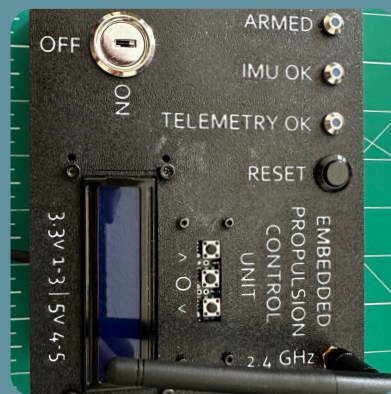

Nathaniel Cavazos

Controls Engineering Portfolio

Mechanical Engineer Student at California State
University, Long Beach
B.S. Mechanical Engineering | Expected May 2028

Controls Engineering • Industrial Automation • Embedded Systems



Featured Projects:

- Embedded Telemetry Ground Station
 - Water Tank PLC Automation System
 - Gear Drive Performance Comparison Study (In Progress)
-

Portfolio showcasing controls engineering,
PLC automation, embedded systems, and
experimental design projects.

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LinkedIn – [linkedin.com/in/nathanielcavazos2007](https://www.linkedin.com/in/nathanielcavazos2007)

Portfolio – nathaniel-cavazos.com

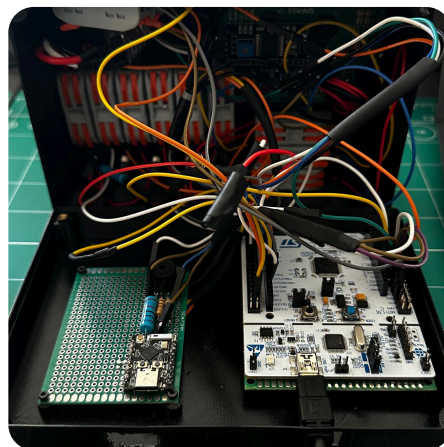
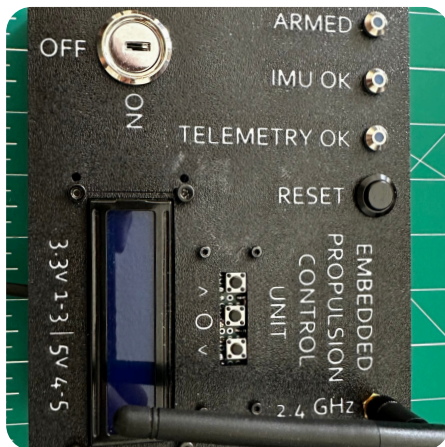
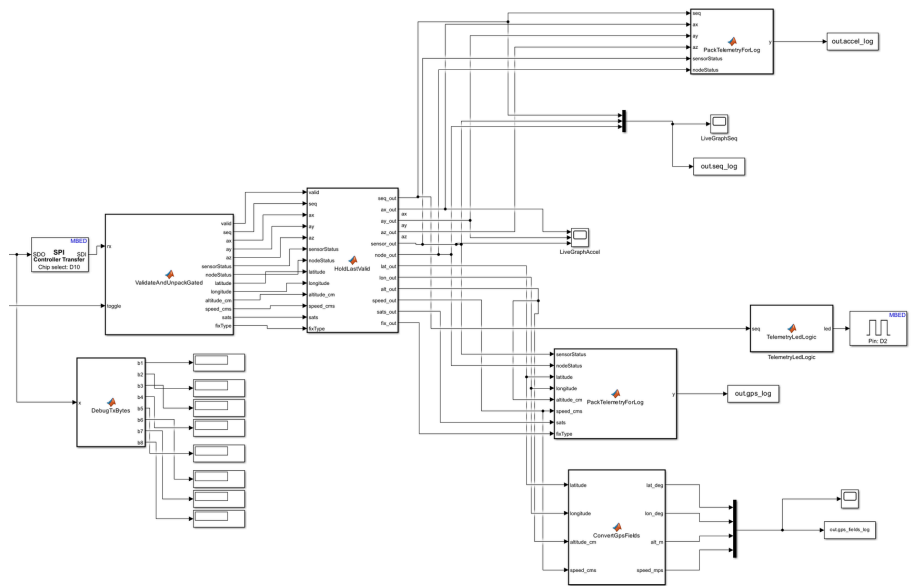
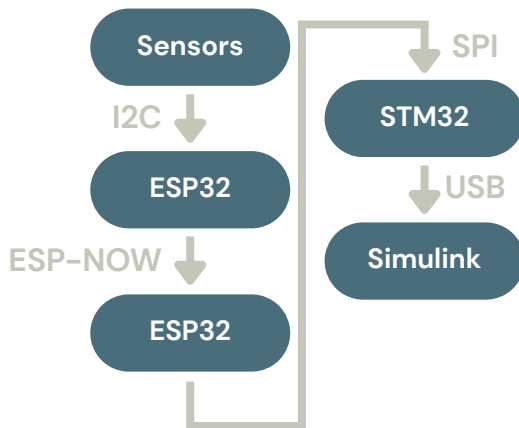
Embedded Telemetry Ground Station – Personal Project

Tools: SolidWorks • MATLAB/Simulink • ESP-NOW • I2C • SPI • UART • STM32 • ESP32

Overview: Developed a downlink wireless communication system between an STM32-Based flight controller and an ESP32 ground station. The system utilized ESP-NOW for low-latency data transmission and integrated with Simulink for real-time monitoring and telemetry visualization.

Goal: Design a reliable telemetry system to transmit sensor and status data from an embedded platform to a ground station while minimizing latency and packet loss.

System Architecture:



Responsibilities:

- Developed a Simulink-based telemetry visualization interface.
- Implemented ESP-NOW wireless communication in C.
- Integrated sensor data acquisition and packet decoding.

Technical Highlights:

- ESP-NOW wireless networking.
- Real-time telemetry visualization.
- SPI, I2C and UART communication protocols.
- Packet-based data transmission.

Results:

- Successfully streamed real-time telemetry to Simulink for monitoring and data logging.
- Achieved reliable wireless transmission of sensor and status data.

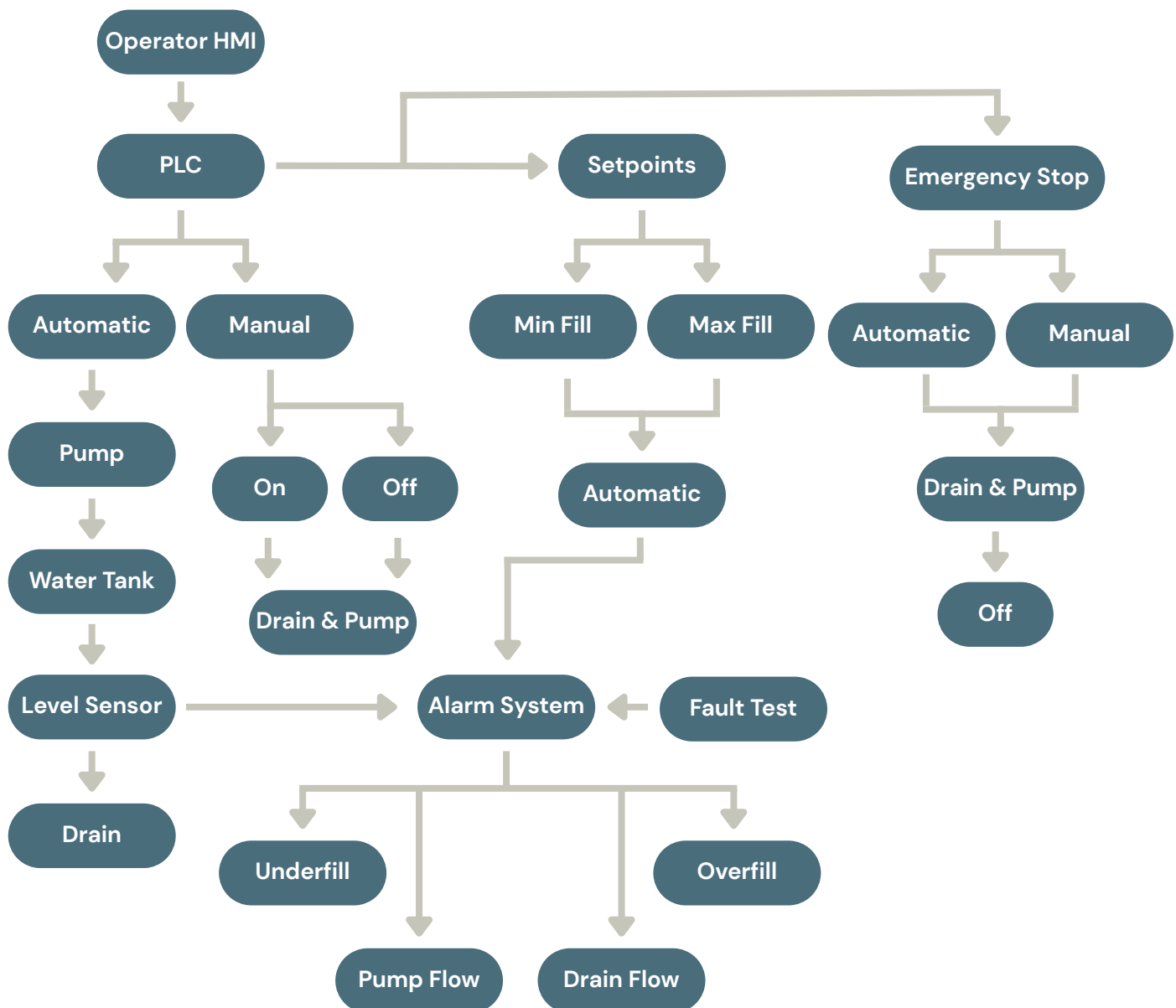
Water Tank PLC Simulation – Personal Project

Tools: CCW • Rockwell Automation • RSLinx • BootP • Ethernet/IP • PLC • HMI

Overview: Developed a PLC-based water tank automation system to simulate industrial liquid level control and process monitoring. The system incorporated automated pump control, level sensing, operator interface screens, and fault logic to maintain safe and reliable operation.

Goal: Design an automated water tank control system capable of maintaining desired tank levels while providing operator monitoring, alarm management, and system protection through PLC and HMI integration.

System Architecture:



Nathaniel Cavazos

Mechanical Engineer at California State University Long Beach

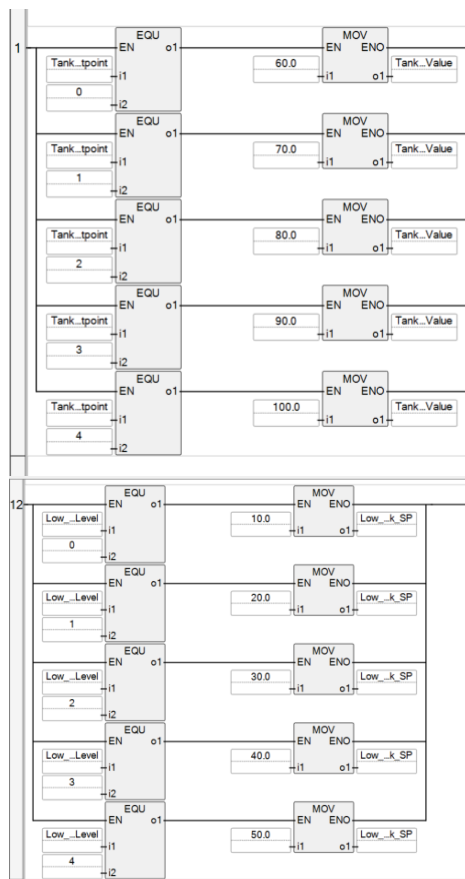
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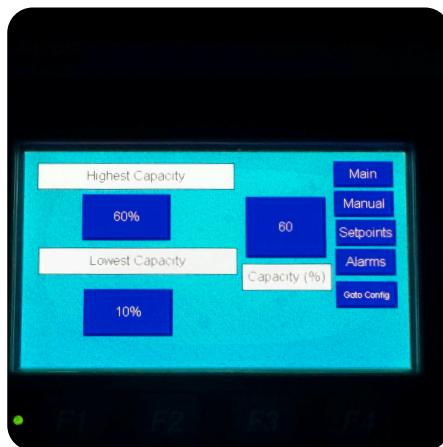
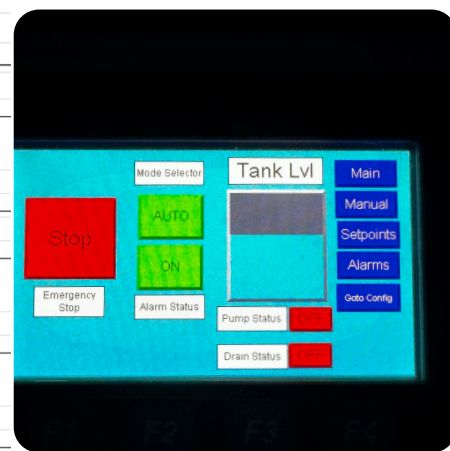
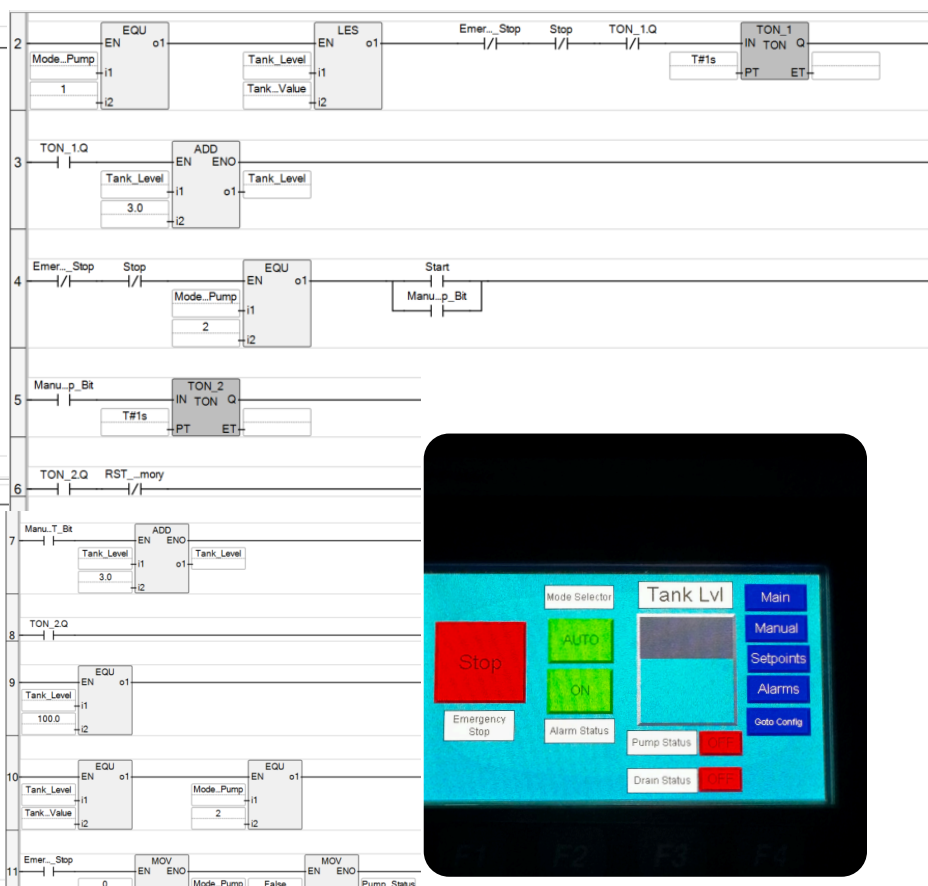
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Water Tank PLC Simulation Continued – Personal Project

Setpoints:



PLC Control Logic & Safety Interlocks:



Responsibilities:

- Developed ladder logic for automatic tank filling and draining operations.
- Implemented emergency stop and fault handling routines.
- Configured PLC-HMI using BootP.

Technical Highlights:

- PLC Ladder Logic Programming
- HMI Development and Navigation
- Alarm Management
- Automatic and Manual Control Modes
- Industrial Process Simulation

Results:

- Successfully automated water tank filling and draining operations.
- Validated automatic fill, manual override, alarm, and emergency stop operating states.

Technical Skills

Controls & Automation

- Allen-Bradley PLCs
- Connected Components Workbench (CCW)
- Ignition HMI
- RSLinx
- Ethernet/IP
- HMI Development
- Ladder Logic Programming
- Alarm Management
- Industrial Automation

Engineering Software

- SolidWorks
- Siemens NX
- MATLAB
- Simulink
- KiCad

Embedded Systems

- STM32
- ESP32
- UART
- SPI
- I2C
- Sensor Integration

Control & Modeling Languages

- Ladder Logic
- MATLAB
- Simulink Modeling

Mechanical Design & Testing

- CAD Modeling
- Additive Manufacturing (3D printing and machining)
- Prototype Development
- Experimental Testing
- Load Cell Integration
- Data Collection & Analysis

Industrial Communications

- Ethernet/IP
 - SPI
 - I2C
 - UART
 - USB-Serial
 - ST-Link
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