

wearable vital sensor

# VitalTAG



## Written Progress Report

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## 1. Background

During 911 emergency calls paramedics are not always first on the scene. Firefighters, lifeguards, and first aid attendants are often the first responders but are unable to acquire the victim's vital information. Upon arrival paramedics spend 2 to 2.5 minutes gathering Blood Pressure, Heart Rate and SpO<sub>2</sub> per victim. ETA is developing VitalTAG, a portable vital measuring and logging device that can be used by any first responder. Upon arrival, the paramedic's smart eyewear automatically pairs to all nearby VitalTAGs and displays the continuous vital measurements. The paramedics can then administer appropriate care to the most crucial victims first, thus saving time and saving lives.

## 2. Schedule

On January 28<sup>th</sup>, 2016 ETA created a proposed timeline as seen below in Figure 1. The system research and software implementation have been completed for Heart Rate, SpO<sub>2</sub>, and Blood Pressure. The System and Hardware Integration is nearly complete. The team is currently working on the product prototype manufacturing/testing.

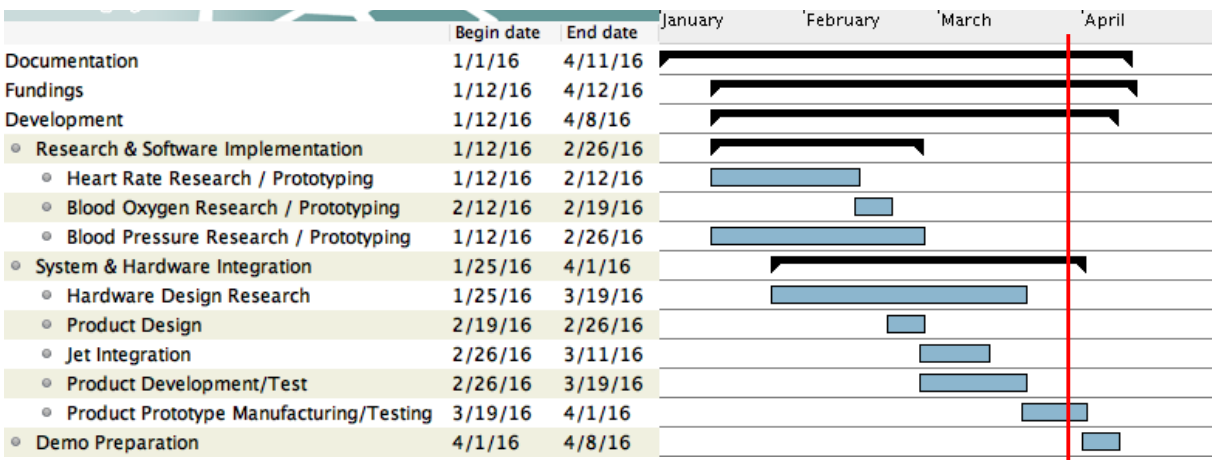


Figure 1: Proposed Schedule on Jan 22nd, 2016

## 3. Finances

Table 1: Financial Balance

	Amount
Proposed Budget	\$1295.50
Total Expenditures	\$1,444.47
Total Funding	\$693.00
Balance	-\$751.87

From Table 1, the project is 11.6% over the proposed budget. The primary reasons for the inflated expenditures are due to three factors: deadlines, duplicates, and component costs. Rush shipping was chosen due to the tight deadlines. Multiple Arduino Genuino 101s and sensors were purchased to simultaneously develop software and hardware. Multiple microprocessors and

sensors were purchased to simultaneously develop the proof-of-concept/prototype and final product. The components were individually affordable but the rush shipping and duplicates purchased increased the expenditures significantly. We have \$1444.57 in expenditures and \$693.00 in funding thus putting our balance at a \$751.87 deficit. The ETA team currently covers the deficit equally and will apply to the Wighton Fund to recoup the financial deficit incurred.

## 4. Progress

### 4.1 Enclosure

Our initial SolidWorks design R1.0 was modified to a two-piece design. R1.1 was 3D printed but had dimensional errors. A precisely crafted, six-piece assembly, R1.3, was designed and is being 3D printed for the demo. R1.3 will be ready to house the circuitry and sensors.

### 4.2 Smart Eyewear

The user interface has been finessed and updated from R1.0 to R1.1 to include alarm limits and help distinguish between systolic and diastolic Blood Pressure.

### 4.3 Circuitry

The initial EAGLE PCB design, R1.0, was modified and R1.1 was fabricated by OSH Park but once populated two faults were found. Firstly, the crystal oscillator required two external capacitors to complete the LC circuit to start the oscillation and provide the timing signal to the ATmega328P microprocessor. Secondly, the low impedance of the MAX30100 sensor affected the two-resistor voltage divider that supplied the sensor with 1.8V. With these issues resolved, several additions such as switches and LEDs were also added into R1.3 and manufactured by Omni Circuit Boards. PCB R1.3 was populated, tested, and functions to the specifications including Bluetooth communication. PCB R1.3 is in position to be mounted in the R1.3 3D printed enclosure.

### 4.4 Sensor

The MAX30100 sensor could not be successfully soldered on PCB R1.2. Thus, PCB R1.3 included longer pads and with the use of solder paste the MAX30100 was soldered and is fully functional.

### 4.5 Software

The software can detect Blood Pressure, Heart Rate and SpO<sub>2</sub> using the Arduino Genuino 101 and Pulse Sensor. The code was ported and modified to the Arduino Uno and MAX30100 sensor and has been successfully uploaded to the ATmega328P on PCB R1.3.

## 5. Conclusion

ETA team is working tirelessly to ensure the project is adhering to our proposed scheduled deadlines and be ready for the demo date. Presently, we are at par with our proposed schedule. Additionally, our project is 11.6% over our estimated budget of \$1295.00 due to development errors, expedited shipping, and the parallel development approach used in order to complete the project within 4 months. Unforeseen problems, shipping times, manufacturing times, and numerous revisions have been the root of any delays but have been mitigated appropriately. The team of ETA is confident they will be able to deliver a working VitalTAG by April 8<sup>th</sup>, 2016.