Weather Balloon PCB Final Project

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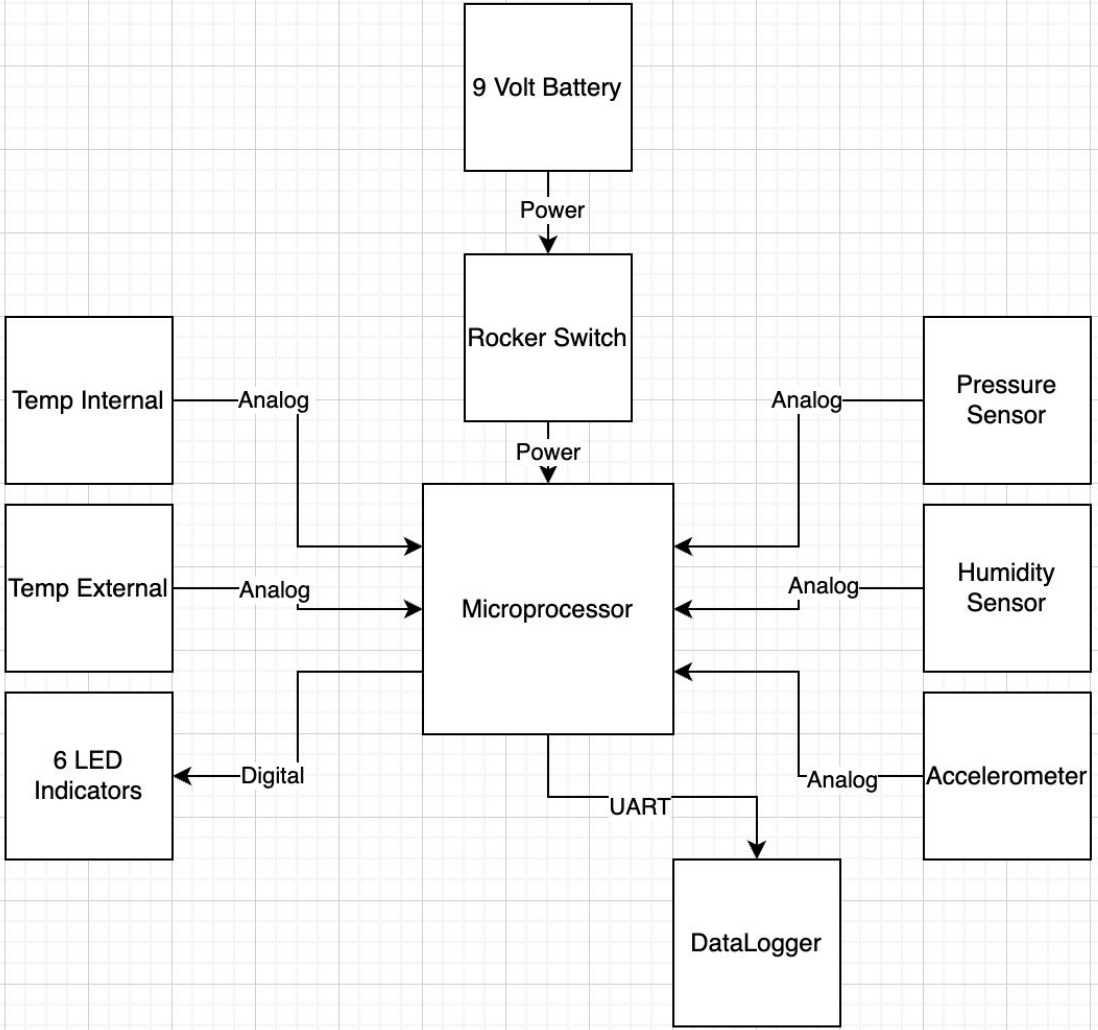
Introduction

- COSGC (Colorado Space Grant Consortium) Provides hands on experience with a High Altitude Balloon Payload Kits
- The total kits cost is $147
- The original sensor kit includes out of date or missing components
- Documenting the original design
- Provide an updated design

Phase 1-Original Design

Block Diagram

- 5 Analog Inputs
- 6 Digital Outputs
- 1 UART
- 1 Power Input



Estimated Cost, Weight, and Power Consumption

Original Design							
	Requirements	Part Name	Link	Quantitiy	Weight (grams)	Power Consumption (Amps)	Price
	Arduino	Adunio Board	ArduinoLink	1	25	0.075	$ 27.60
	LEDs	LED	LedLink	6	1.2	0.12	$ 0.90
	Tempature Sensor	TMP36	TempSensorLink	2	0.4	0.0001	$ 2.84
	Humidity Sensor	HIH 4030	HumiditySensorLink	1	1	0.0002	$ 19.00
	Pressure Sensor	HSCDANN015PAAA5	PressureSensorLink	1	1	0.037	$ 37.47
	Accelrometer	SEN-09269	AccelrometerLink	1	1.5	0.00032	$ 16.95
	Dataloggers	SparkFun OpenLog	DataloggerLink	1	10	0.06	$ 16.95
	Micro SD Card	Transcend 4GB	MicroSDLink	1	4.5	0.03	$ 10.00
	Arduino Sheild PCB	N/A	AnyPCB manafactuer	1	20	0	$ 1.00
	9 Volt Battery	9 Volt Battery	BatteryLink	1	45	0	$ 4.46
	Rocker Switch	Rocker Switch	RockerLink	1	5	0	$ 9.99
Totals					114.6	0.32262	$ 147.16
					Avg Power Consumption	1.6131	watts

- Total Cost: $ 147.16
- Total Weight : 143.4 grams
- Total Power Consumption: 1.6131 watts

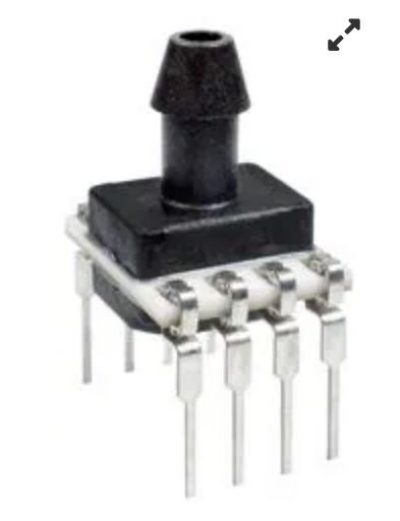
Original Parts Being Changed

Humidity Sensor

- Not Available
- Only Humidity
- Takes up space on PCB
- Analog

Accelerometer

- Poor Reviews
- Cheaper Versions Elsewhere
- Analog

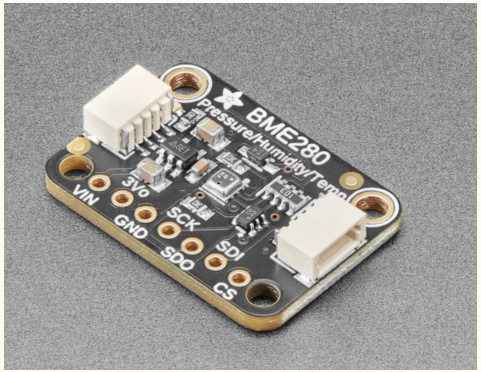


- Expensive
- Delicate
- Analog

Phase 2-Updated Design

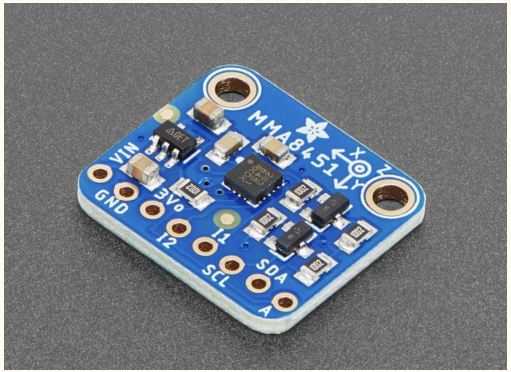
Alternative Parts

Adafruit BME280



- Internal Temperature, Pressure, and Humidity.
- I2C

Adafruit MMA8451



- Accelerometer
- Cheaper
- I2C

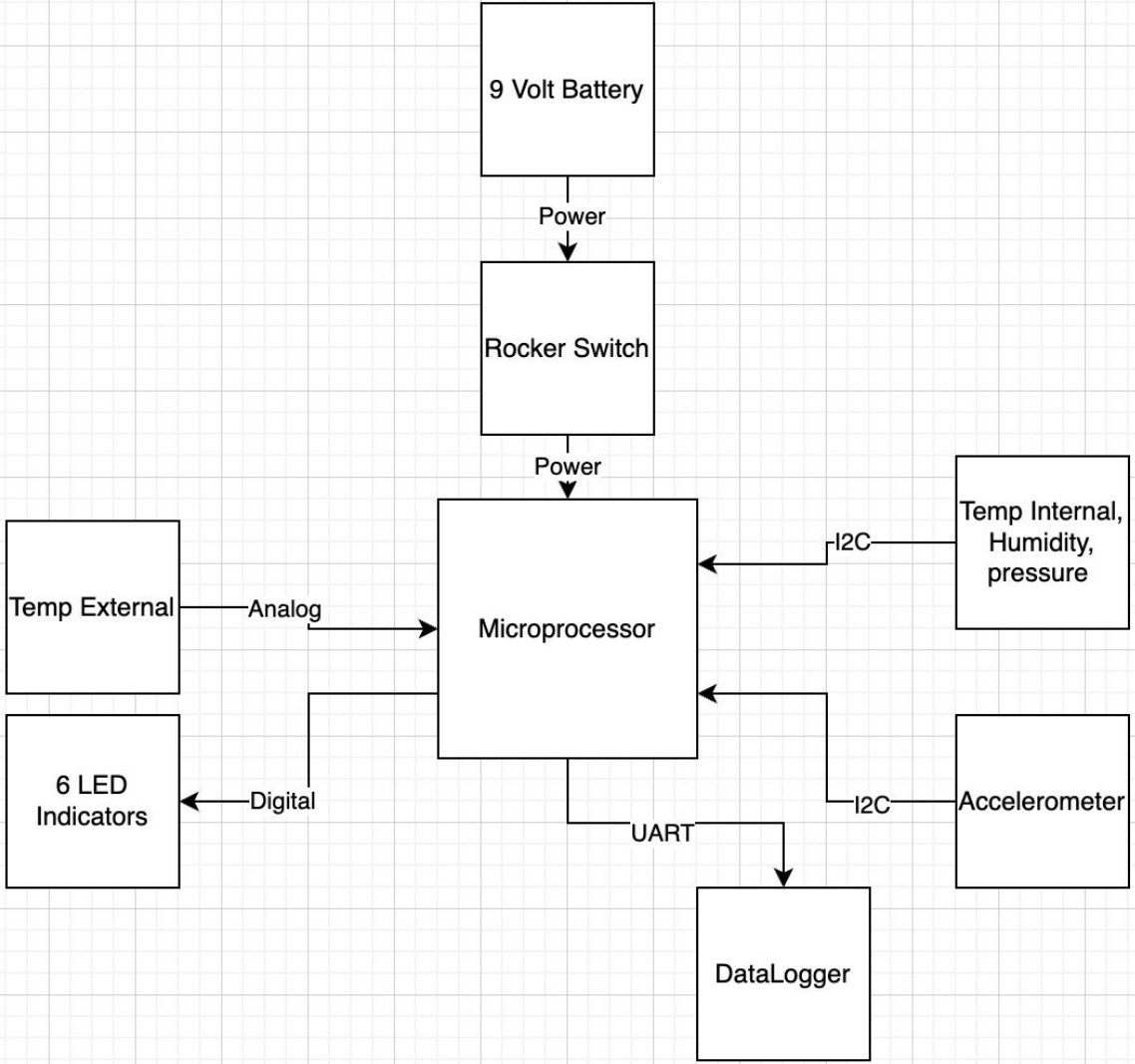
Block Diagram

2 I2C

1 Analog Input

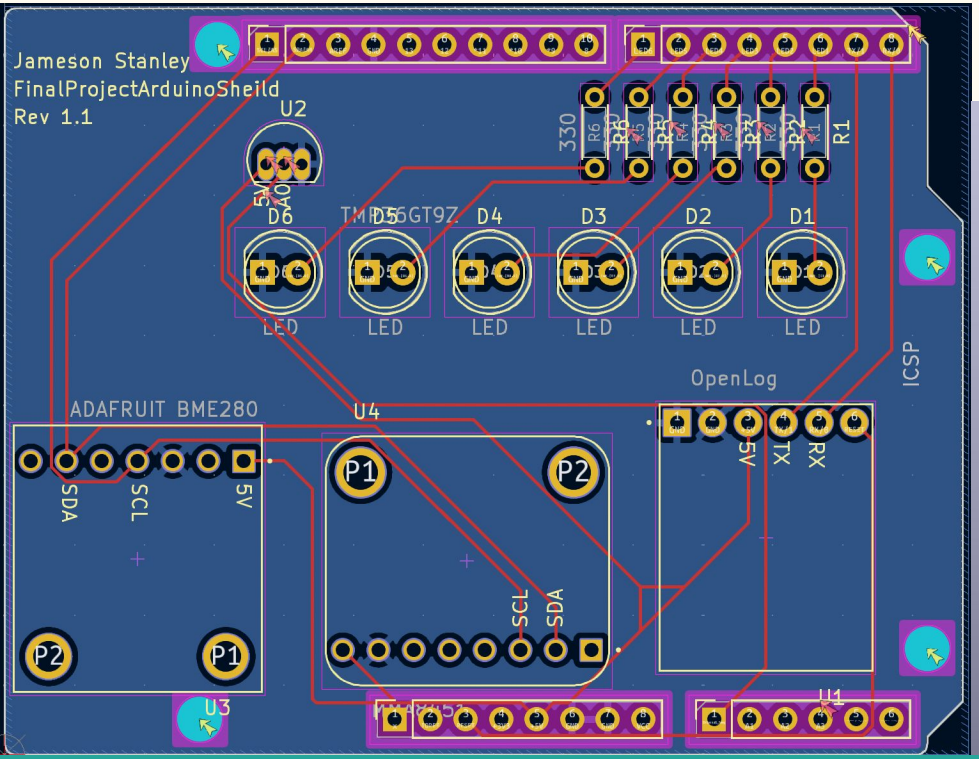
6 Digital Output

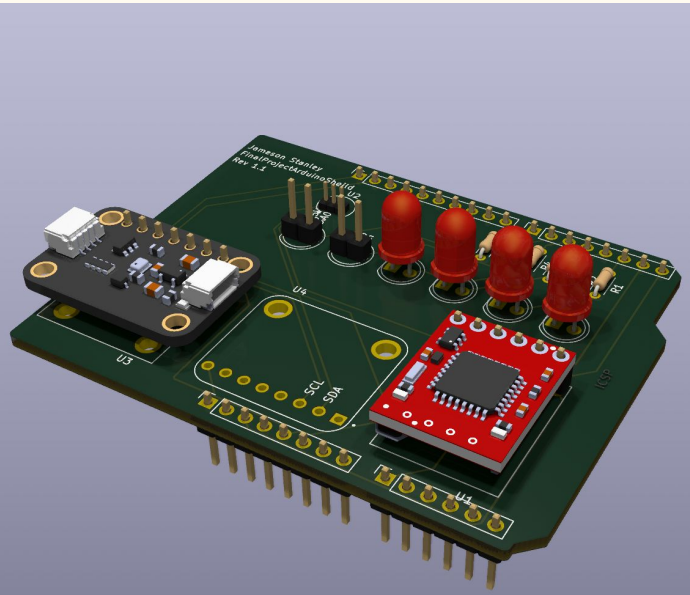
1 UART



PCB Design

- All Through hole Connection
- Maintains Connections for External Indicators and Temp Sensor
- Ground Plane Uninterrupted





New Design Cost, Weight, and Power Consumption

Phase 2 Design							
	Requirements	Part Name	Link	Quantitiy	Weight (grams)	Power Consumption (Amps)	Price
/	Arduino	Adunio Board	ArduinoLink	1	25	0.075	$ 17.00
/	LEDs	LED	LedLink	6	1.2	0.12	$ 0.90
/	Tempature Sensor	TMP36	TempSensorLink	1	0.2	0.00005	$ 1.42
/	Int. Temp and Humidity a	BME280 ADAFRUIT	TempHumidityPressureLink	1	1	0.0002	$ 14.95
/	Accelrometer	Adafruit MMA8451	AccelrometerLink	1	1	0.000016	$ 7.95
/	Dataloggers	SparkFun OpenLog	DataloggerLink	1	10	0.06	$ 16.95
/	Micro SD Card	Secueye. 64gb	MicroSDLink	1	4.5	0.03	$ 10.00
	Arduino Sheild PCB	N/A	AnyPCB manafactuer	1	20	0	$ 1.00
	9 Volt Battery	9 Volt Battery	BatteryLink	1	45	0	$ 4.46
	Rocker Switch	Rocker Switch	RockerLink	1	5	0	$ 9.99
Totals					107.9	0.285266	$ 74.63
					Avg Power Consumption	1.42633	watts

- Total Cost: $ 74.63
- Total Weight : 136.7 grams
- Total Power Consumption: 1.4233 watts

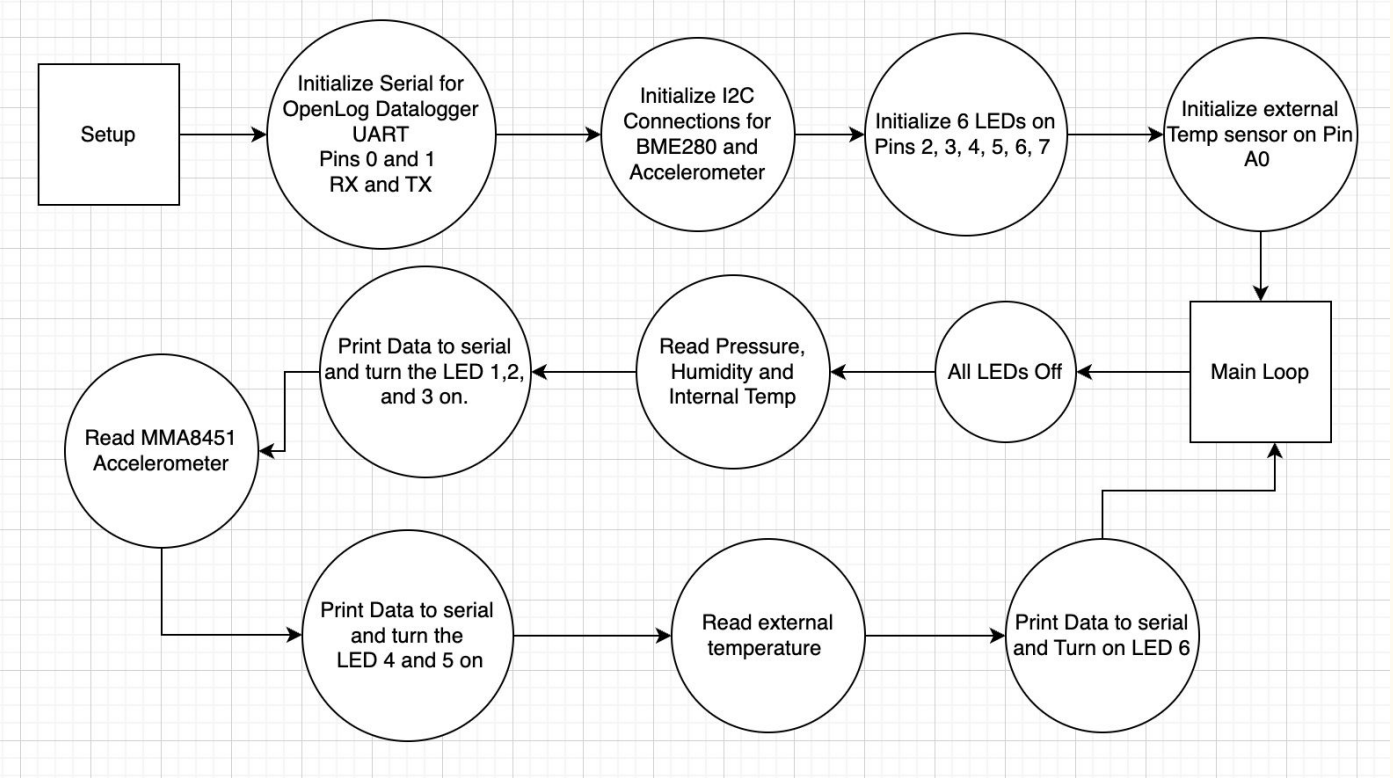
Program Block Diagram

Main Setup

- Initializes All Inputs and outputs

Main Loop

- Reads each sensors
- Stores to datalog
- Turns LED on each success
- Resests LEDS at the end



Comparison

Original Design

- Total Cost: $ 147.16
- Total Weight : 143.4 grams
- Total Power Consumption: 1.6131 watts

Updated Design

- Total Cost: $ 74.63
  - 49.3% Cheaper
- Total Weight : 136.7 grams
  - 6.7 grams lighter
- Total Power Consumption: 1.4233 watts
  - 0.1898 less watts consumed