PCB: Mainboard

The Mainboard contains the Teensy 4.1 microprocessor unit and direct connections for components including, PWM signal to the BLDC motor electronic speed controller (ESC), input from the flow sensor (Flow), pressure sensor (Pressure), and current sensor (Current Sensor), and output to the red LED indicating ready to run (LED1) and to the green LED indicating the start timer (LED2). A coin cell battery holder (BAT1) allows Teensy's RTC to keep time while the unit is disconnected from external power. Teensy's built-in microSD card allows for data logging. Teensy's microUSB adapter is connected to a USB-A connector on the Mainboard, allowing external connection to a PC via the bulkhead connector on the end cap. The Mainboard is mounted on a tray between the end cap and Battery Holder Bottom with brass spacers through the four mounting holes.

Note: Pins Int2 is unused as of the pump's current state.

<table>
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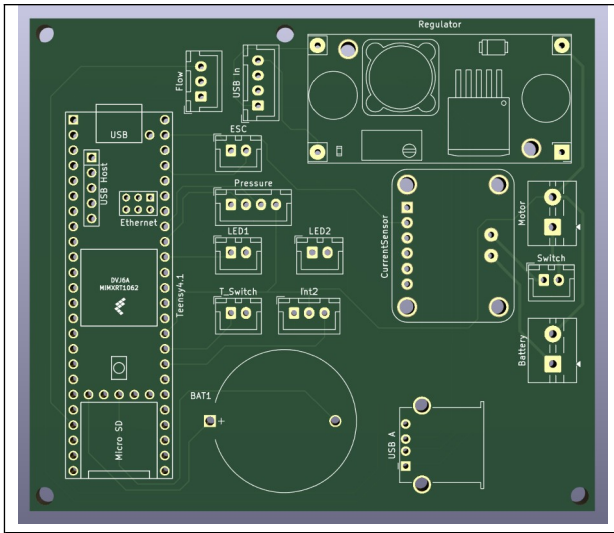
<td> 
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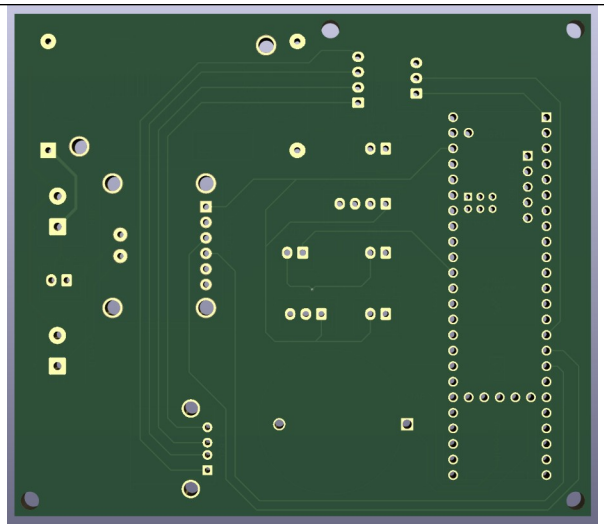
<td>  </td>
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<tr>
<td>PCB: Mainboard (Front)</td>
<td>PCB: Mainboard (Back)</td>
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</table>

Bill of Materials (BOM)					
#	*Description*	*Loc.*	*Cost (USD)*	*Qty*	*Supplier*
1	Teensy 4.1 microcontroller with pins	Teensy 4.1	$40.00	1	Amazon.com
2	Single row PCB female pin headers, 2.54 mm pitch	Teensy 4.1	$0.05		Amazon.com
3	Coin cell PCB mount battery holder	BAT1	$0.60	1	Amazon.com
4	JST-XH 2-pin PCB mount connector, 2.54 mm pitch	ESC, LED1, LED2, Int1, Switch	$0.03	5	Amazon.com
5	JST-XH 3-pin PCB mount connector, 2.54 mm pitch	Flow, Int2	$0.03	2	Amazon.com
6	JST-XH 4-pin PCB mount connector, 2.54 mm pitch	USB In, Pressure	$0.03	2	Amazon.com
7	Coin cell 3V battery (e.g. CR2032, CR2025, CR2015)		$0.60	1	Amazon.com
8	32 GB microSD memory card		$4.00	1	Amazon.com
9	USB Type A Female Socket USB Board connector, 2.54mm pitch	USB A	$0.70	1	Amazon.com
10	LM2596 DC-DC adjustable Buck converter step-down voltage regulator module	Regulator	$1.25	1	Amazon.com
11	Screw terminal block connector, 2-pin, THT, 5 mm pitch	Battery	$0.15	2	Amazon.com
12	INA219 High Side DC Current Sensor Breakout - 26V +-3.2A Max - Stemma QT	Current Sensor	$16.26	1	Amazon.com
Total Cost: $64.03					

Assembly (approximate time: 30 minutes):

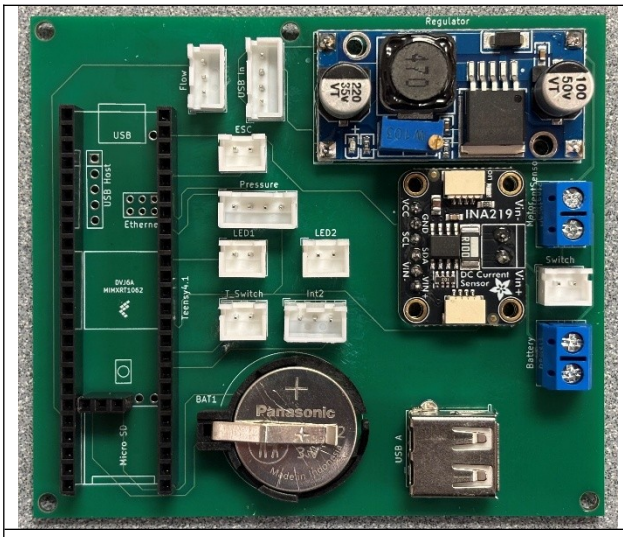
Prep Note:

- Solder pins onto all four vias on back side of voltage regulator.
- Remove terminal block included in current sensor and replace with pins, and solder the other six pins onto the remaining vias.

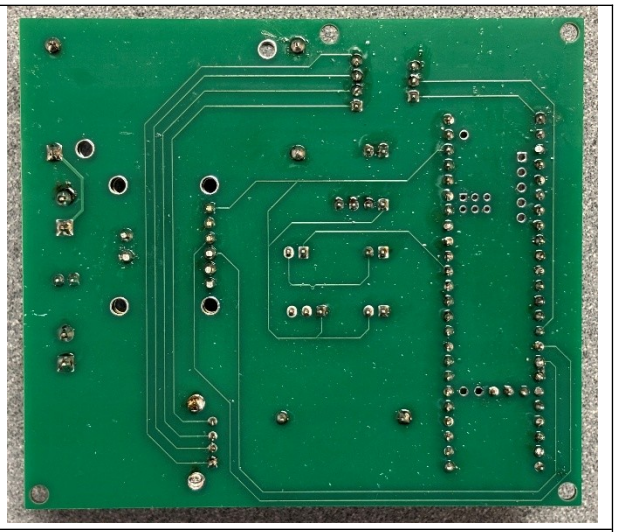
Main Assembly:

All components mount to the top of the Mainboard.

1. Insert pin headers, battery holder, JST-XH connectors, screw terminal block connectors, voltage regulator, and current sensor to PCB board.
2. Solder all pins.
3. Insert Teensy 4.1 into headers, insert microSD card, and insert battery.



Assembled PCB: Mainboard (Front)



Assembled PCB: Mainboard (Back)

Teensy 4.1 Pin Assignments		
Pin	*Wire – color (function)*	*Color (function)*
23	ESC	White
GND	ESC	Black (GND)
29	Flow sensor	Yellow
3.3V	Flow sensor	Red (VIN)
GND	Flow sensor	Black (GND)
3.3V	BAR30	Red (VIN)
19	BAR30	Green (SCL)
18	BAR30	White (SDA)
GND	BAR30	Black (GND)
17	Red LED	Red (VIN)
GND	Red LED	Black (GND)
16	Green LED	Green (VIN)
GND	Green LED	Black (GND)
41	Switch 2	Blue
3.3V	Switch 2	Blue (VIN)
40	INT2*	
3.3V	INT2*	
GND	INT2*	