Reinfusion Module Design for Rika

TERUMO BLOOD AND CELL TECHNOLOGIES

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Background

- Plasma donations save 125,000 lives annually in the US
- Terumo's Rika Plasma Donation System separates blood components to collect plasma
- Completes plasma donation collections in 35 minutes or less
- Has an advanced control system that carries out collections with minimal intervention from device operators

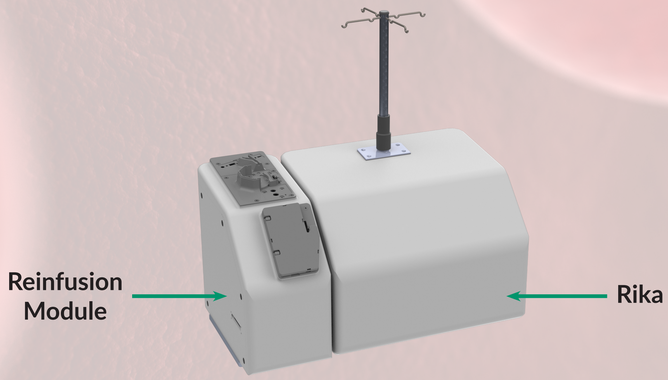
Objective and Requirements

Main Objective

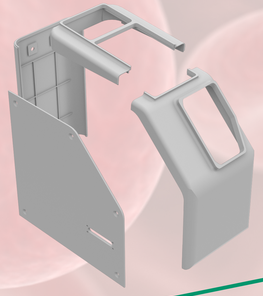
- Integrate with Rika to perform additional blood-related processes it previously did not have capabilities to perform

Requirements

- Easy on-site installation with minimal down-time of Rika
- Match Rika's profile while minimizing width and weight
- Repurpose modules from Rika
- Develop novel software commands for new machine states

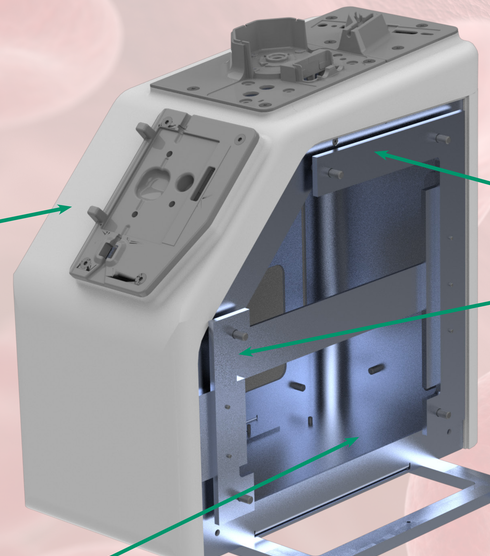


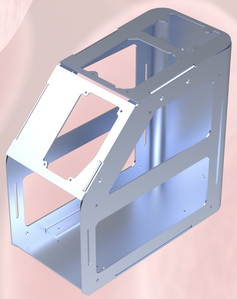
Design and Manufacturing



Device Cover

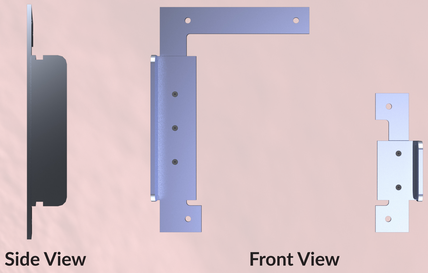
- Housing: ABS, 3D printed in three parts
- Side plate: Delrin, laser cut and milled
- Lip and groove feature aids in alignment and protects internal components
- Supports modules





Device Frame

- AL 5052, laser cut and bent
- Provides structural support
- Contains threaded holes for fastening modules



Alignment Brackets

- Al 6061, waterjet and milled
- Alignment using slotted interfaces
- Notches allow for easy attachment to Rika
- Purely for alignment purposes (does not provide structural support)

Undermount Frame

- AL 6061, waterjet and milled
- Allows Rika & Reinfusion Module (150lb) to be transported as one with minimal deflection of the undermount frame

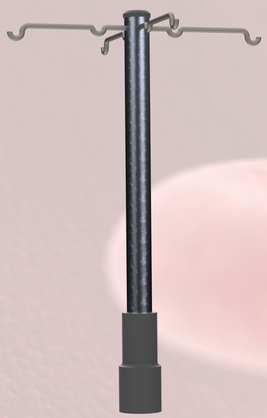
Load Cell Attachment and Disposables

Load Cell Attachment

- Load cell attachment supports a load of up to 4 liters of fluid which allows fluid balance changes to be monitored via the load cell

Disposables

- The disposable is a set of plastic tubing used to transport fluid and is discarded after every procedure
- Disposable tubing and collection bag provide a cost-effective way for fluid to be moved through a closed, replaceable system



Load Cell Attachment

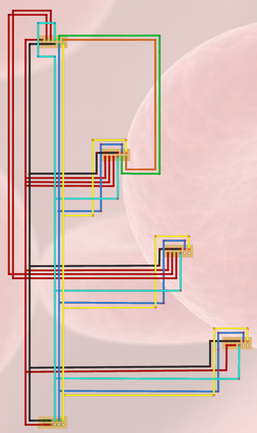
Systems and Testing

Systems

- Wrote pseudo code to implement state commands in device software
- Manufactured a wiring harness and pneumatic tubing layout for module control and actuation

Testing

- Planned tests using saline to determine feasibility of device state commands and logic
- Mechanical requirements checked through simple verification tests and user testing



Wiring Harness Schematic

Impacts

"We have a saying: "A Prototype is Worth 1000 PowerPoints" and this project has exemplified that spirit. This prototype has already caused thinking and discussion about the product concept and our design directions. It will be featured in meetings in the week following the expo. Nice job to the CU team!"

— Tom Felt, VP of Innovation and Advanced Technology, Terumo BCT

Future Improvements

- Reduce number of complex bends
- Improve alignment bracket design
- Increase efficiency of procedure by modifying state commands
- Incoperate Faraday-Cage to prevent RF interference
- Continue interation on load cell pole and waste bag design

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