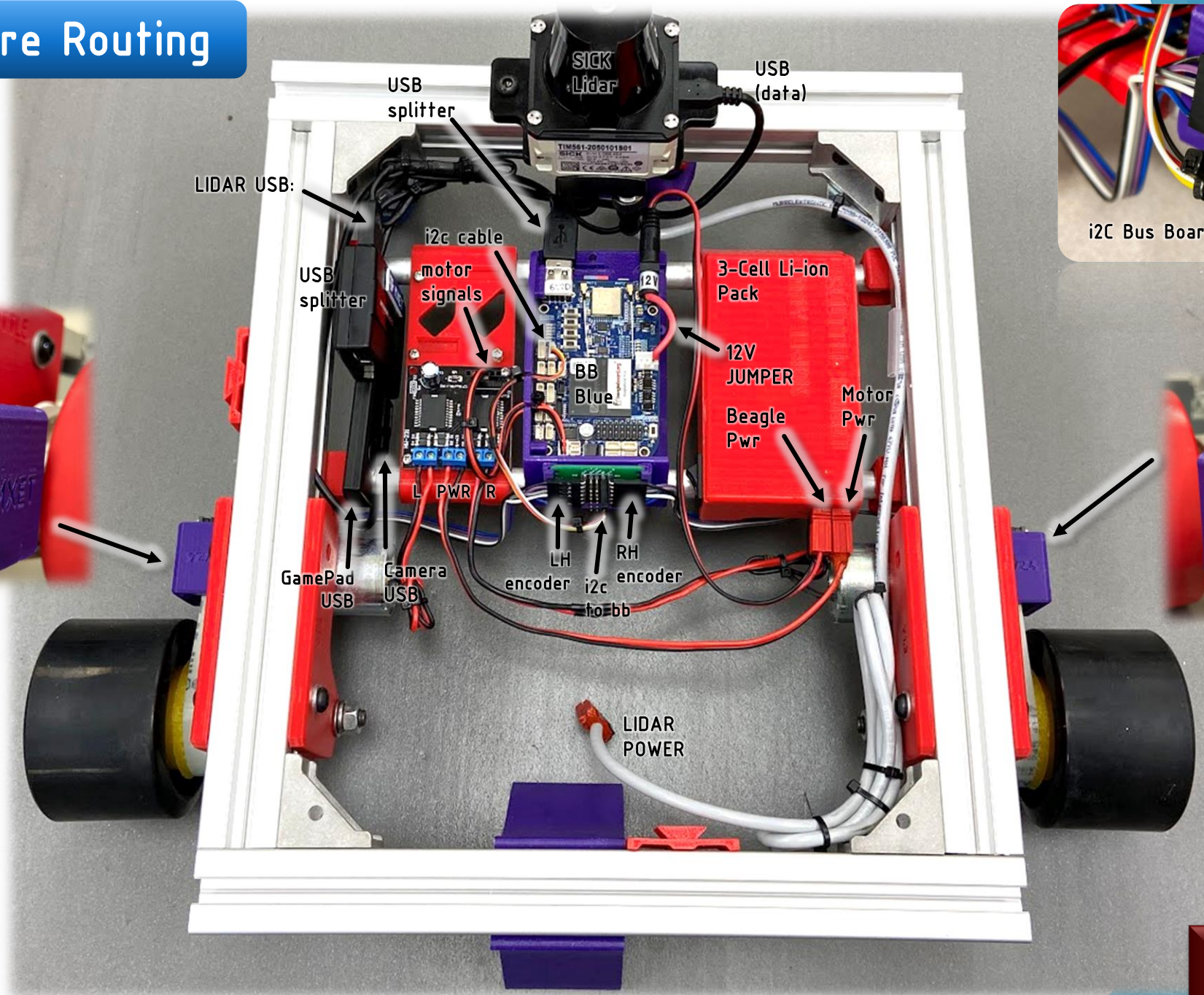
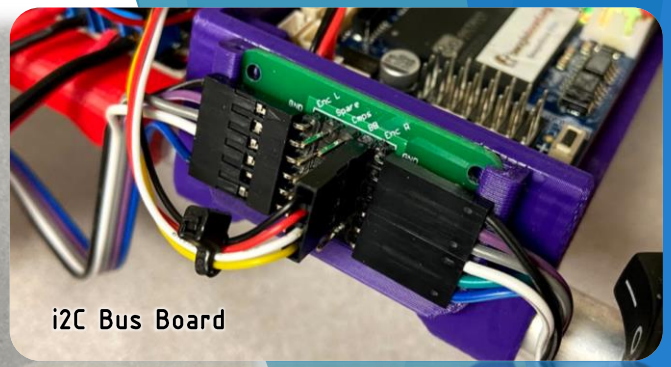
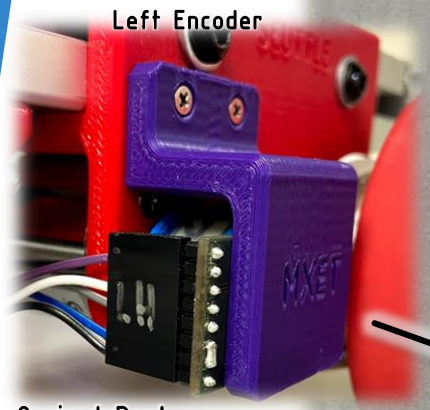
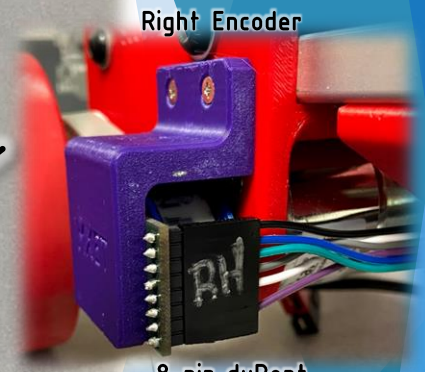
SCUTTLE Wire Routing









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