Icthystick Upgrade Kit (cable kit version)

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Supplies and kit contents

You will need:

- Wire strippers
- Soldering iron and solder
- Existing Icthystick electronics box
- USB-C cable (to connect to Arduino, if you did not receive it pre-programmed from Acbotics Research)

Base Kit contents:

- Arduino Uno R4 Wifi
- Icthystick Arduino Shield
- Mounting plate
- 5 x M2 5mm screws (phillips head) (one spare)

Cable Kit contents:

- 1x2 microclasp pigtail
- 1x8 microclasp pigtail
- 2x2 microfit pigtail
- 1x3 microfit pigtail
- 2x3 microfit pigtail
- 1x6 microclasp pigtail (in case user wants to add camera in the future)
- Heat shrink

Option 1: USB connector add-on

- Drill an extra hole in the box
- Add Bulgin USB connector (replaces serial in old module)

Option 2: Camera triggered by mag touch

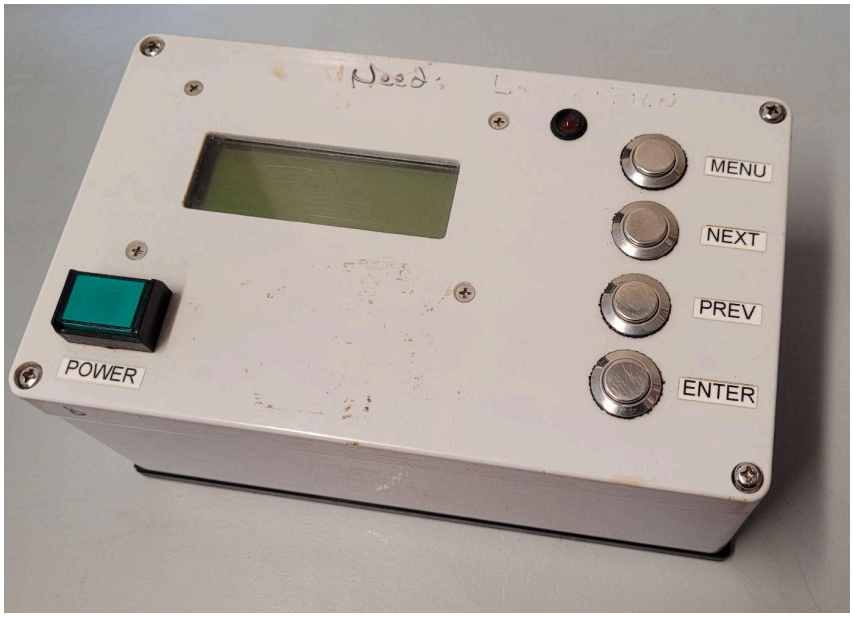
- SPI camera
- External connector
- Internal cable
- You will need to drill an extra hole in the box

Soldering Tips

If soldering using the Icthystick Cable Kit, we recommend the following steps per connection to ensure you wind up with robust connections with electrical isolation:

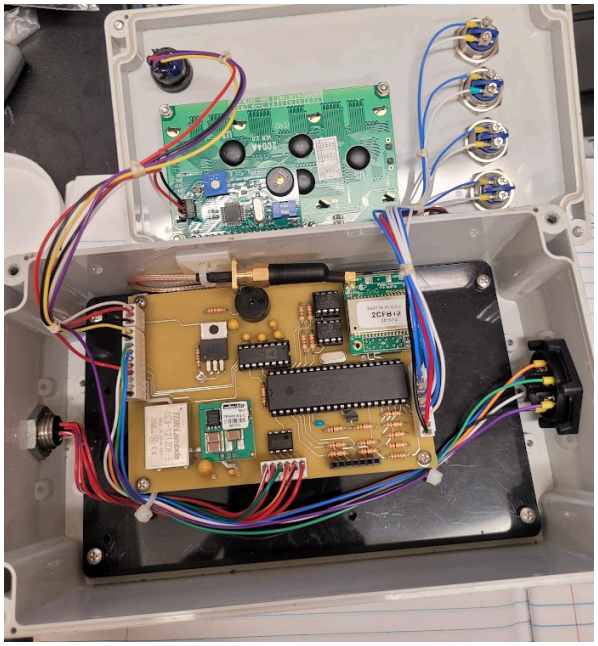
1. Strip wire on the original wire
2. Strip wire on the pigtail cable
3. Thread heat shrink piece about 2x the length of your stripped wire onto the original wire end; slide up away from stripped end
4. Twist original wire and pigtail cable wire together
5. Solder
6. Slide heatshrink over solder joint
7. Use heat gun or soldering iron to shrink the tubing
8. Repeat for each connection between the old cables and the new pigtails.

Upgrading electronics in an existing box [base kit]

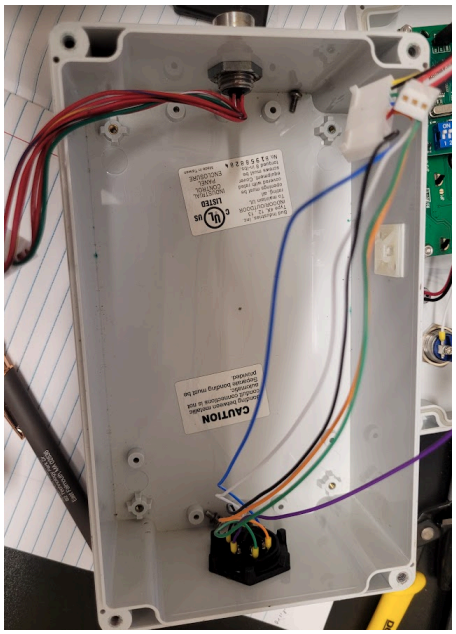


Current icthystick dry box with buttons, LCD, and power button. The upgrade kit will replaces the internal electronics with an arduino and custom shield so that almost any random engineer can add software/hardware features if needed.

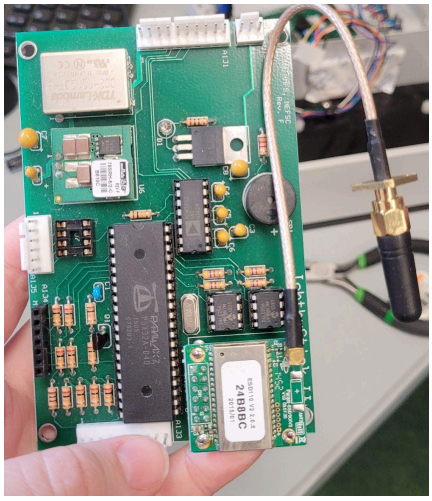
1. Remove corner screws and open the box



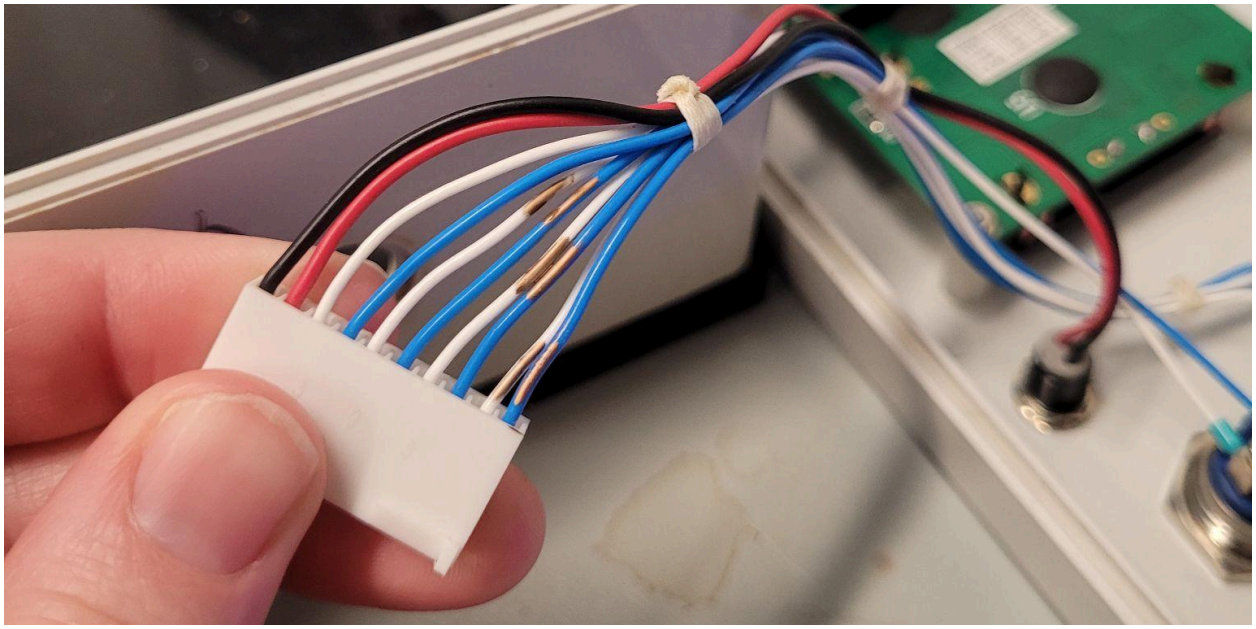
2. Disconnect all cables from the PCB in the lower part of the box and cut zip tie holding antenna, unscrew black plate in bottom to make it possible to remove old PC board and plate together.



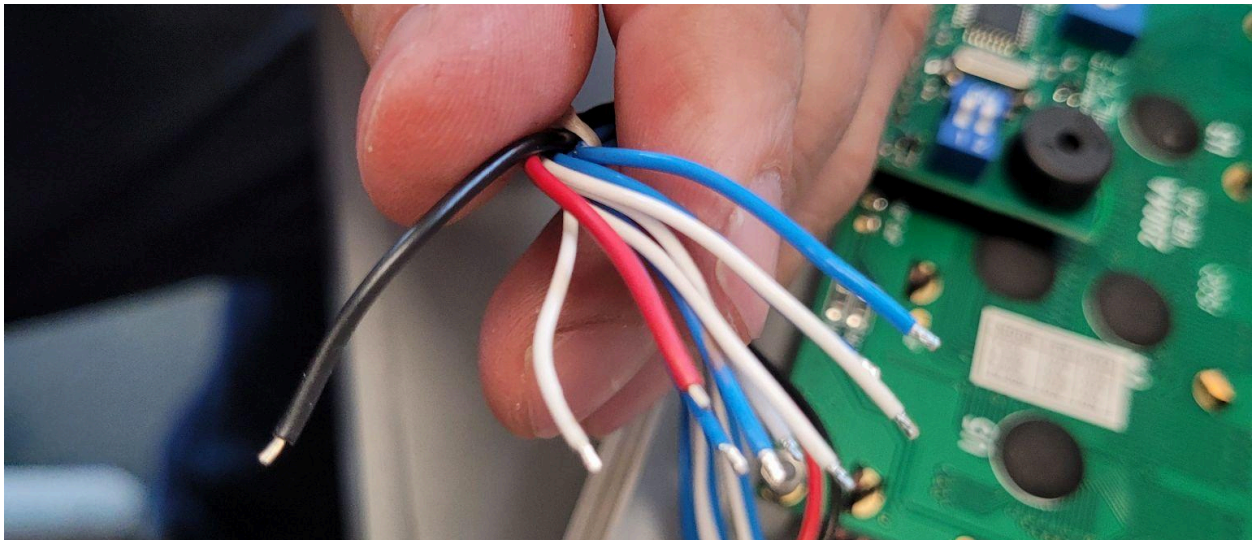
3. Remove old PC board



4. Solder button connector with microclasp 1x8 and 1x2:
    a. Mark pairs of button cables so you can identify the pinout [we used a colored marker and colored each pair at different heights]

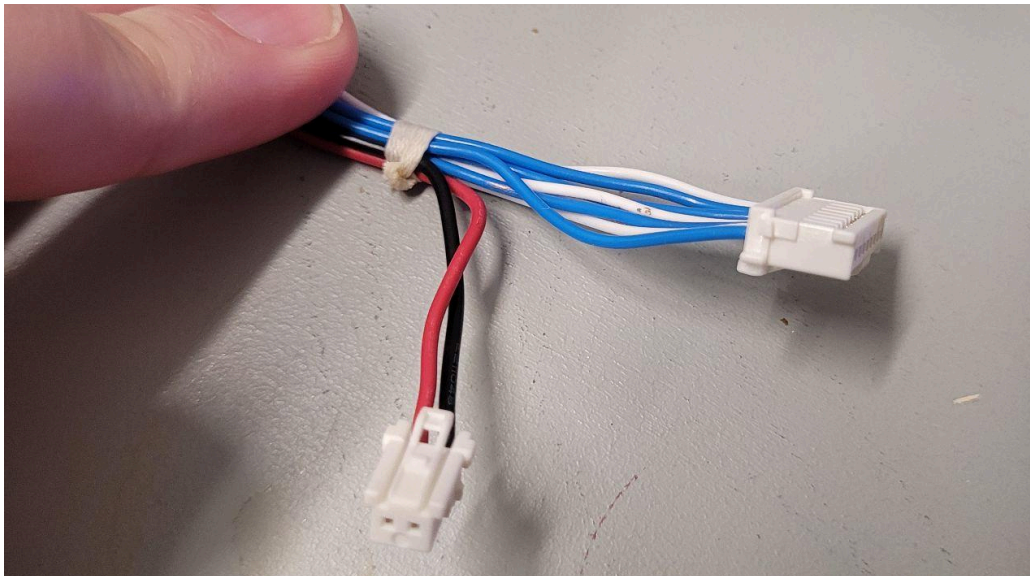


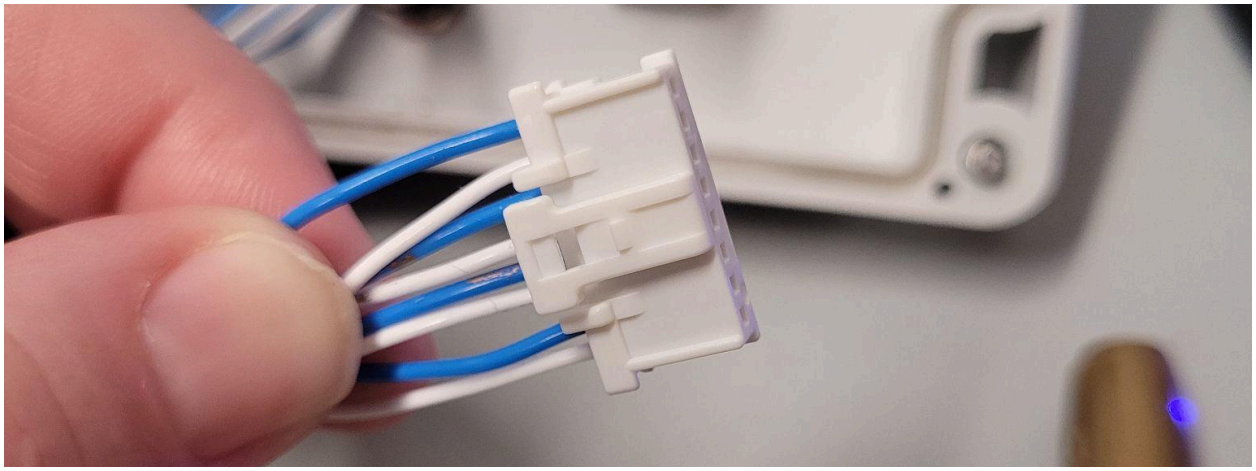
    b. Cut off connector, Strip ⅛” of jacket off of all 10 wires



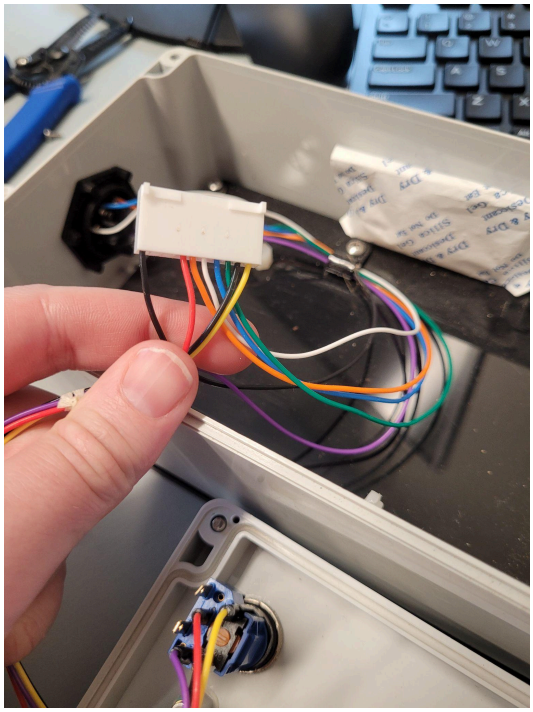
c. Solder LED wires (Red/Black) into 2-pin microclasp pigtail, black=pin 1, red=pin 2; Solder button wires into 1x 8. First connector pin per new connector is labeled in the cable kit.

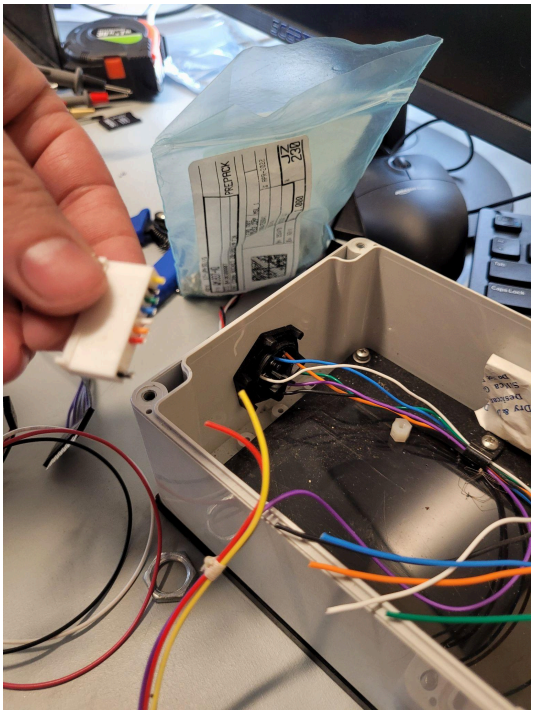
Old connector pin (10 pin)	Wire color	New connector	New connector pin
1	Black	J5	J5-1
2	Red	J5	J5-2
3	White	J3	J3-2
4	Blue	J3	J3-1
5	White	J3	J3-4
6	Blue	J3	J3-3
7	White	J3	J3-6
8	Blue	J3	J3-5
9	White	J3	J3-8
10	Blue	J3	J3-7



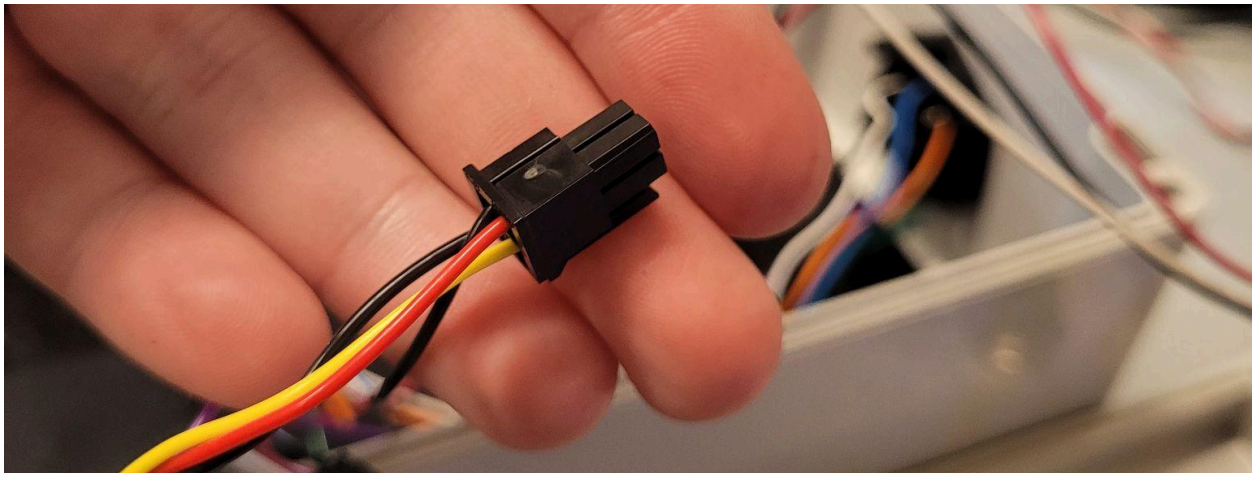


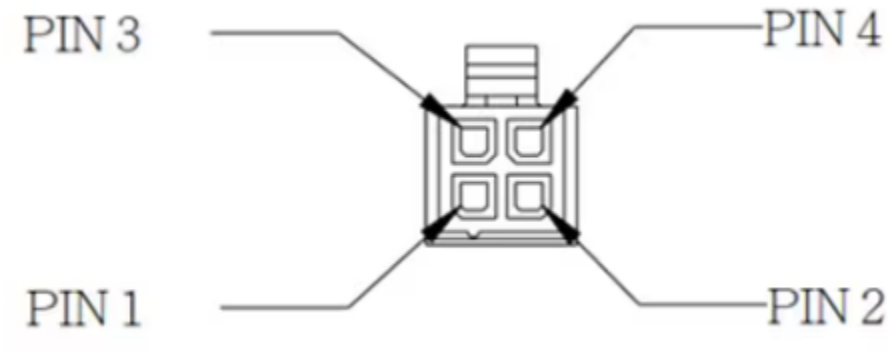
5. Power connector: [Note: the current version does NOT provide UART, will provide USB if desired [see addendum: adding USB]





a. Cut off connector, noting wiring colors/numbers if not as indicated below!!
b. Solder as indicated to microfit 2x2 M connector pigtail

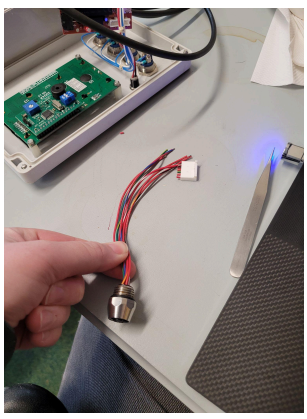


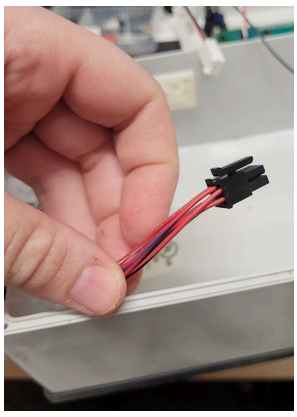


Above: J4 crimped; pin numbers for J4 as shown. Note colors may vary!

Current Pin no.	Current color	New connector/pin no	New pigtail color (digikey part no. WM16116-ND)	Description
1	Black	J4-1	**RED** (YES, it is confusing but the off the shelf cables have this color, oddly)	GND
4	Red	J4-2	**BLACK** (YES, it is confusing but the off the shelf cables have this color, oddly)	Power in [after switch]
5	Orange	NC		Serial [NC]
6	White	NC		
7	Blue	NC		
8	Green	NC		
9	Black	J4-3	**YELLOW**	GND
10	Yellow	J4-4	**ORANGE**	Power switch LED

6. Magnet sensor cable:



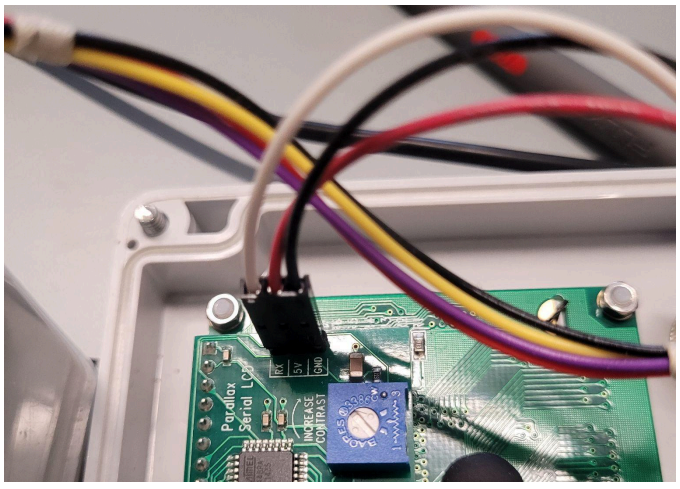


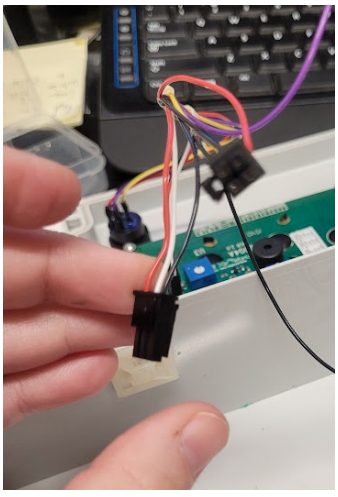
   a. Cut cable [Note pinout if colors differ from below]
   b. Strip each wire
   c. Put through hole in box, tighten nut. **If you solder the microfit on first before installing the connector in the box, the nut will not fit over the connector**
   d. Solder microfit 2x3 pigtail to magnet sensor wires as indicated below

Current Pin no.	Current color	New connector/pin no	New pigtail color Digikey WM1619-ND	Description
1	Red/white stripe	Pin 6 J1	black	Power
2	Red/Red	Pin 1 J1	red	GND
3	Green/yellow	Pin 2 J1	orange	Pin5- transceiver
4	Red/orange	Pin 3 J1	yellow	Pin6 transceiver
5	Red/black	Pin 4 J1	green	Pin7 transceiver
6	Red/blue	Pin 5 J1	brown	Pin 8 transceiver

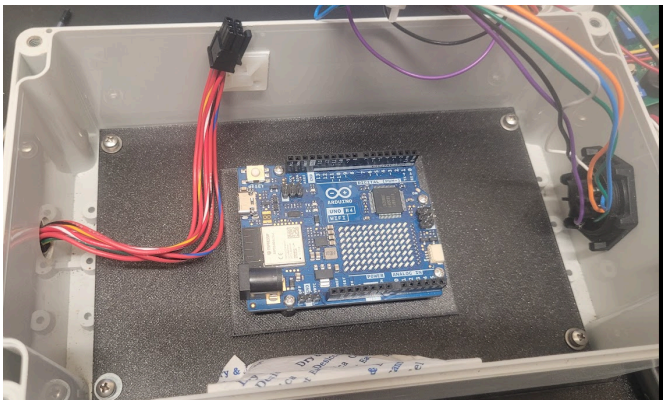
7. Crimp 1x3: cut off old connector
    a. Cut cable [Note pinout if colors differ from below]
    b. Strip each wire
    c. Solder to pigtail J2 as follows:

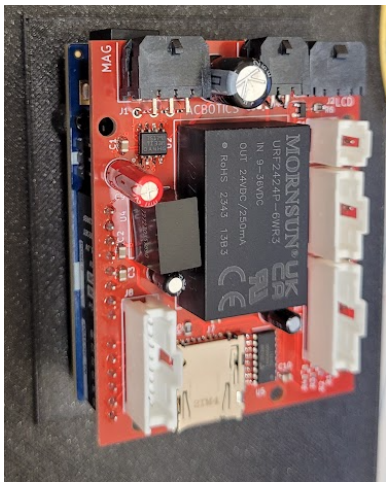
Current Pin no.	Current color	New connector/pin no	Description
1	Black	J2-1 (Pin 1 J2)	GND
2	Red	J2-3 (Pin 3 J2)	POW
3	White	J2-2 (Pin 2 J2)	SIG



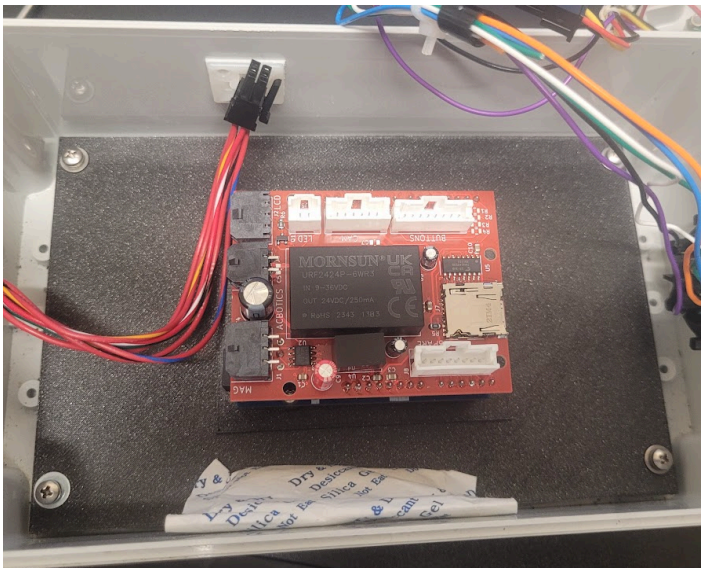


8. Screw in new base plate. Attached Arduino Uno R4 wifi to the new base plate using M2 x 5.5 mm phillips head screws. Note: barrel connector on Arduino Uno R4 should face the magnetic sensor connector as shown; this means the new plate should be installed with the wider-space holes facing the mag connector.

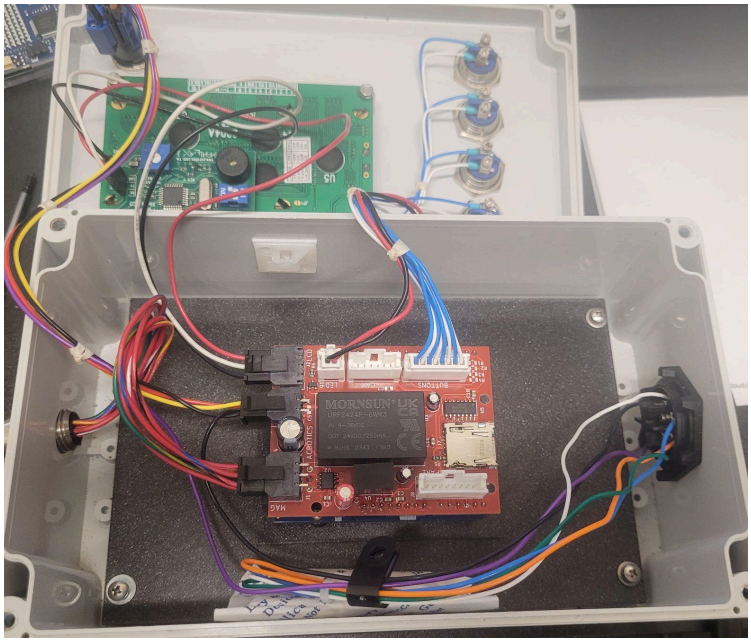




9. Push the custom icthystick shield onto the arduino



10. Connect all cables to appropriate connectors on the icthystick shield.



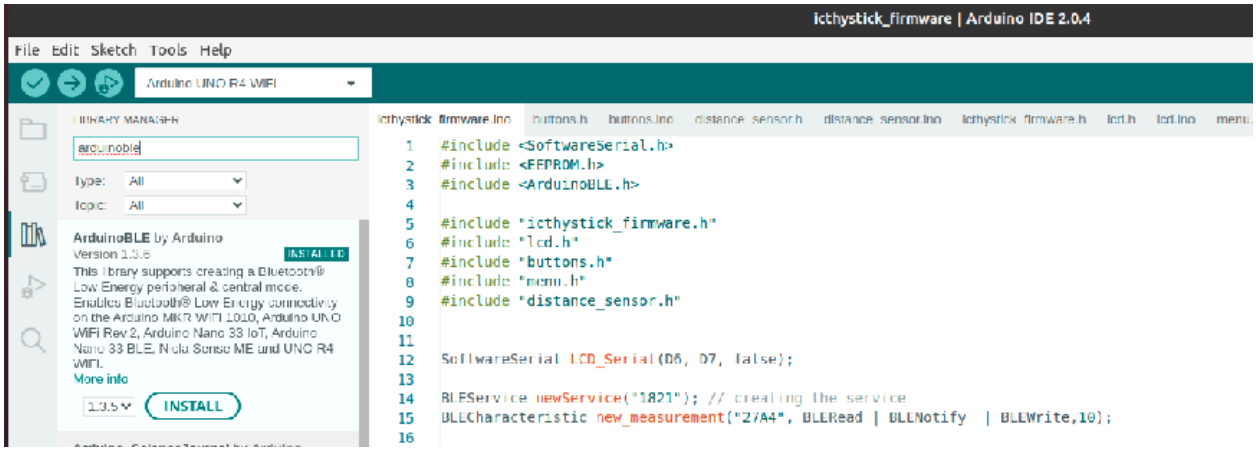
11. Close box

Programming Arduino Uno R4

1. Get the icthystick_firmware from github: https://github.com/Acbotics-Public/Icthystick2.0/tree/main/icthystick_firmware

2. Open up icthystick_firmware.ino in Arduino IDE (it will open a bunch of .ino files automatically)

3. Follow instructions here to set up the R4 to work with arduino IDE (if you have not done this already): https://docs.arduino.cc/tutorials/uno-r4-wifi/r4-wifi-getting-started/
4. Install dependencies: Add Library -> search for ArduinoBLE



5. Connect your arduino via USB cable
6. Hit the program button (Arrow)