

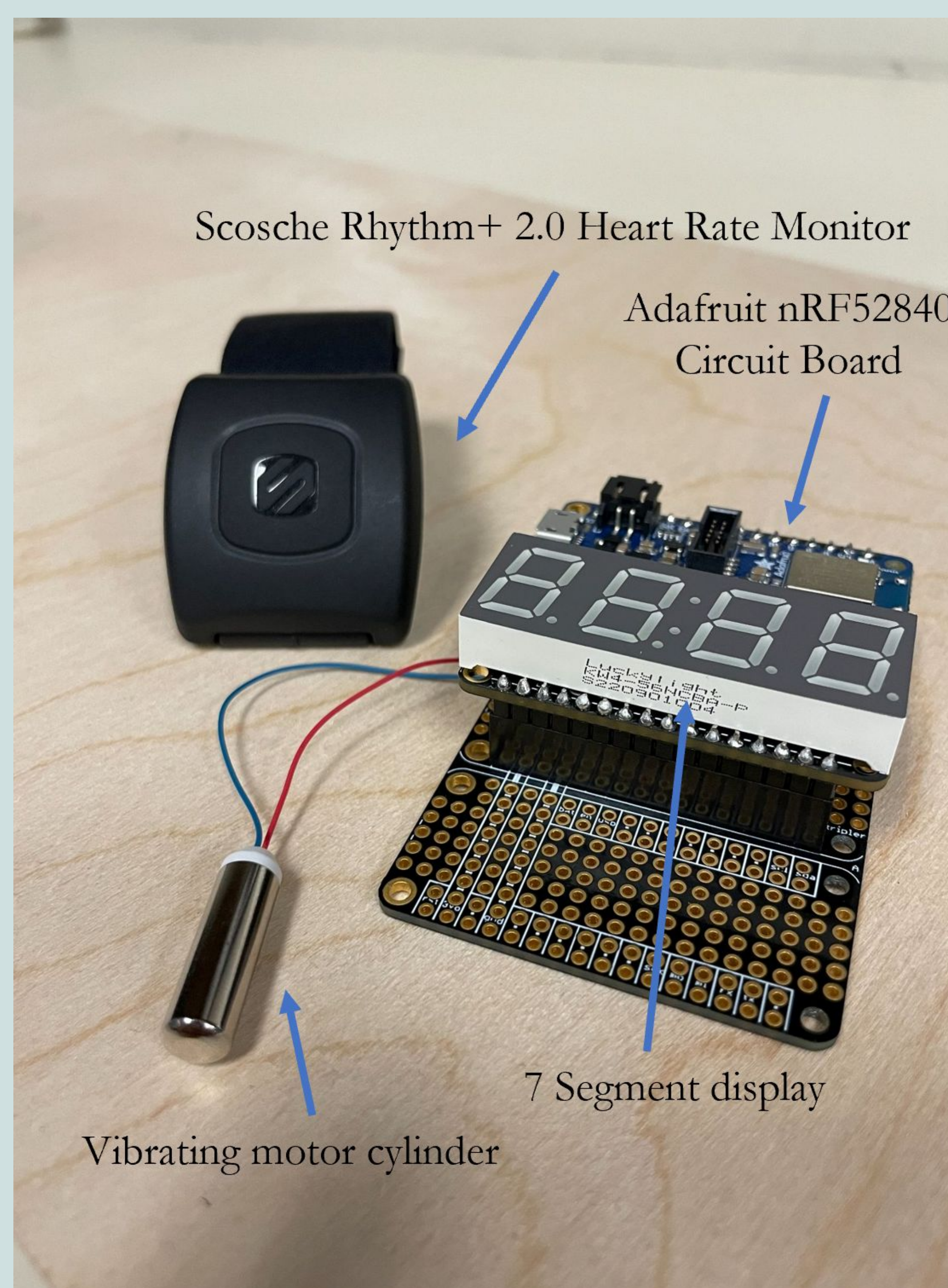
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## Introduction

### Our Goal:

Create a design prototype that will detect a spike of the user's heart rate indicative of a PTSD episode and send an alert using vibrating motors to the user's service dog to shorten or stop the episode.

## Our Design

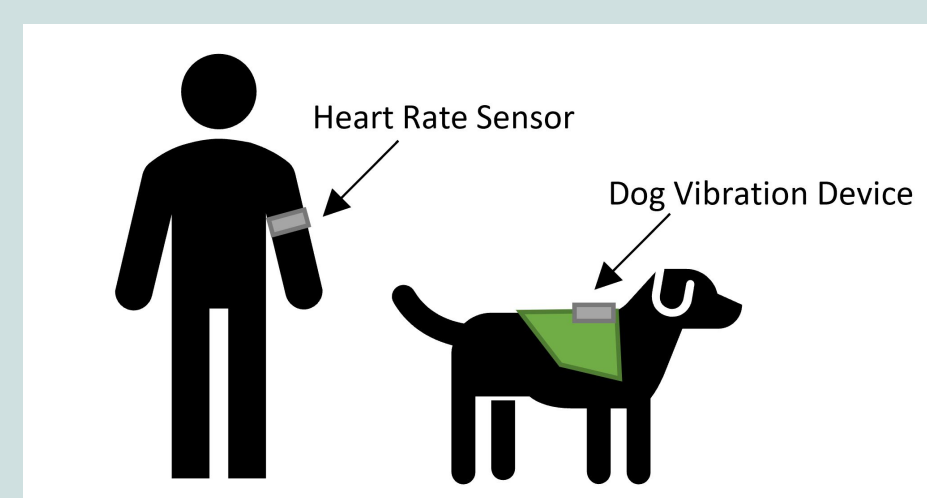


## Power Analysis

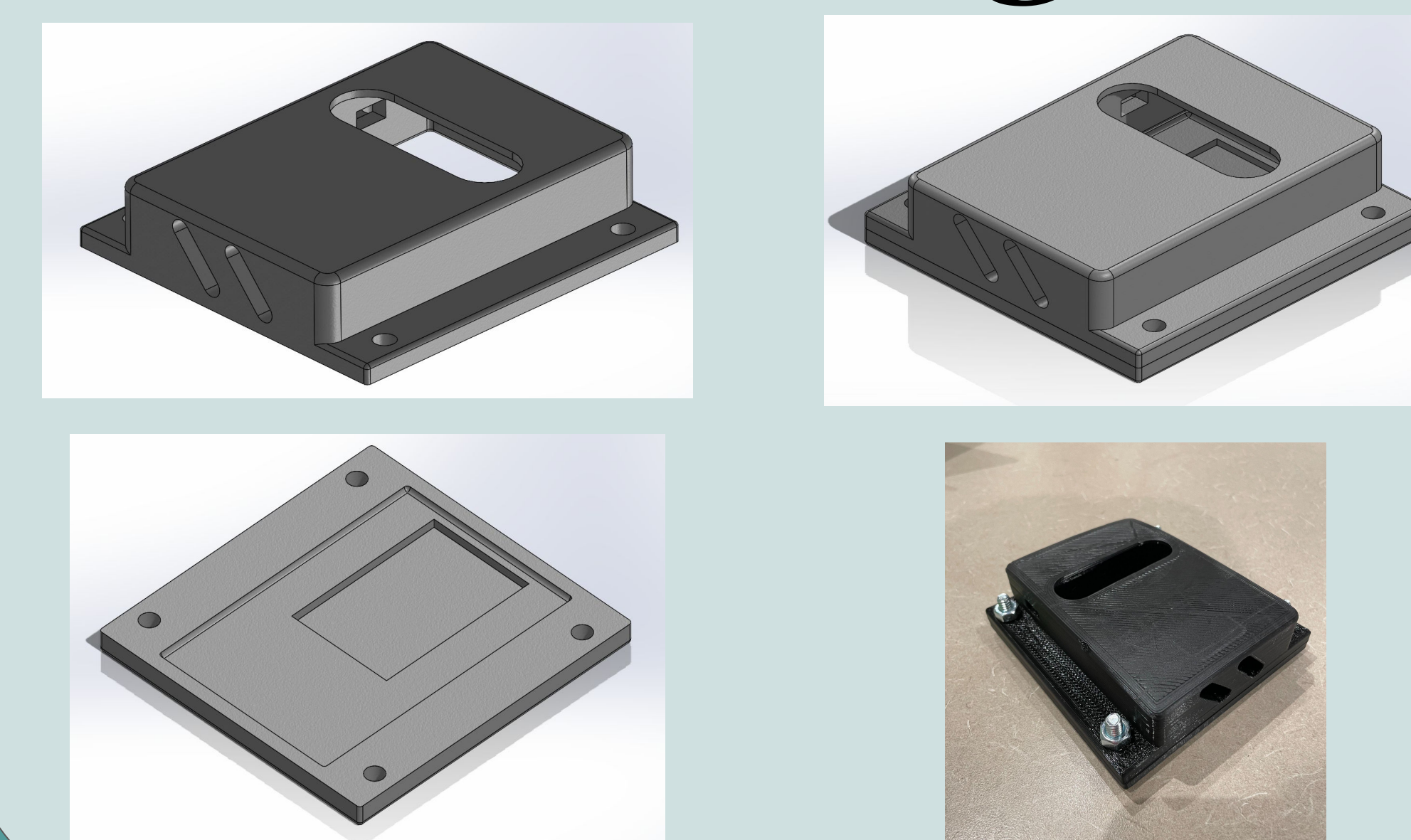
**Motor Power:**  
 $P_{\text{motor}} = V_2 / R_{\text{motor}} = 0.346 \text{ W}$   
**nRF Microcontroller Idle Power:**  
 $P_{\text{Idle}} = I_{\text{Idle}} * V_{\text{Idle}} = 7.4 \text{ mW}$   
**nRF Microcontroller Power with Display On:**  
 $P_{\text{Display}} = I_{\text{Display}} * V_{\text{Display}} = 66.6 \text{ mW}$   
**nRF Microcontroller in Alerting State:**  
 $P_{\text{Alert}} = I_{\text{Alert}} * V_{\text{Alert}} = 259 \text{ mW}$   
 $t = E / P_{\text{avg}} = \text{approximately } \underline{9.6 \text{ days}}$

## How it works

- The Scosche arm band and nRF52840 board automatically connect to each other via bluetooth
- The armband will monitor heart rate which will be transmitted to the microcontroller.
- If the heart rate is over a set, user specific rate the microcontroller will activate a vibrating motor to alert the service dog.
- The motor will buzz in 2, 0.75 sec bursts with a 1 sec break and a 2 min cooldown.



## Housing



## Testing



### Test Subject A:

- Motors were tested on both sides of chest, spine and ribcage
- Subject reacted to all locations
- Strongest reaction with cylinder motor rather than disk

### Bluetooth Test:

| Clear Line of Site | Range |
|--------------------|-------|
| Test #1            | 15 ft |
| Test #2            | 15 ft |

| Line of Site Obstructed by Human Body | Range |
|---------------------------------------|-------|
| Test #1                               | 6 ft  |
| Test #2                               | 5 ft  |

## Potential

- Use of an AI that is able to recognize when someone has a PTSD episode.
- Use in a non service animal could provide a similar experience to use in a service animal at a fraction of the cost.
- Work with a wide range of smart watches and heart rate sensors.