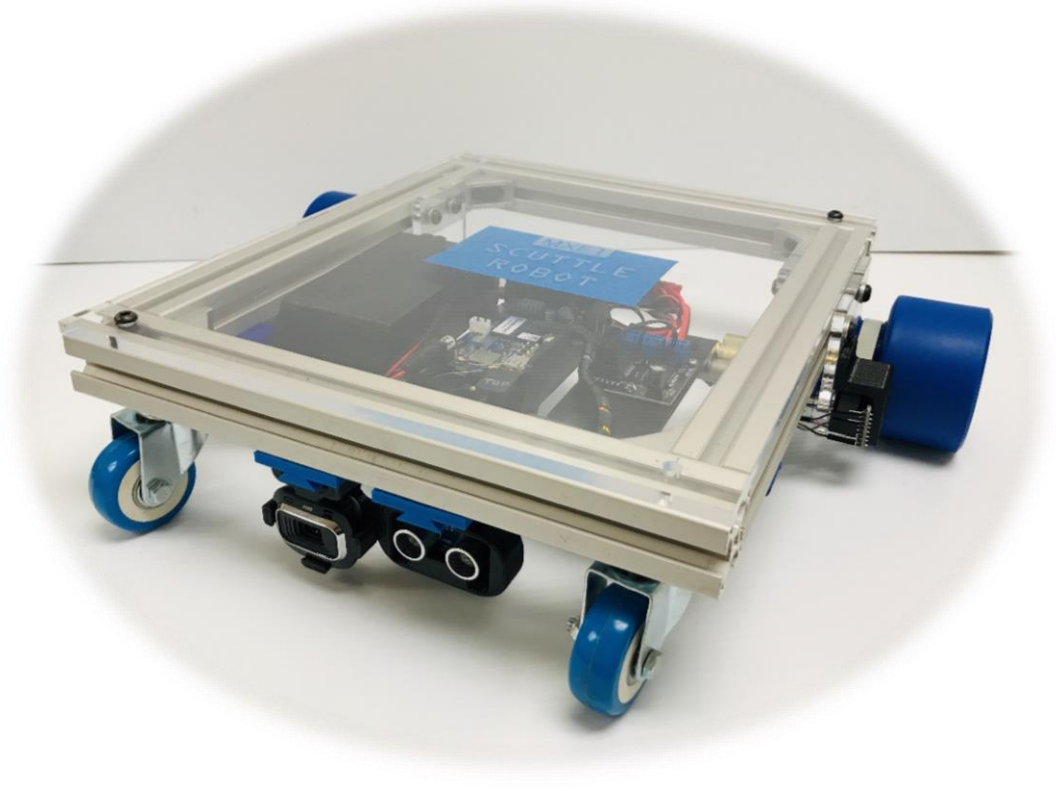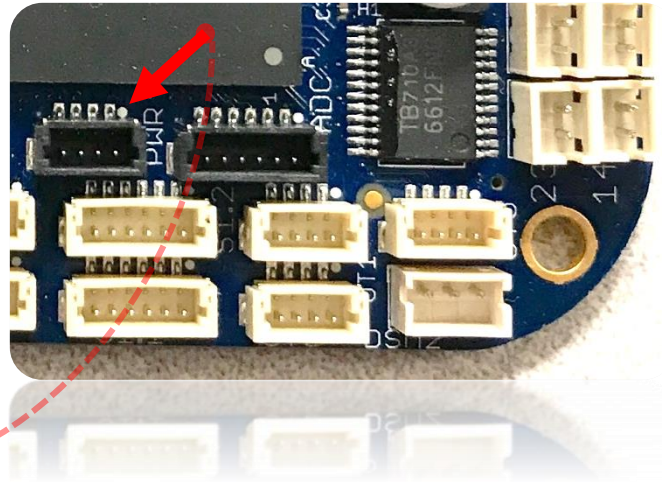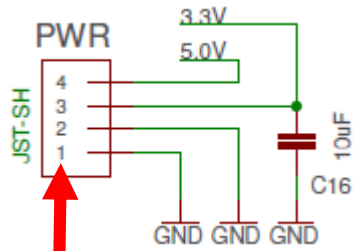# Scuttle robot Wiring Guide (rev 2019.11.07)
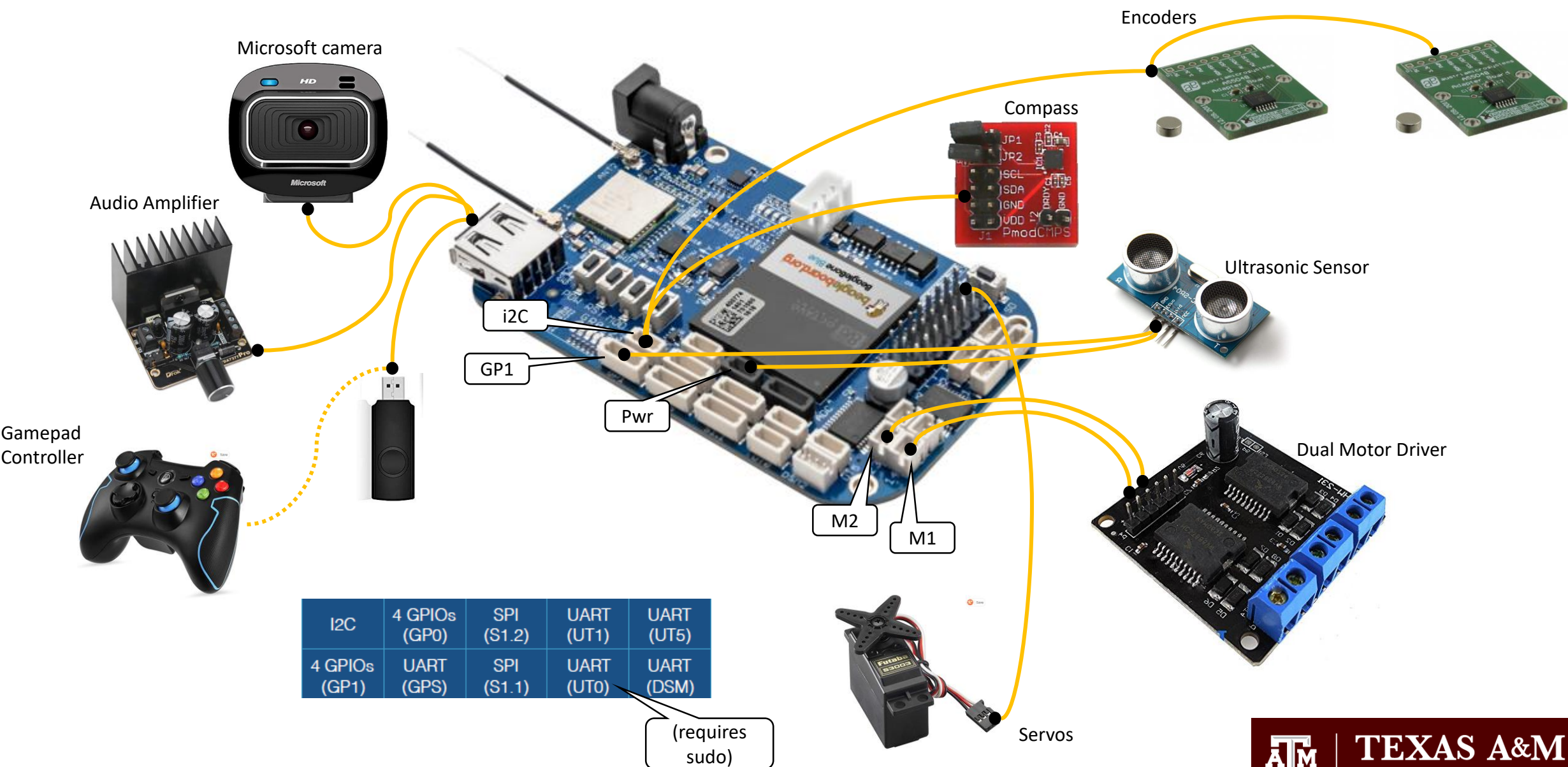
Important Info:
To match the beaglebone pins to the pin numbers on the diagram:
The tiny white circle on the silkscreen at each connector indicates "pin1"

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

All Sensors & Actuators

Microsoft camera

Audio Amplifier

Gamepad Controller

Encoders

Compass

Ultrasonic Sensor

Dual Motor Driver

Servos

i2C

GP1

Pwr

M2

M1

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

(requires sudo)

TEXAS A&M UNIVERSITY

Motor Driver Signal Cables

M2 controls Right motor

M1 controls Left motor

in1 on DuPont connector goes to in1 on driver

Motor Driver Top View
HW-231 Motor Driver

Power wires are 18 AWG

Right Motor drives CW on positive command

(29cm)

Power Supply

(26cm)

(20cm)

Left Motor drives CCW on positive command

GND here

in1
in2
in3
in4

Ground is not connected because the BBB has a common ground to the battery pack.

(Strip 6mm & tin this end)

Solder & heat shrink this end

Pin 1 should be HIGH when motor is driven FORWARD

The hardware design convention is pin 1 gets the square solder pad.

Motor1 Pin1
Motor1 Pin2

Motor2 Pin1
Motor2 Pin2

TEXAS A&M UNIVERSITY
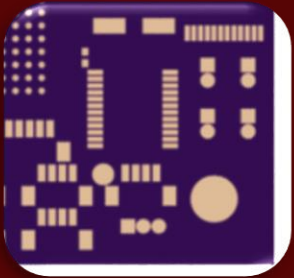
Ultrasonic Distance Sensor (GPIO)

1) VCC
2) Trigger
3) Echo
4) GND

Connector Style: JST-SH 4-pin

PWR

JST-SH

4
3
2
1

3.3V
5.0V
5v

10uF
C16

GND GND GND

Connector Style: JST-SH 6-pin

GP1

GND
3.3V
GPIO3_2
GPIO3_1
LED_RED
LED_GRN

1
2
3
4
5
6

JST-SH

TEXAS A&M UNIVERSITY
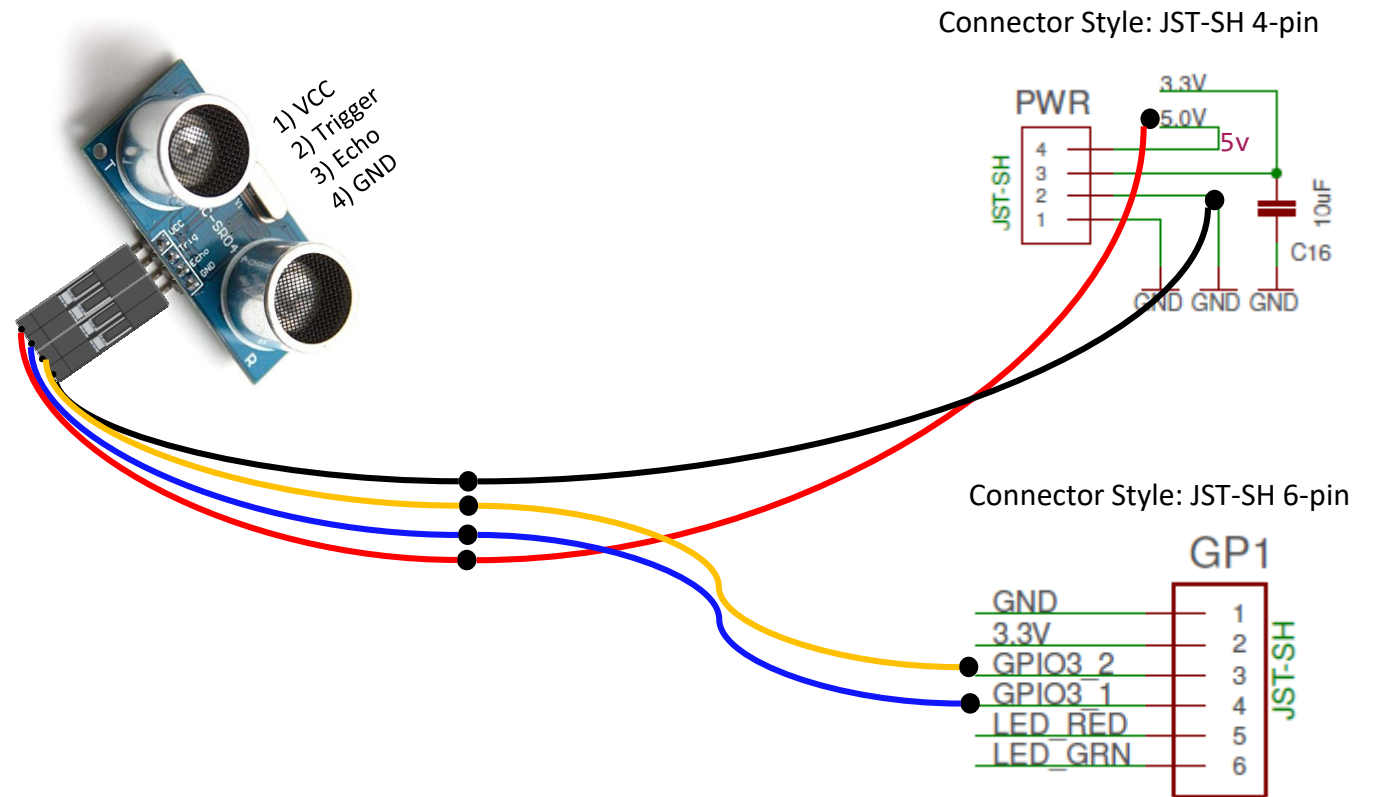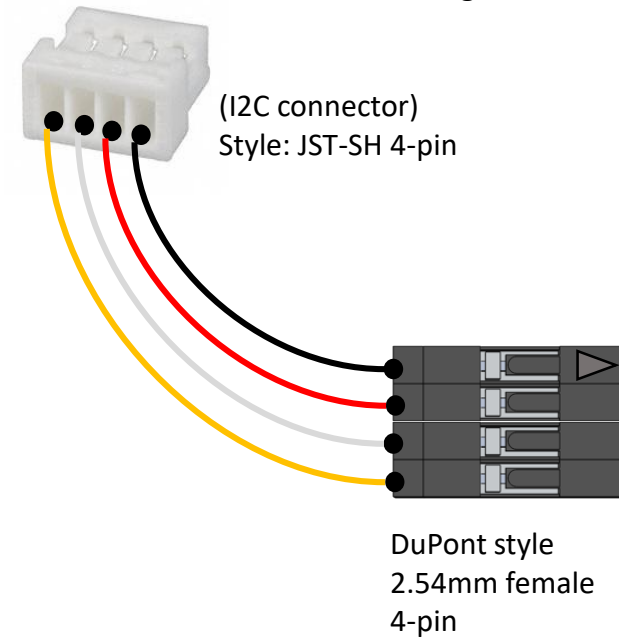
Beaglebone to I2C bus cable

Diagram

BeagleBone I2C Connector
Style: JST-SH 4-pin

I2C

GND	1
3.3V	2
I2C1_SCL	3
I2C1_SDA	4

Plugs into I2C Bus

Cable Design

(I2C connector)
Style: JST-SH 4-pin

DuPont style
2.54mm female
4-pin

TEXAS A&M UNIVERSITY
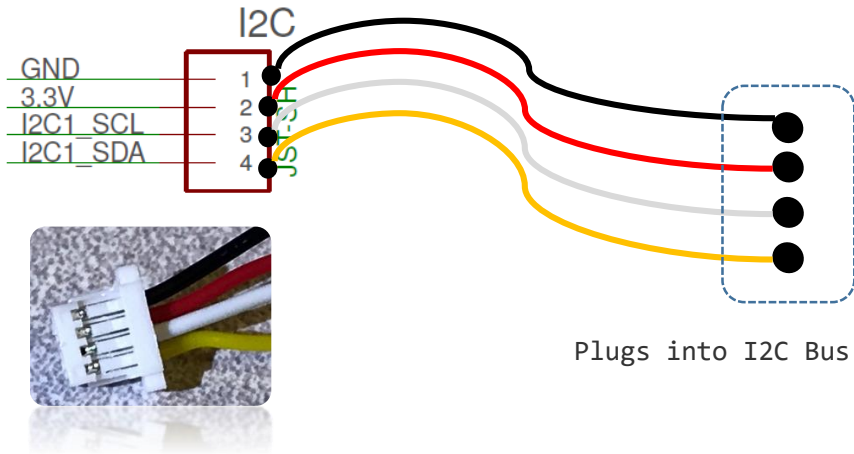
Compass CMPS or CMPS2 (I2C)

BeagleBone I2C Connector
Style: JST-SH 4-pin

I2C

GND — 1
3.3V — 2
I2C1_SCL — 3
I2C1_SDA — 4

Nodes on the I2C bus
board are indicated here

Compass

SCL
SDA
GND
VDD
PmodCMPS
J1
JP1
JP2

TEXAS A&M UNIVERSITY
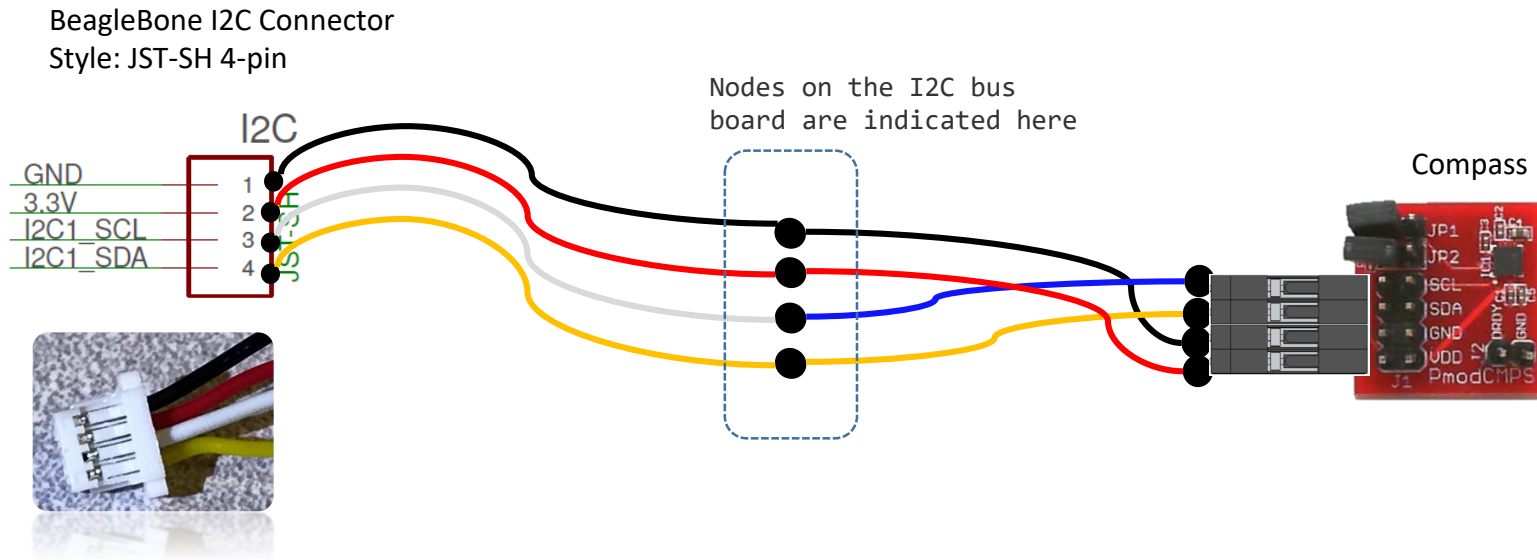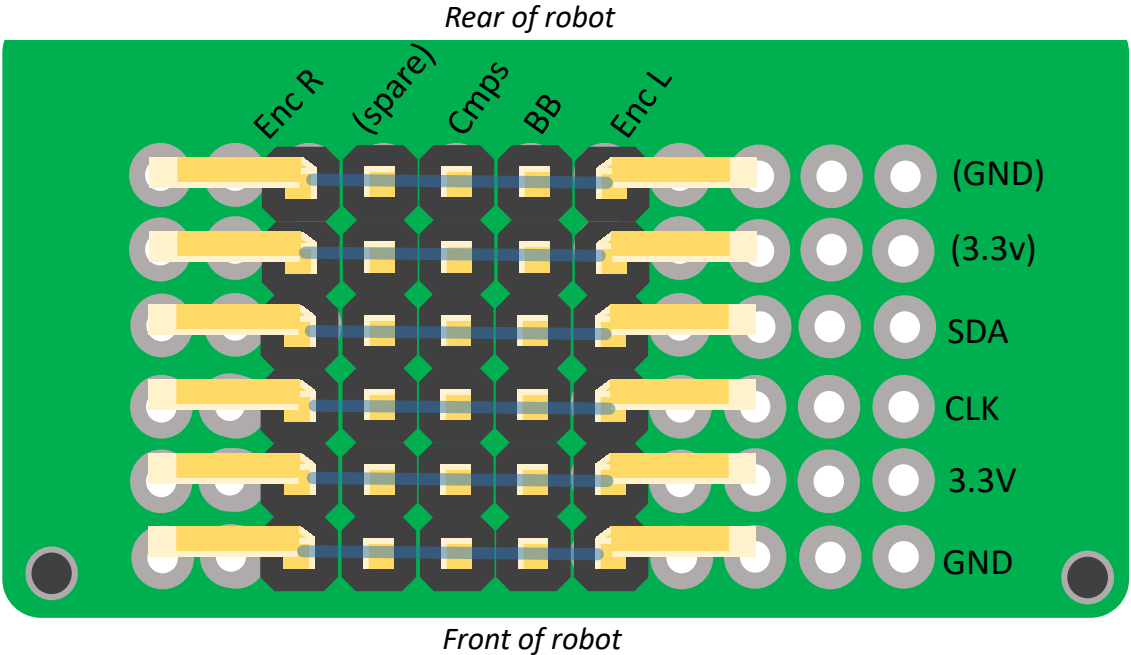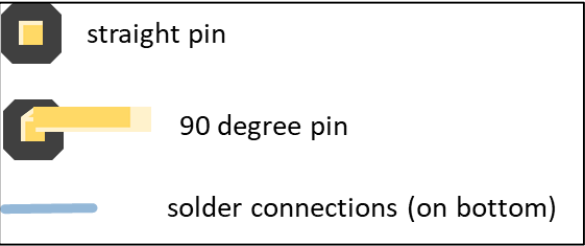
I2C Bus Board

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.
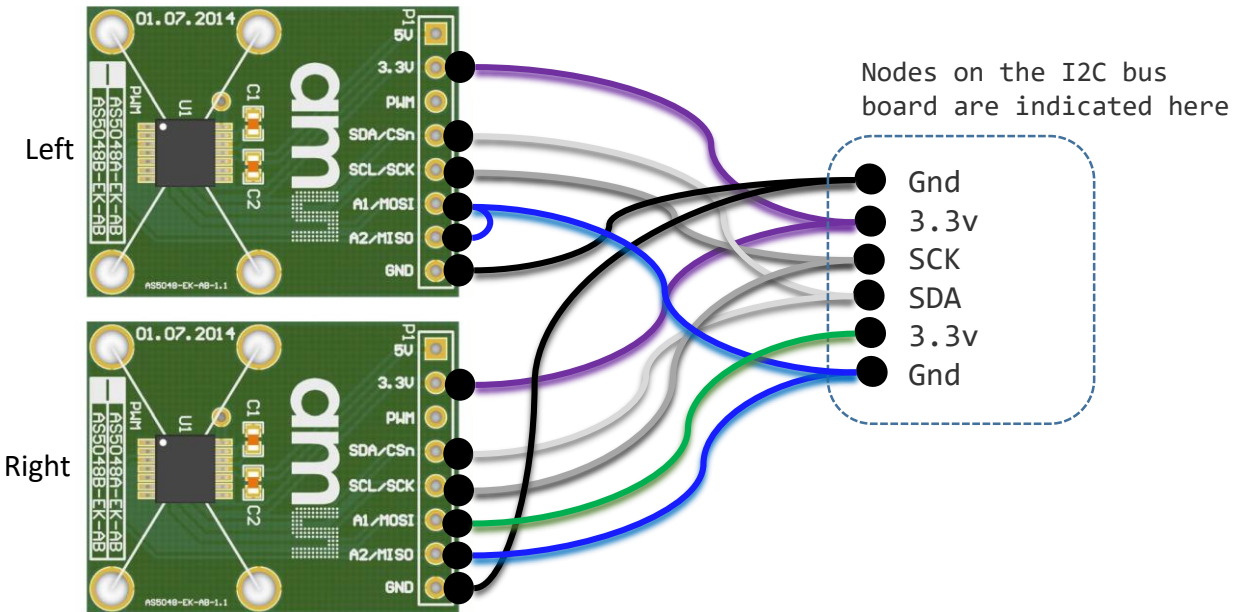

Rear of robot

Enc R (spare) Cmps BB Enc L

(GND)
(3.3v)
SDA
CLK
3.3V
GND

Front of robot

Screw Hole

straight pin

90 degree pin

solder connections (on bottom)

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

Left

Right

Nodes on the I2C bus
board are indicated here

Gnd
3.3v
SCK
SDA
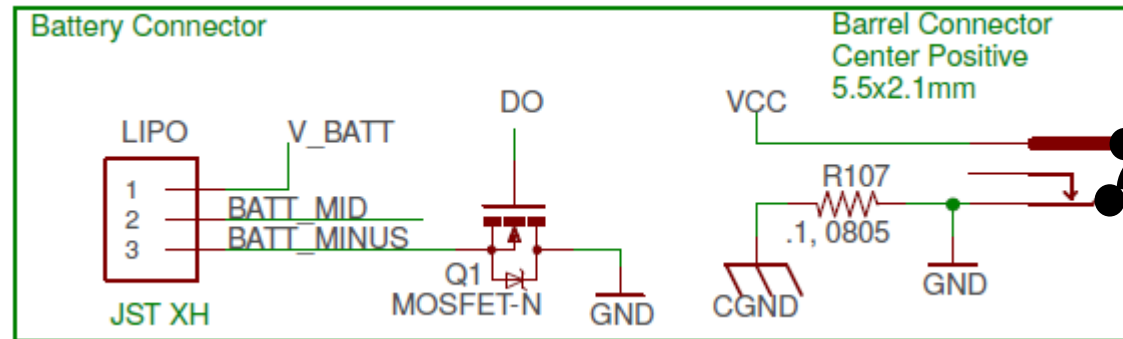3.3v
Gnd

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

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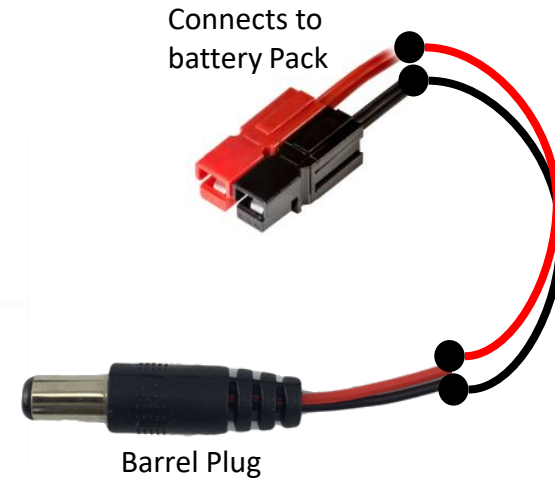the pins A1 and A2 using solder, to
each other.

Encoder Cables

Left Hand

20cm from tip to tip

A1 & A2 soldered together on pcb

Left Hand encoder end (top to bottom): NC / NC / 3.3v / NC / SDA / SCK / NC / A2 / GND

Left Hand bus board end (top to bottom): GND / 3.3v / SCK / SDA / 3.3v / GND

Encoder ends (different)

Bus Board Ends (matching)

Right Hand

Right Hand encoder end (top to bottom): NC / 3.3v / NC / SDA / SCK / A1 / A2 / GND

Right Hand bus board end (top to bottom): GND / 3.3v / SCK / SDA / 3.3v / GND

TEXAS A&M UNIVERSITY

Battery Connector

LIPO
V_BATT
DO
1
2 BATT_MID
3 BATT_MINUS
Q1
MOSFET-N
GND
JST XH

Barrel Connector
Center Positive
5.5x2.1mm
VCC
R107
.1, 0805
CGND
GND

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

Connects to battery Pack

12 V

Barrel Plug

TEXAS A&M UNIVERSITY
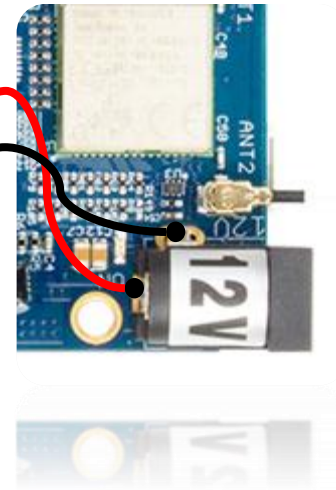
Battery Pack

Bottom Side

11.1v

7.4v

3.7v

0.0v

3-Cell 18650 holder

All Wires 18AWG
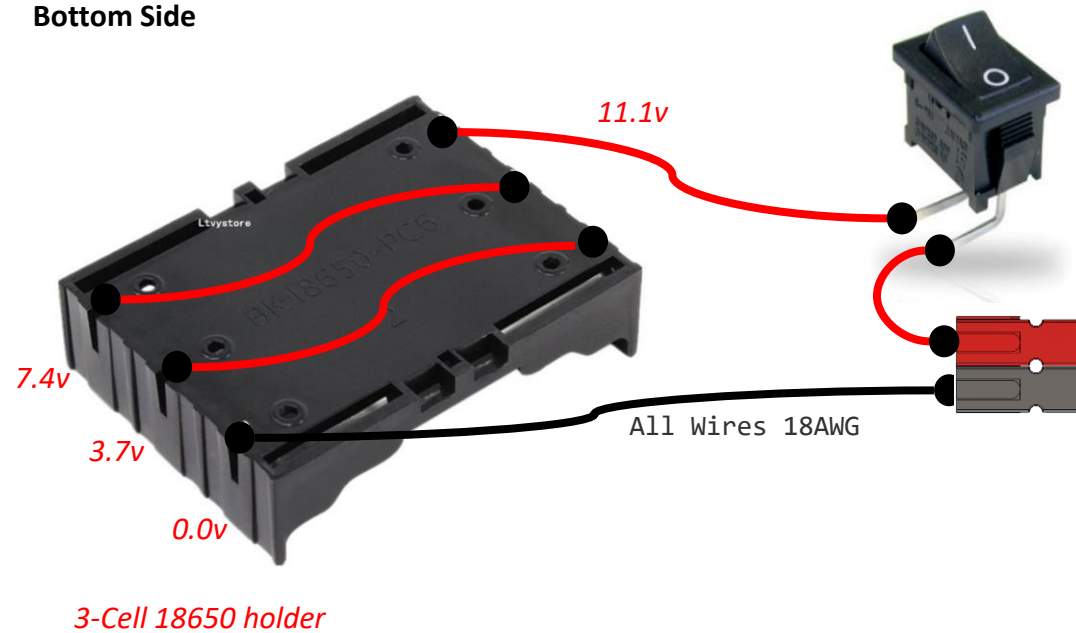
Switch PN:SRB22A2FBBNN
Carries 10A max

Two pairs of Anderson connectors are attached here.

TEXAS A&M UNIVERSITY

LIDAR

Lidar Device

TiM 561

Power Connector Diagram (lidar side)

POWER connection (supply voltage)

Connection "Power"
5-pin M12 plug

Power Cable: 1 DC 9 ... 28 V
(brown) → 2 SYNC/DEVICE READY
(white) 3 GND
(blue) 4 n.c.
5 n.c.
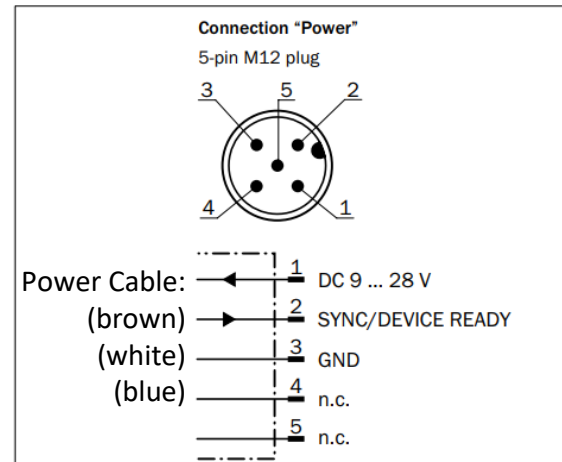
LIDAR-side connector (male pins)

Power Cable Diagram (plugs into lidar)
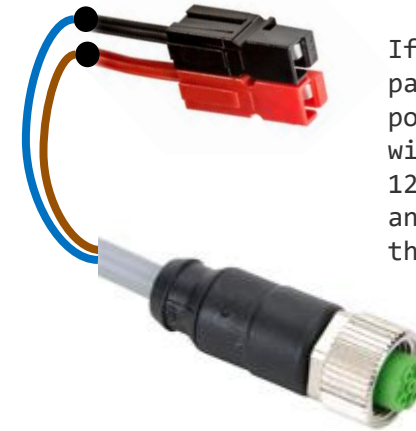
If the indicated cable part number is used for power to the lidar, brown will be crimped into the 12v positive APP terminal and blue is crimped into the negative.
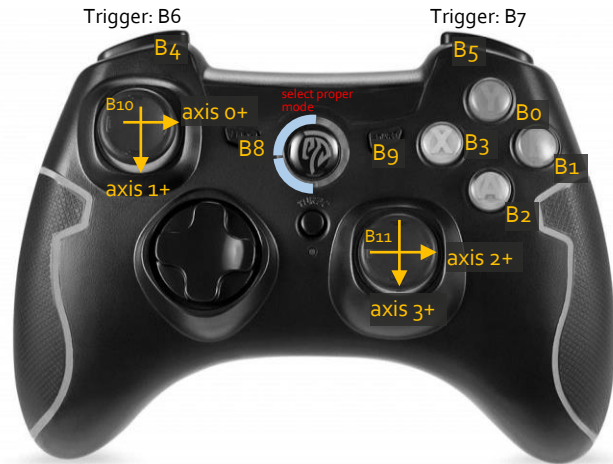
Cable: 7000-12241-2150300

Cable-side connector (female pins)

Typical Lidar power consumption: 2.1w

GamePad

Gamepad Controls Mapping

Trigger: B6   Trigger: B7

Button Behavior:
- not pressed: 0
- Pressed: 1

Axis behavior:
- Right returns positive values
- down returns positive values

```python
# Get Button States
x_button = joystick.get_button( 3 )
l_button = joystick.get_button( 6 )
r_button = joystick.get_button( 7 )
```

```python
l_joy_x = joystick.get_axis( 0 )
l_joy_y = joystick.get_axis( 1 )
```

Servos

Bridge Power to the liPo connector

positive terminal

solder to third pin

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.

Servo Channel 8

Servo Channel 1

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

RFID reader

RC522 low-cost
RFID Scanner

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

SPI1_SS1
SPI1_SCK
SPI1_MISO
SPI1_MOSI
3.3v
GND

3.3v
RST
GND
IRQ
MISO
MOSI
SCK
SDA

RFID RC522