

Abstract

The Portable Ruggedized Fluid Pump (PRFP), is a compact and durable medical device designed to save lives by swiftly delivering large volumes of vital fluids at an easily configurable flow rate in critical situations. It's specifically crafted for battlefield and pre-hospital care, where time is of the essence. The PRFP is user-friendly, offers remote control for precise operation, and complies with medical standards. It addresses the urgent need for efficient fluid infusion in extreme conditions, benefiting military healthcare providers, combat medics, and paramedics. Our project's mission is clear: enhance patient care, reduce resource strain, and support those on the front lines of emergency medical response.

Need for Product

Gunshot wounds often lead to significant blood loss, and even with sealed wounds, the crucial need to restore lost blood is well-known to us as humans. Addressing the gap in the current market, our solution steps in. The PRFP, a compact and robust device, efficiently administers precise fluid volumes at an adjustable rate in critical situations. Specifically designed for battlefield and pre-hospital care, its purpose is to enhance patient care by swiftly and accurately addressing the urgent need for fluid infusion in life-threatening scenarios.



Figure 1: The Competition



Figure 2: Concept Art

Product Description

Our innovative PRFP is a vital response to the critical gap in the market for portable solutions addressing life-threatening situations, such as gunshot wounds. **Designed** for battlefield and pre-hospital care, the PRFP is compact and durable, ensuring swift and precise delivery of fluids at an adjustable rate. With a focus on improving patient care in high-stress scenarios, our device is equipped to make a significant impact by efficiently addressing the immediate need for fluid infusion in critical medical situations.

Main Functions/Features

1. Peristaltic Pumps
2. Touch Screen Display
3. Microcontroller (ESP 32)
4. 24V Battery
5. Sterilized Tubing
6. Wireless



Figure 3. Wireless communication

Hardware Diagram

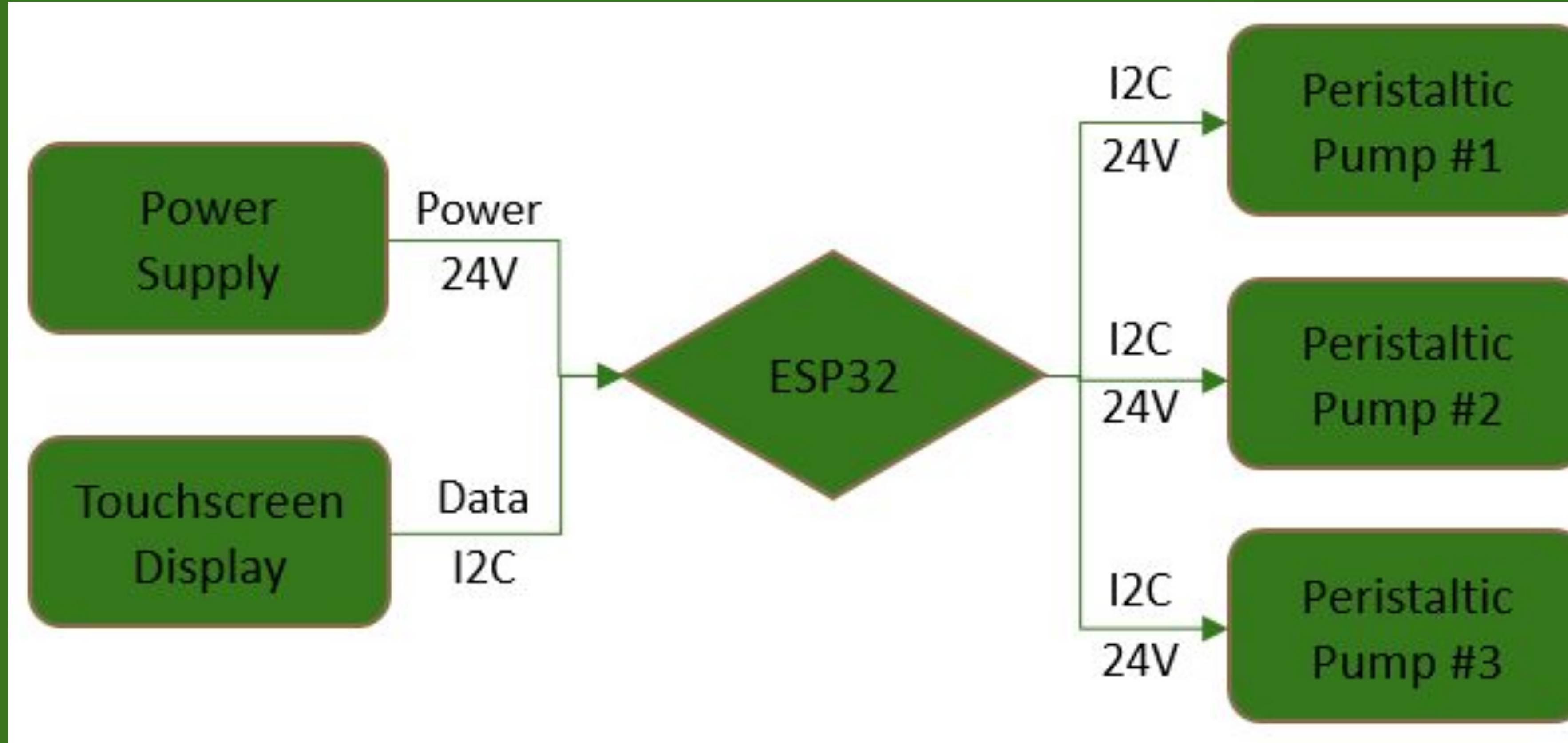


Figure 4: Hardware Block Diagram

Software Flowchart

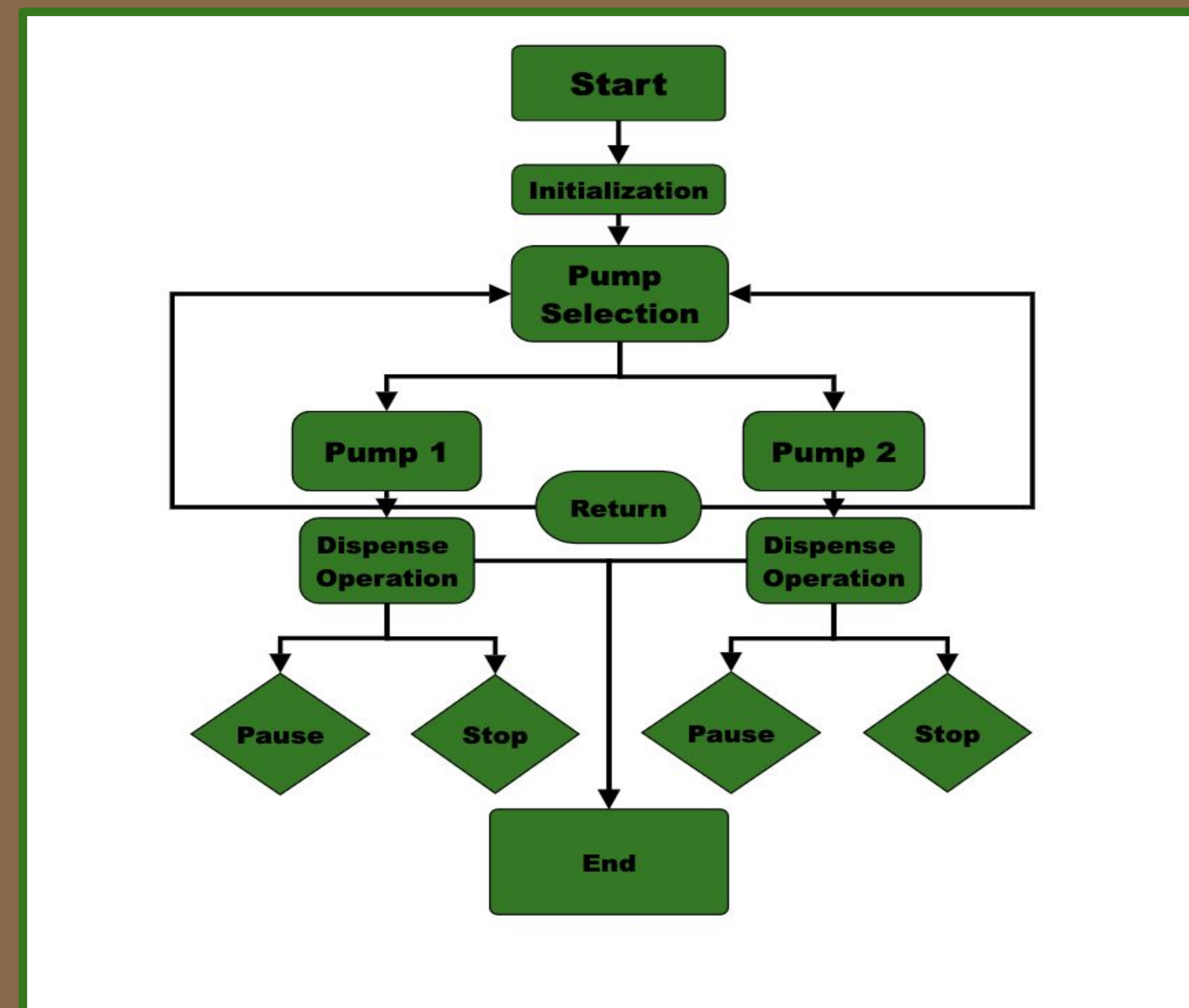


Figure 5: Software Flowchart

Project Budget

Item	Description	Cost
Peristaltic Pumps	EZO-PMP-L™ Large Embedded Dosing Pump (x2)	\$500
Microcontroller	ESP32 (x1)	\$10
Battery	Talencell 24V Lithium Ion Battery (x2)	\$100
Touchscreen Display	Elecrow 5in Touchscreen Monitor (x1)	\$50
Miscellaneous	Various small components and materials	\$50
Total Cost		\$710

Implementation and Integration

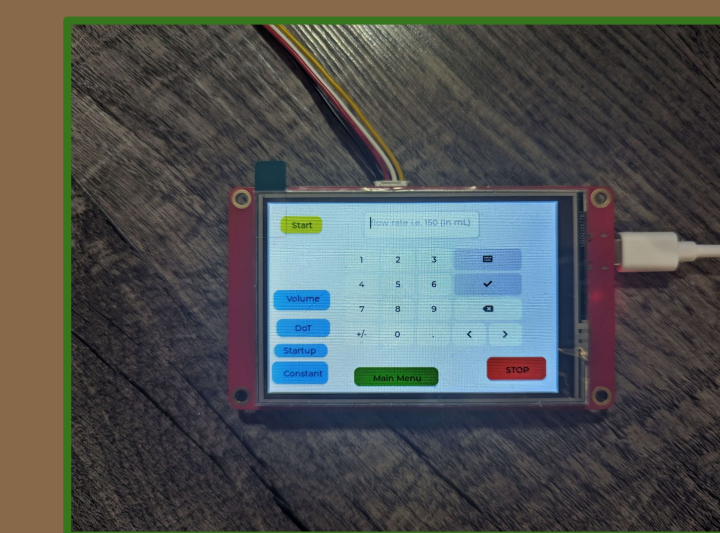


Figure 6: GUI Running on Display

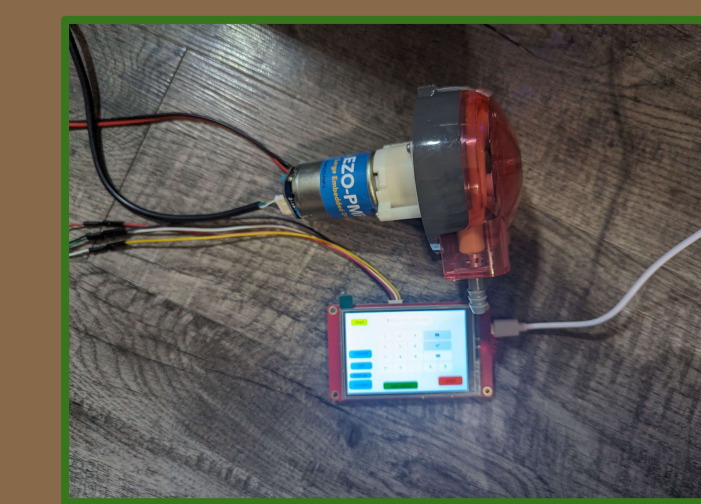


Figure 8: Display Controlling Pump

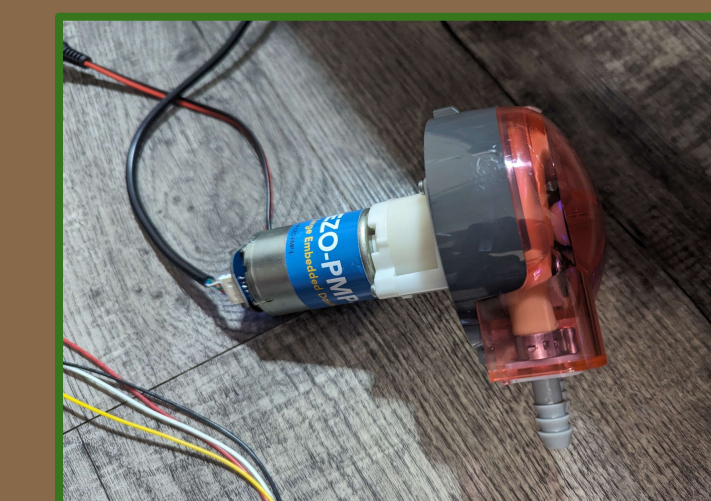


Figure 7: Pump Running with I2C

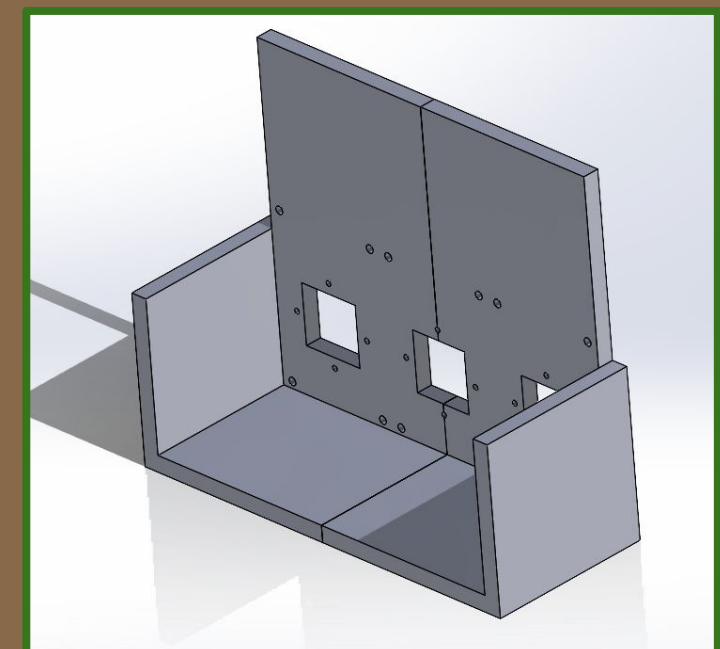


Figure 9: CAD Assembly of Enclosure

Verification and Validation Testing

Given the sensitive nature of the PRFP, it is of the utmost importance to conduct extensive verification and validation. In particular, the correct volume dispensation at the chosen flow rate. The graph that follows is an example of the pump's accuracy under continuous strain, operating at various rates.

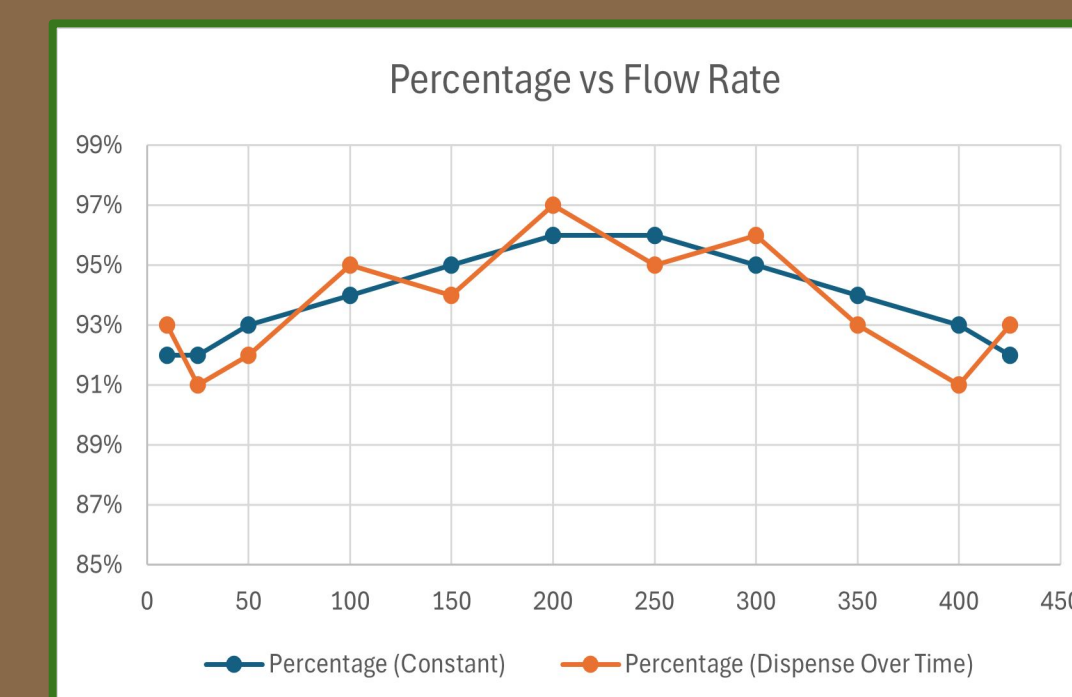


Figure 11: Percentage v Flow Rate Graph

Acknowledgements

No more fun and games, the time has come. It was asked of us and we delivered. This in thanks to the countless silent contributors to this grand project whose immeasurable assistance has led us here, and it would be dishonest and downright despicable to ignore their contributions. To you, oh magnificent beings, we dedicate this. Also we chilled at the MakerSpace and that was nice.