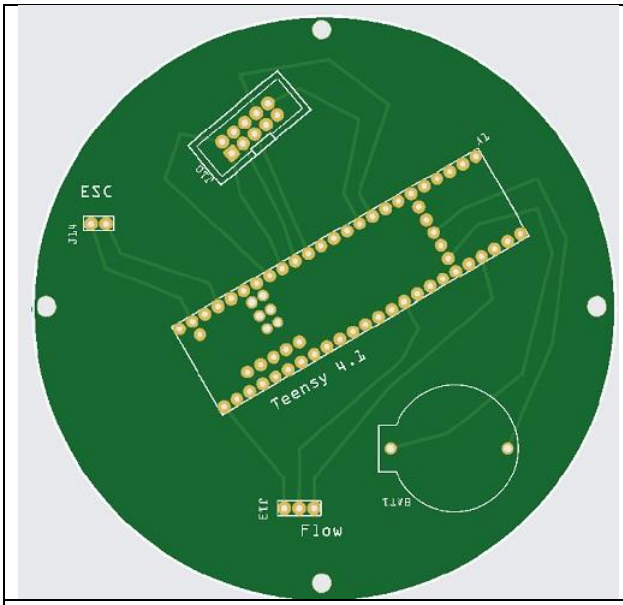
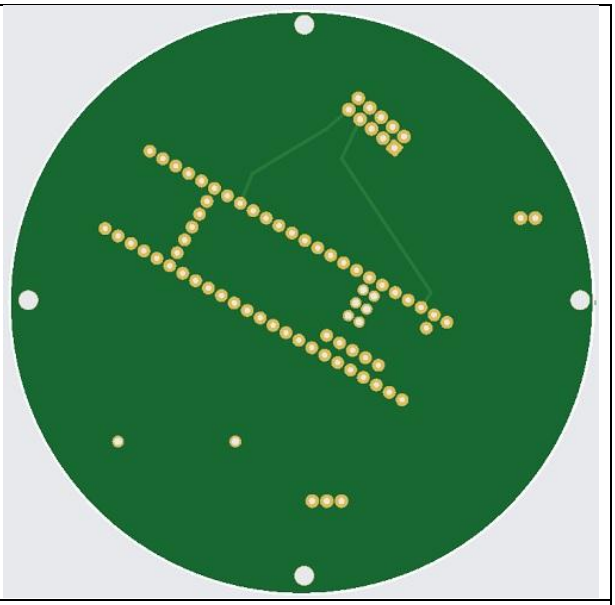
PCB: Mainboard

The Mainboard contains the *Teensy 4.1* microprocessor unit (A1) and direct connections for the PWM signal from to the BLDC motor electronic speed controller, ESC (J14), and input from the flow sensor (J13). Signals for the other input and output components are fed to/from the Bus Board via a 10-wire ribbon cable (J10). 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 Bus Board, allowing external connection to a PC via the bulkhead connector on the end cap. The Mainboard is mounted between the Bus Board and Battery Holder Bottom with brass spacers through the four mounting holes.



PCB: Mainboard (front view)



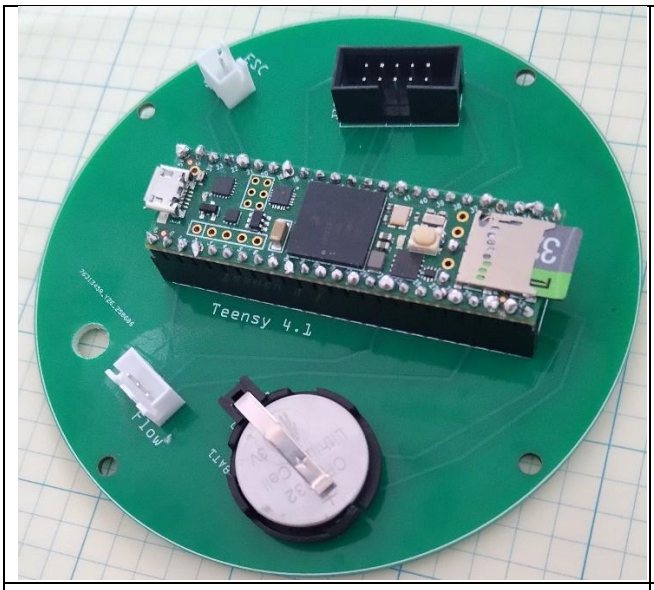
PCB: Mainboard (back view)

Bill of Materials (BOM)					
#	*Description*	*Loc.*	*Cost*	*Qty*	*Supplier*
1	Teensy 4.1 microcontroller with pins	A1	$40.00	1	Amazon.com
2	Single row pcb female pin headers, 2.54 mm pitch	A1	$0.05		Amazon.com
3	Coin cell PCB mount battery holder	BAT1	$0.60	1	Amazon.com
4	IDC 10-Pin male header ribbon cable connector socket, 2.54 mm pitch	J10	$0.15	1	Amazon.com
5	JST-XH 2-pin PCB mount connector, 2.54 mm pitch	J14	$0.03	1	Amazon.com
6	JST-XH 3-pin PCB mount connector, 2.54 mm pitch	J13	$0.03	1	Amazon.com
7	Coin cell 3V battery (e.g. CR2032, CR2025, CR2015)		$0.60	1	Amazon.com
8	microSD memory card		$4.00	1	Amazon.com

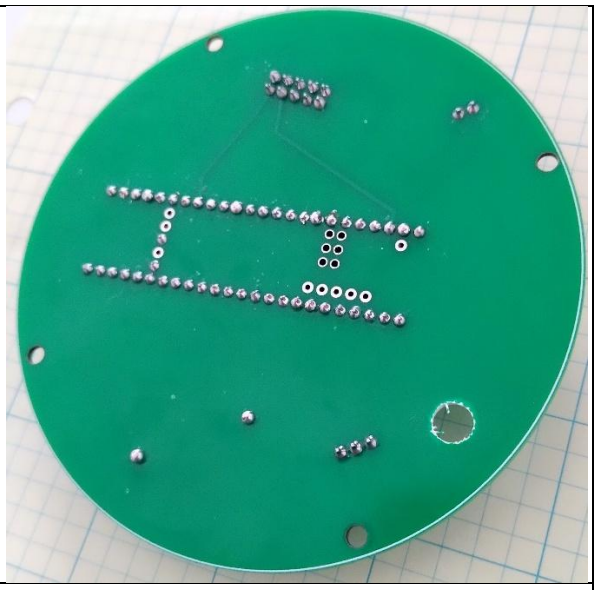
Assembly *(approximate time: 30 minutes)**:***

All components mount to the top of the Mainboard.

1. Solder pin headers, battery holder, JST-XH and IDC connectors to board.
2. Insert Teensy 4.1 into headers, insert microSD card, and insert battery.



Assembled PCB: Mainboard (front)



Assembled PCB: Mainboard (back)

Recommended mods:

When using a 4-inch pressure tube, the power cables from the battery holder to the Bus Board will get squeezed as they pass by the Mainboard. The solution is to drill an additional hole through the Mainboard and pass the two cables through that (for hole placement, see photo of assembled Mainboard above).

Teensy 4.1 Pin Assignments	
Pin	*Wire – color (function)*
23 (A9)	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 (A16)	INT2*
3.3V	INT2*
GND	INT2*

* INT2 refers to 3-pin JST-XH connector (J13) on Bus Board. It was used as a flow sensor interrupt in an earlier version, but is not used in the current configuration.