



**Team Members:** Artemis Pelle, Zach Pick, Zac Mullen, Kaitlyn Glen, Dylan Carson, Cameron Kupec  
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### Customer Background

Salk Institute for Biological Studies is a research facility based in San Diego, CA and was founded in 1963. They are a company that focuses on plant biology, neuroscience, genetics, and immunology.

### Problem Statement / Scope of Work

Salk needs a new system for efficient data collection in plant growth experiments. The system will use actuators to move petri dishes onto a scanner, enabling hands-free operation and reducing costs. Project goals include making the prototype functional, creating a user-friendly interface, ensuring communication with Salk's file system, and meeting design and safety requirements.

### Requirements

- Air and Light
  - Must allow adequate amounts
- Plates
  - Minimum of 48
- Power
  - Use reasonable power implementation
- Emergency Stop
  - Power shut down by 250ms
- Scanner
  - 6400 x 9600 dpi
- Robot arm
  - Solution for moving petri dishes
- Size
  - 91.44cm x 142.24cm x 43.18cm

### Experimentation and Concepts

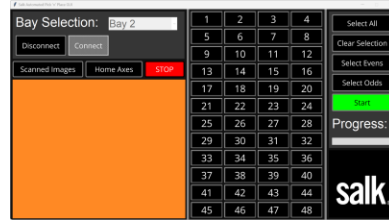


Petri Dish Holder

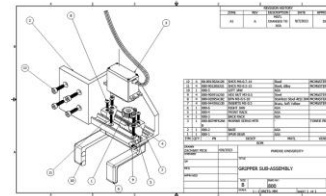


Electrical Schematic

Multiple experiments and concepts were completed during this project. Feel free to ask the team about the changes and what other parts of the project were experimented!

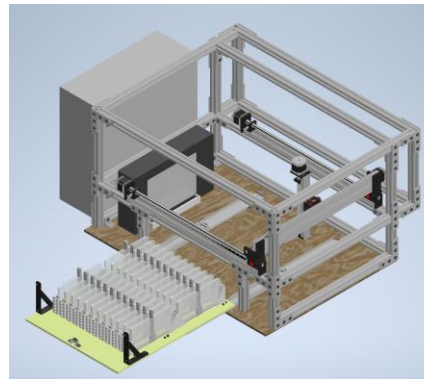


GUI



Gripper

### Final Design



The system is a pick and place gantry that carries two petri dishes at a time to a V600 scanner to be scanned so they can be monitored for root growth. A drawer is used to unload and load the system with new dishes.

### FMEA

- Cage/Structure
  - Drawer system fails
    - Risk priority is 8
  - Structural support fails
    - Risk priority is 10
- Safety
  - Limit switch fails
    - Risk priority is 9
  - E-Stop
    - Risk priority is 9
- Gantry Motion
  - Stepper motors fails
    - Risk priority is 54
  - Controller fails to communicate
    - Risk priority is 36

### Testing

The main areas for testing are mechanical, programming, and electrical. The gantry can hold and scan any number between 1 and 48 petri dishes. The scanner can image petri dishes with resolutions up to 1200 dpi. Numerous safety protocols have also been tested, including a circuit breaker, E-stop, and limit switches. The gantry has also been tested in various environmental conditions that simulate the growth chamber in the Salk plant science laboratory.