Weather Balloon PCB Final Project

-Jameson Stanley

Introduction

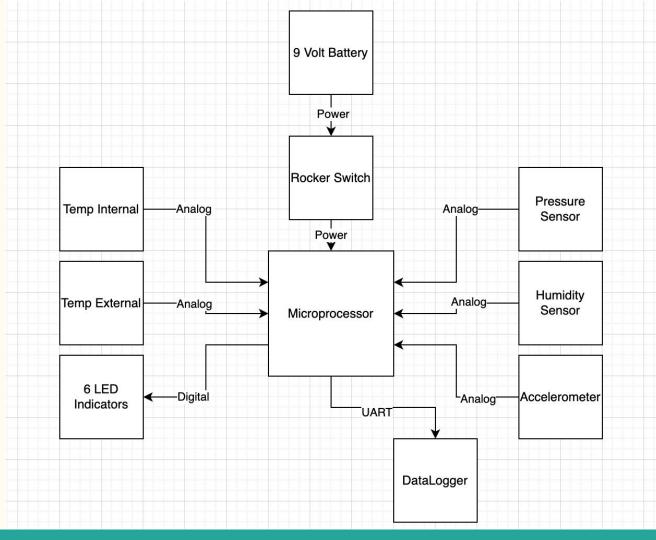
- COSGC (Colorado Space Grant Consortium)
 Provides hands on experience with a High
 Altitude Balloon Payload Kits
- The total kits cost is \$147
- The original sensor kit includes out of date or missing components
- Documenting the original design
- Provide an updated design



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)	Pric	е
	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 Consumpution	1.6131	wat	ts

- 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

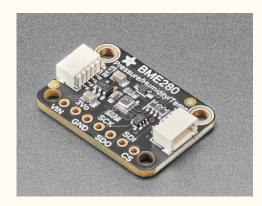


- Expensive
- Delicate
- Analog

Phase 2-Updated Design

Alternative Parts

Adafruit BME280



- Internal Temperature, Pressure, and Humidity.
- I2C

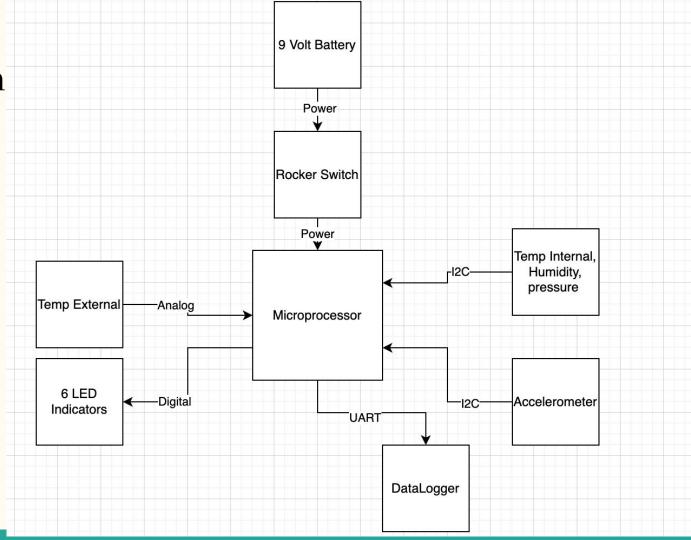
Adafruit MMA8451



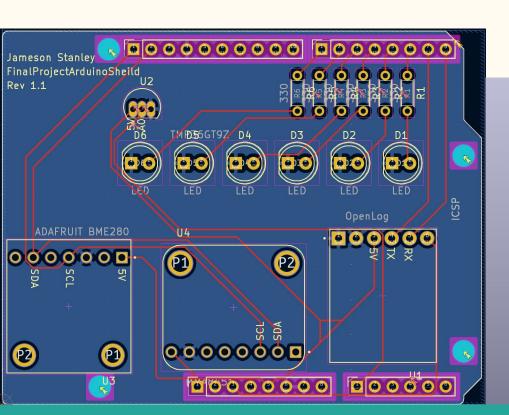
- Accelerometer
- Cheaper
- I2C

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

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
				107.9	0.285266	\$	74.63
				Avg Power Consumpution	1.42633	watt	s
	Arduino LEDs Tempature Sensor Int. Temp and Humidity a Accelrometer Dataloggers Micro SD Card Arduino Sheild PCB 9 Volt Battery	Arduino Adunio Board LEDs LED Tempature Sensor TMP36 Int. Temp and Humidity a BME280 ADAFRUIT Accelrometer Adafruit MMA8451 Dataloggers SparkFun OpenLog Micro SD Card Secueye. 64gb Arduino Sheild PCB N/A 9 Volt Battery 9 Volt Battery	Arduino Adunio Board ArduinoLink LEDS LED LedLink Tempature Sensor TMP36 TempSensorLink Int. Temp and Humidity a BME280 ADAFRUIT TempHumidityPressureLink Accelrometer Adafruit MMA8451 AccelrometerLink Dataloggers SparkFun OpenLog DataloggerLink Micro SD Card Secueye. 64gb MicroSDLink Arduino Sheild PCB N/A AnyPCB manafactuer 9 Volt Battery 9 Volt Battery BatteryLink	Arduino Adunio Board ArduinoLink 1 LEDs LED LedLink 6 Tempature Sensor TMP36 TempSensorLink 1 Int. Temp and Humidity a BME280 ADAFRUIT TempHumidityPressureLink 1 Accelrometer Adafruit MMA8451 AccelrometerLink 1 Dataloggers SparkFun OpenLog DataloggerLink 1 Micro SD Card Secueye. 64gb MicroSDLink 1 Arduino Sheild PCB N/A AnyPCB manafactuer 1 9 Volt Battery 9 Volt Battery BatteryLink 1	Arduino Adunio Board ArduinoLink 1 25 LEDs LED LedLink 6 1.2 Tempature Sensor TMP36 TempSensorLink 1 0.2 Int. Temp and Humidity a BME280 ADAFRUIT TempHumidityPressureLink 1 1 1 Accelrometer Adafruit MMA8451 AccelrometerLink 1 1 1 Dataloggers SparkFun OpenLog DataloggerLink 1 1 1 Micro SD Card Secueye. 64gb MicroSDLink 1 4.5 Arduino Sheild PCB N/A AnyPCB manafactuer 1 20 9 Volt Battery 9 Volt Battery BatteryLink 1 45 Rocker Switch RockerLink 1 5 Focker Switch RockerLink 1 5	Arduino Adunio Board ArduinoLink 1 25 0.075 LEDs LED LedLink 6 1.2 0.12 Tempature Sensor TMP36 TempSensorLink 1 0.2 0.00005 Int. Temp and Humiditya BME280 ADAFRUIT TempHumidityPressureLink 1 1 0.00002 Accelrometer Adafruit MMA8451 AccelrometerLink 1 1 0.00001 Dataloggers SparkFun OpenLog DataloggerLink 1 1 0.00001 Micro SD Card Secueye. 64gb MicroSDLink 1 4.5 0.03 Arduino Sheild PCB N/A AnyPCB manafactuer 1 20 0 9 Volt Battery 9 Volt Battery BatteryLink 1 45 0 Rocker Switch Rocker Link 1 5 0 Leduin Make 451 Accelrometer Link 1 45 0 Micro SD Card Secueye. 64gb Micro SD Card 1 45 0 Rocker Switch	Arduino Adunio Board ArduinoLink 1 25 0.075 \$ LEDs LED LedLink 6 1.2 0.12 \$ Tempature Sensor TMP36 TempSensorLink 1 0.2 0.00005 \$ Int. Temp and Humiditya BME280 ADAFRUIT TempHumidityPressureLink 1 1 0.0002 \$ Accelrometer Adafruit MMA8451 AccelrometerLink 1 1 0.000016 \$ Dataloggers SparkFun OpenLog DataloggerLink 1 1 0.000016 \$ Micro SD Card Secueye. 64gb MicroSDLink 1 4.5 0.03 \$ Arduino Sheild PCB N/A AnyPCB manafactuer 1 20 0 \$ 9 Volt Battery 9 Volt Battery BatteryLink 1 45 0 \$ Rocker Switch Rocker Link 1 5 0 \$ LED LedLink LedLink 1 1 0 0 0

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

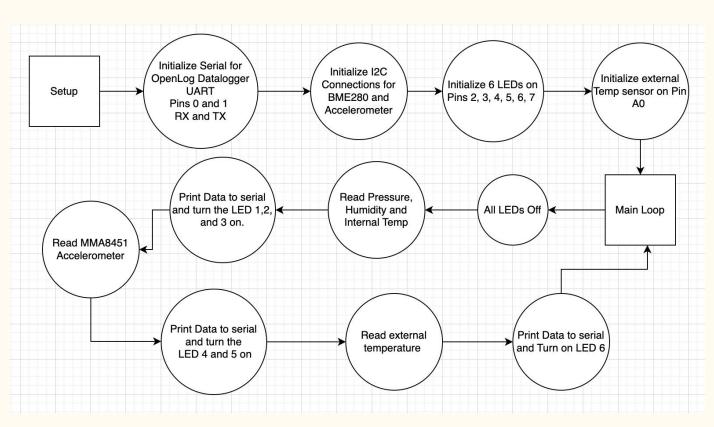
Program Block Diagram

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