Why are we doing this test?

*This is an introduction. Capture the reasons for the test, giving enough background information to justify doing **any** prototyping at all. Is the **general** objective one of: learning, communication, de-risking, etc.*

For deliverable G, we are creating the second prototype for our steampunk wearable. This testing phase is for our group to physically set-up and program the arduino software, LCD screen, and heart-rate sensor in order to detect and fix any problems in the circuitry and wiring, as well as determining optimal places for the sensor to be placed in order to pick up the wearer's heart rate.

This prototype is less focused on the aesthetics of the design, but more on the software and technology side of the wearable. In the last prototype we will then determine on how to incorporate both the first prototype design with the software layout of prototype 2.

Test Objectives Description

*What are the **specific** test objectives?*

The specific objectives for this prototype are as follows:

- Determining the program that will translate the heart beat from the sensor through the Arduino.
- Seeing how to make the LCD screen flash a gear shape when it picks up the heart beat.
- Finding the best spot on the user's body to place the heart rate monitor to pick up their heart beat.
- Combining all aspects and moving parts previously mentioned.

*What **exactly** is being learned or communicated with the prototype?*

Through prototype 2 we are hoping to learn the specifics of the code that will translate the wearer's heart beat into a language that can be read and transmitted through the Arduino and onto the LCD screen. We hope to communicate the interaction that will take place between the user's body and this software, enabling the viewers to get a shallow glimpse of the user's state through their heart rate (relaxed, excited, nervous, calm).

What are the possible types of result?

- The program is not compatible with Arduino.
- The sensor does not pick up the wearer's heart beat.
- We put the sensor on the user's ear for most effective beat pick-up.
- The LCD screen doesn't flash or blink, only slides back and forth.
- The LCD image refresh rate will be too low to keep up with the beats.

How will these results be used to make decisions or select concepts?

A lot of these results can be fixed with changing around or adding to the code, and building extra parts to the physical prototype to help hide the wiring. If the sensor has trouble picking up the heartbeat, we may have to switch the type of impulse it receives. Perhaps have it connected to the wearer's forearm to pick up the muscles being flexed. If this design does not meet the client's needs or accurately reflect the given steampunk theme, different designs and layout will need to be reassessed in order to capture the customer's wants.

What are the criteria for test success or failure?

Failure:
- Design flaws lead to failure of prototype 2.
- Finding ease-of-use issues to determine the failure of design.
- Not meeting the customer's demand.
- Not finding a program compatible with the Arduino and LCD screen.

Success:
- Verifying the product is ready to launch.
- Soliciting improvement ideas.
- Writng code for the LCD screen so it can communicate properly with the Arduino and receive images.
- Provide the client with a working prototype to demonstrate progress and receive feedback.

What is going on and how is it being done?

Describe the prototype ***type*** *(e.g. focused or comprehensive) and the reason for the selection of this type of prototype.*

This prototype would be classified as a focused prototype. We gave it this classification as it is focused on the testing and layout of the software, creating a compatible and applicable program, and determining how to translate the user's heart beat into a pulse on the LCD screen. This prototype includes our subsystem that will be a part of our final product. It focuses only on the circuitry subsystem, and not the aesthetics or layout of all subsystems combined.

Describe the testing process in enough detail to allow someone else to build and test the prototype instead of you.

An arduino code will be written and used to run the arduino board. The board will then be connected to the heart rate sensor for pulse detection, and in order to make sure that pulse detection is working properly, it will be tested with blinking LED pins first. Then, a different code will be written to determine how to upload images to the LCD screen. From there, a new code will be created that can take the pulse information and then be transferred and displayed on the connected LCD screen. The system will then be tested on every group member in order to ensure that it is consistent.

*What information is being **measured**?*

The information being measured is the heart rate. A metal ear piece will be attached on the lower part of the ear in order for the heart rate sensor to pick up the test subjects pulse and display it through a flashing LED that matches the pulse.
Another piece of information being measured is the refresh capabilities of the LCD screen. The LCD screen must be able to flash a picture of a gear on and off at the same beats per minute as the user.

*What is being observed and how is it being **recorded**?*

Every group member's heart rate will be measured then recorded as a part of the test. Observations will be made on the flashing LED afterwards in order to make sure that the pulse sensor works and has a unique flashing speed for every individual member.
The heartrates will be recorded in the serial plotter of the arduino application.

What materials are required and what is the approximate estimated cost?

The parts include:

- the arduino board($10)
- heartrate sensor($34.27)
- LCD screen($19.55)

These three items plus the shipping fee($15) sum up to a total cost of $80.

What work (e.g. test software or construction or modeling work or research) needs to be done?

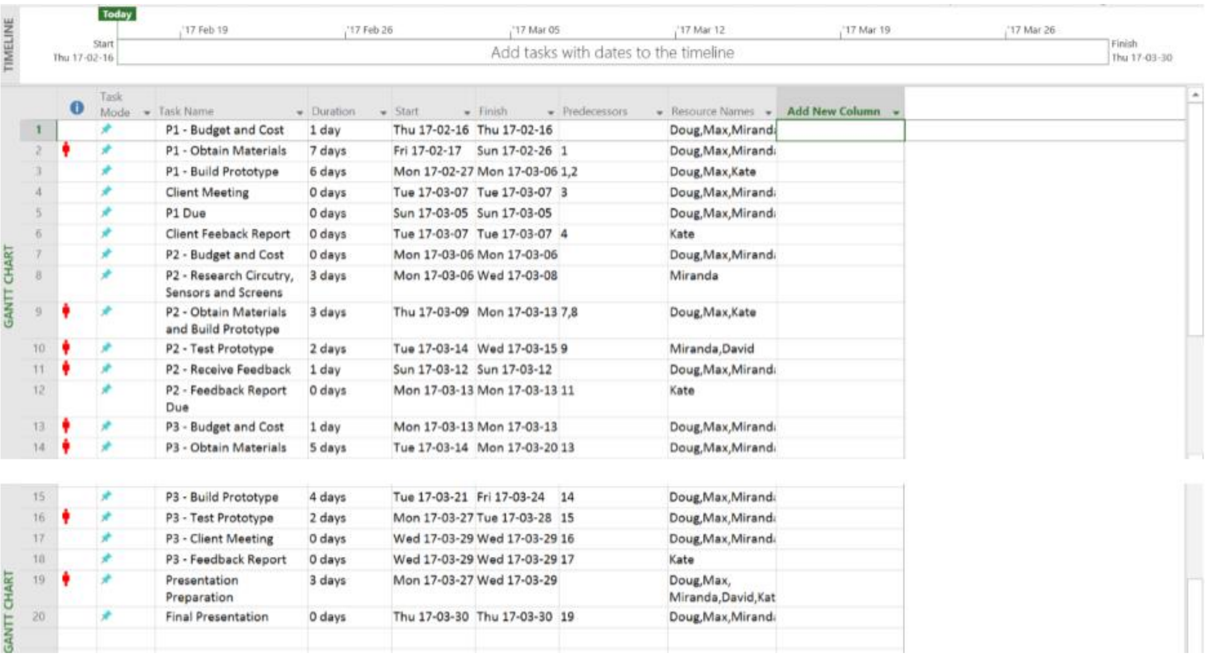
An arduino code will be written and used to run the arduino board. The board will then be connected to the heart rate sensor for pulse detection, and the information will then be transferred and displayed on the connected LCD screen which is set up previously. In order to setup the arduino board and synchronize it with the heart rate sensor. research on the C language needs to be done for the proper codes to be entered onto arduino. In order to build the prototype, basically circuitry knowledge is also required for the wiring of the system.

When is it happening?

*How long will the test take and what are the **dependencies** (i.e. what needs to happen before the testing can occur)?*

The testing process will take place over the month of March in 3 increments. The first prototype will be one focused more on aesthetic and the design layout of the wearable. The second prototype will be more specific to the manipulation and testing of the software and technology we will be incorporating. And lastly, the third prototype will be an implementation of both technology and design, similar to the final product. Before these steps occur, our team must be prepared by acquiring the proper materials, having design specifications and measurements, detailed production schedule, and criteria. As this process furthers, our team will seek feedback from our clients in order to ensure that we meet their needs.

A separate test planning Gantt chart can be created to help making sure that the testing fits with the overall project schedule or it can be defined as part of that schedule (i.e. as a sub-task).



	ⓘ	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Add New Column
1		📌	P1 - Budget and Cost	1 day	Thu 17-02-16	Thu 17-02-16		Doug,Max,Mirand	
2	●	📌	P1 - Obtain Materials	7 days	Fri 17-02-17	Sun 17-02-26	1	Doug,Max,Mirand	
3		📌	P1 - Build Prototype	6 days	Mon 17-02-27	Mon 17-03-06	1,2	Doug,Max,Kate	
4		📌	Client Meeting	0 days	Tue 17-03-07	Tue 17-03-07	3	Doug,Max,Mirand	
5		📌	P1 Due	0 days	Sun 17-03-05	Sun 17-03-05		Doug,Max,Mirand	
6		📌	Client Feeback Report	0 days	Tue 17-03-07	Tue 17-03-07	4	Kate	
7		📌	P2 - Budget and Cost	0 days	Mon 17-03-06	Mon 17-03-06		Doug,Max,Mirand	
8		📌	P2 - Research Circutry, Sensors and Screens	3 days	Mon 17-03-06	Wed 17-03-08		Miranda	
9	●	📌	P2 - Obtain Materials and Build Prototype	3 days	Thu 17-03-09	Mon 17-03-13	7,8	Doug,Max,Kate	
10	●	📌	P2 - Test Prototype	2 days	Tue 17-03-14	Wed 17-03-15	9	Miranda,David	
11	●	📌	P2 - Receive Feedback	1 day	Sun 17-03-12	Sun 17-03-12		Doug,Max,Mirand	
12		📌	P2 - Feedback Report Due	0 days	Mon 17-03-13	Mon 17-03-13	11	Kate	
13	●	📌	P3 - Budget and Cost	1 day	Mon 17-03-13	Mon 17-03-13		Doug,Max,Mirand	
14	●	📌	P3 - Obtain Materials	5 days	Tue 17-03-14	Mon 17-03-20	13	Doug,Max,Mirand	
15		📌	P3 - Build Prototype	4 days	Tue 17-03-21	Fri 17-03-24	14	Doug,Max,Mirand	
16	●	📌	P3 - Test Prototype	2 days	Mon 17-03-27	Tue 17-03-28	15	Doug,Max,Mirand	
17		📌	P3 - Client Meeting	0 days	Wed 17-03-29	Wed 17-03-29	16	Doug,Max,Mirand	
18		📌	P3 - Feedback Report	0 days	Wed 17-03-29	Wed 17-03-29	17	Kate	
19	●	📌	Presentation Preparation	3 days	Mon 17-03-27	Wed 17-03-29		Doug,Max, Miranda,David,Kat	
20		📌	Final Presentation	0 days	Thu 17-03-30	Thu 17-03-30	19	Doug,Max,Mirand	

When are the results required (i.e. what depends on the results of this test in the project plan)?

The results of the second prototype will affect the layout of prototype 3 as it will contribute in determining how the software layout will fit into the improved design of prototype 1, any size, placement, and coding adjustments that need to be made for the final design, and will give us the ability to receive feedback from our client on the working parts of the wearable and how they measure up to and possibly meet their needs and criteria.