Fermilab Experience – Power Panel Survey and UPS Controlling

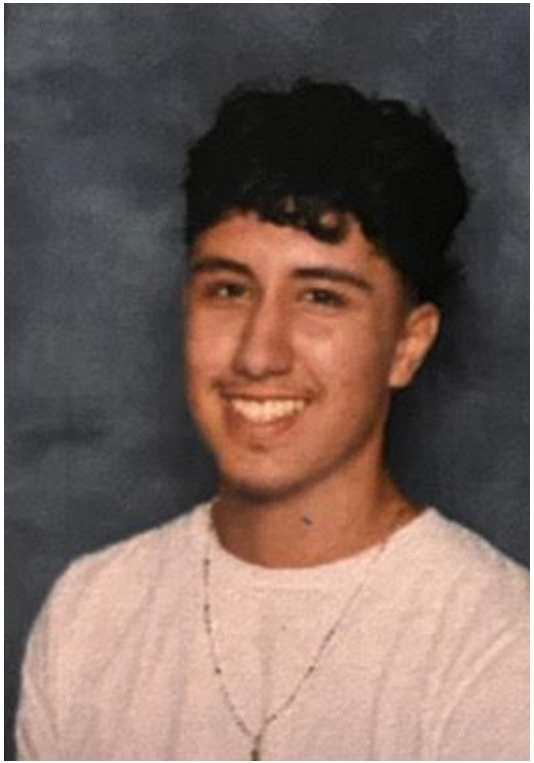
Alex Martinez - TARGET Program
John Daffenberg - VALOR JROTC Internship

John Daffenberg VALOR

- **Marmion Academy: Class of 2025**
- **Born and Raised in Yorkville**
- **Activities:** Math Team, NHS, Cross-Country, Basketball, and Track teams, Mentor program, and many other clubs and activities
- **What I hope to study:** Chemical Engineering or Electrical Engineering
- **What the future holds:**
  - Colorado School of Mines
  - CU Boulder
  - Virginia Tech

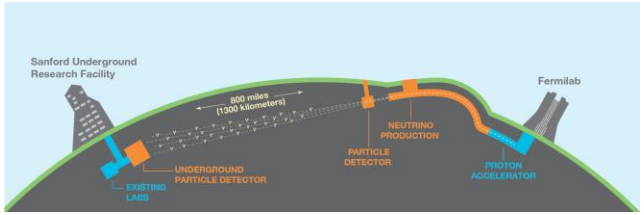
Alex Martinez TARGET

- Morton West High School: Class of 2025
- **Academic Endeavors:** Member of National Honor Society, Robotics enthusiast with a focus on engineering and problem-solving, active participant in JSA/Debate Club for critical thinking and public speaking skills.
- **Career Aspiration:** Software Engineer
- **Passion:** Fascinated by technology and computers, eager to innovate through programming and application development.
- **Goal:** Combine academic achievements with extracurricular activities to contribute to cutting-edge technologies in software engineering.



Fermilab

Why Fermilab?



- **Alex:** As a high school intern, I chose Fermilab for its leading role in particle physics research and technological innovation. Being part of major projects like DUNE and LBNF, and having the opportunity to collaborate with a global scientific community, is a huge and exciting step for me (Networking). I was also looking to enhance my Python skills, and Fermilab's exceptional educational programs and supportive environment make it the ideal place to advance my knowledge and contribute to groundbreaking discoveries at such an early stage in my career.

Why Fermilab?

- **John:** I didn't know much about Fermilab for a long time. My military instructor, LTC Daniel Williams, presented this VALOR JROTC internship at Fermilab. I've always wanted to experience STEM in a real life manner. It's one thing to learn formulas, study textbooks, and watch YouTube videos, but to be out in the actual field is something I wished to experience. Fermilab offered an immersive environment that I knew I couldn't find anywhere else. And so I applied...

Project 1: Power Panel Survey

- Updating panel schedules for 50+ panels in an industrial building, last updated over 9 years ago.
- Communicating with building managers and experts to document each circuit's purpose.
- Using notecards to track changes in circuit purposes
- Enjoying organizational aspects and navigating industrial areas.
- Crucial role in ensuring operational efficiency and safety of facility infrastructure.

Power Panel

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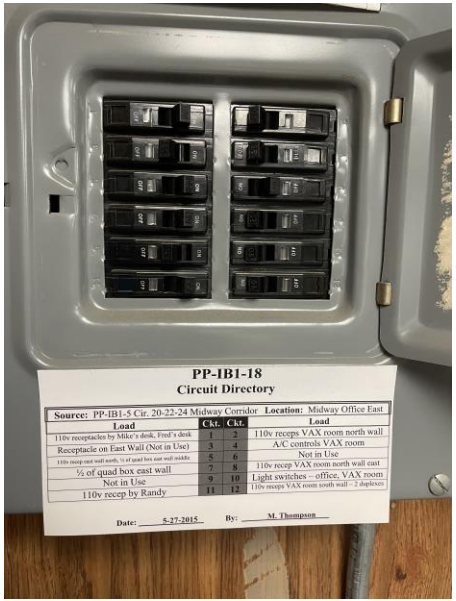
Project #1 Photos

POWER PANEL



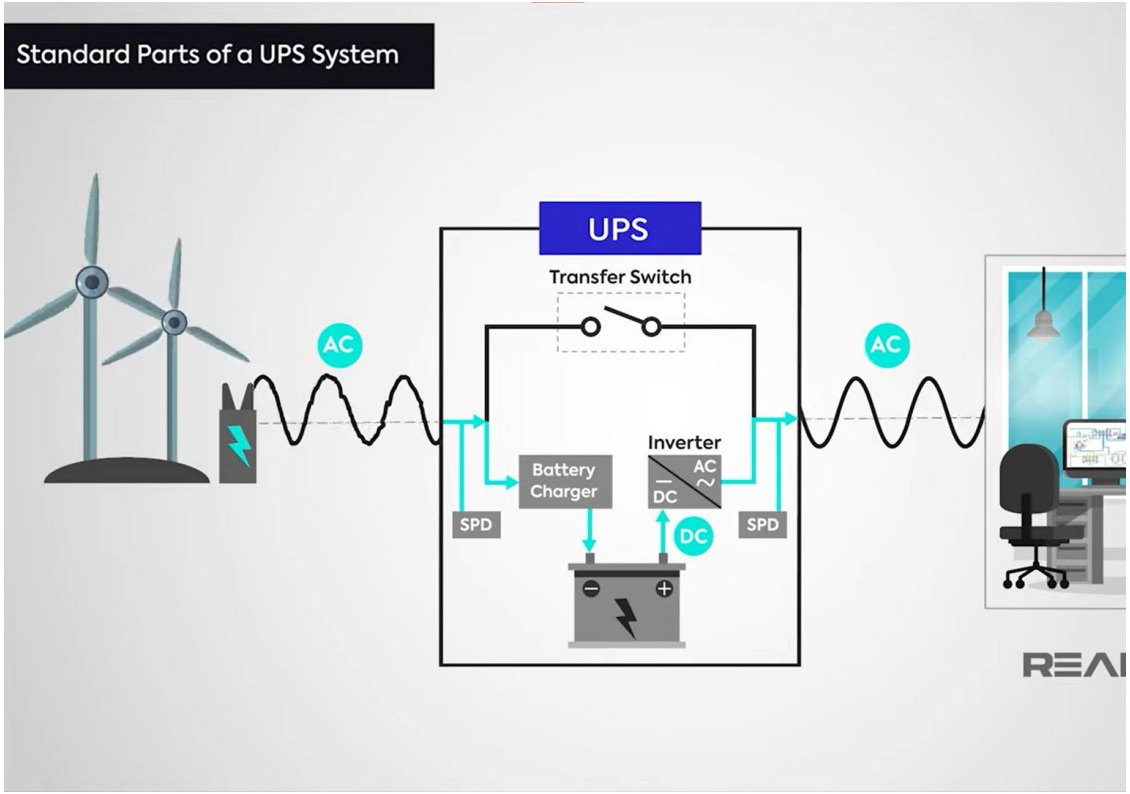
CIRCUIT DIRECTORY

BIGGEST BREAKER

POWER PANEL FACE

Project 2: PLC and UPS

- UPS (Universal Power Supply)
- A Universal Power Supply (UPS) is a device that provides backup power to electrical equipment in the event of a power outage or significant voltage drop. It serves several critical functions including: Uninterruptable P ower, Surge Protection, Voltage Regul ation, Battery
  Backup, Power Conditioning, and Monitoring
- UPS systems are widely used in various settings, including homes, offices, data centers, and industrial environments, to protect critical equipment such as computers, servers, telecommunications equipment, and medical devices from power disruptions.



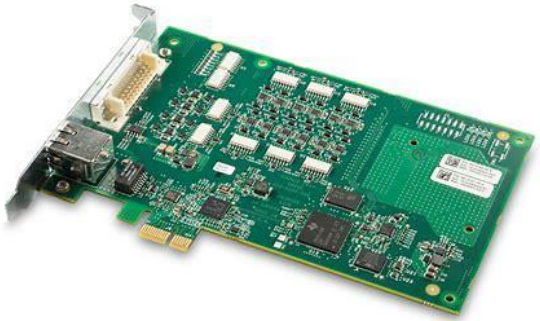
Project 2: PLC and UPS

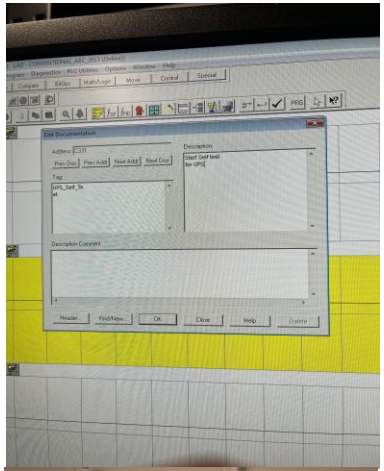
- PLC (Programmable Logic Controller)
- A Programmable Logic Controller (PLC) is a specialized computing device designed for the automation of industrial processes. It is used to control machinery and processes in manufacturing, assembly lines, and other industrial applications.

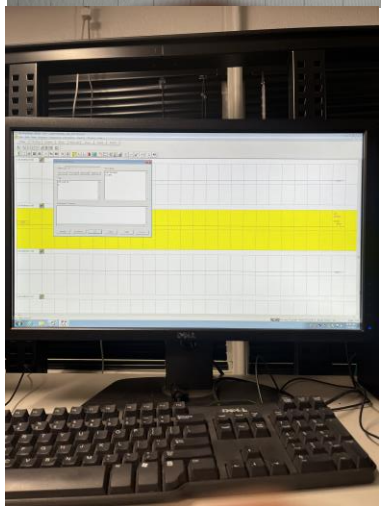
- PLCs are essential in various industries, including manufacturing, automotive, chemical processing, food and beverage, pharmaceuticals, and many others. They provide precise and reliable control over complex processes, enhancing productivity, safety, and efficiency in industrial operations.

Project 2: PLC and UPS

- Combining the Two
- We Wired Specific Outputs and Inputs on an I/O card in order to get the data we want. We had to cut and strip wires to do this appropriately.
- We then Install the card into the UPS so that it can read our Inputs and Outputs. We then guide the Wires to the terminal blocks at the PLC so that we can control the UPS from our computer







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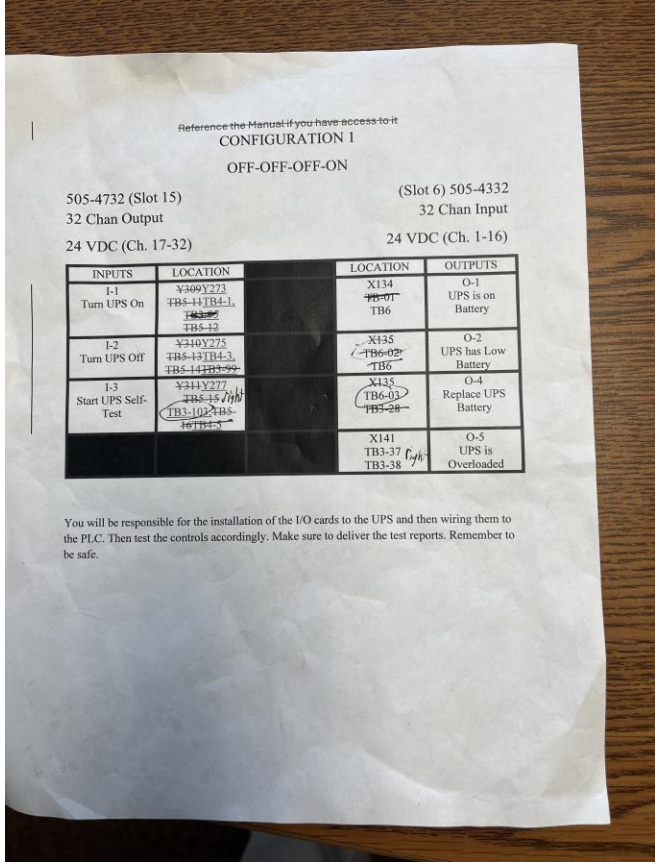


Reference the Manual if you have access to it

CONFIGURATION 1

OFF-OFF-OFF-ON

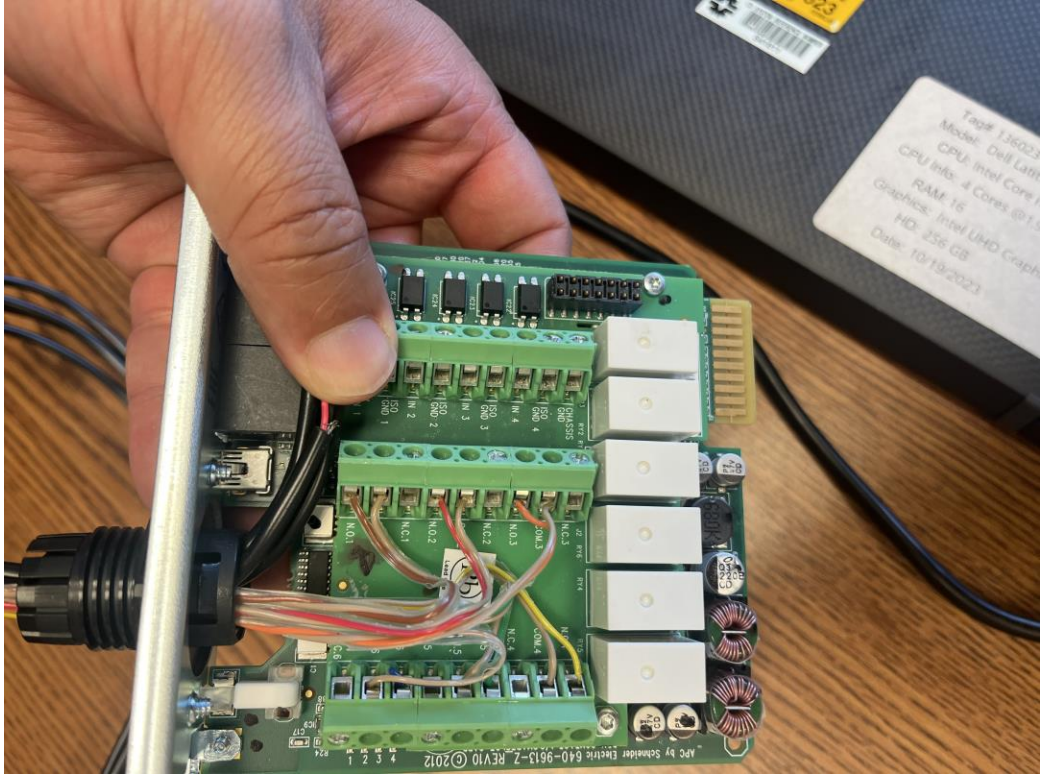
505-4732 (Slot 15)
32 Chan Output
24 VDC (Ch. 17-32)

(Slot 6) 505-4332
32 Chan Input
24 VDC (Ch. 1-16)

INPUTS	LOCATION		LOCATION	OUTPUTS
I-1 Turn UPS On	~~Y309~~ Y273 ~~TB5-11~~ TB4-1, ~~TB3-99~~ ~~TB5-12~~		X134 ~~TB-01~~ TB6	O-1 UPS is on Battery
I-2 Turn UPS Off	~~Y310~~ Y275 ~~TB5-13~~ TB4-3, ~~TB5-14~~ ~~TB3-99~~		~~X135~~ ~~TB6-02~~ TB6	O-2 UPS has Low Battery
I-3 Start UPS Self-Test	~~Y311~~ Y277 ~~TB5-15~~ TB3-102 ~~TB5-16~~ ~~TB4-3~~		X135 TB6-03 ~~TB3-28~~	O-4 Replace UPS Battery
			X141 TB3-37 TB3-38	O-5 UPS is Overloaded

You will be responsible for the installation of the I/O cards to the UPS and then wiring them to the PLC. Then test the controls accordingly. Make sure to deliver the test reports. Remember to be safe.

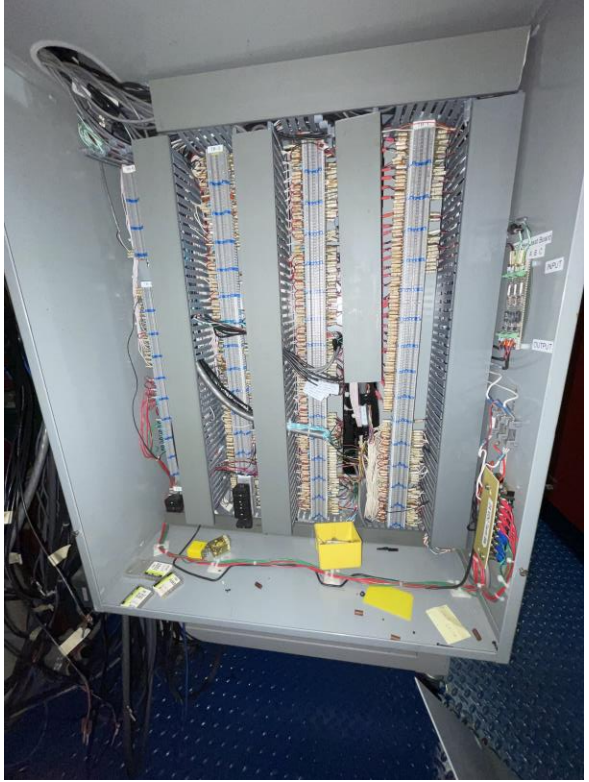
Quick Plan



I/O Card

UPS

Power Rack



PLC

UPS WIRING

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Favorite Workshop: Robotics at Fermilab (Alex)

- **Speaker**: An engineering physicist with expertise in robotics (Adam Watts)
- **Topic**:
  - **Robotics**: Explored the intersection of robotics and mechanical engineering.
  - **Python Integration**: Demonstrated how Python can be used to control and program robotic systems, enhancing automation and efficiency.
- **Key Takeaways**:
  - **Technical Insight**: Gained valuable knowledge about integrating Python with mechanical engineering to develop advanced robotic systems.
  - **Career Inspiration**: The speaker's discussion inspired me to explore further opportunities in robotics and programming.
- **Next Steps**:
  - **Additional Internship**: Motivated me to pursue another internship at Fermilab to deepen my skills in robotics and Python.

```
def check_db():
    if not os.path.isfile(FILE_URI):
        db.create_all()

@app.route("/")
def home():
    check_db()
    all_books = db.session.query(Book).all()
    return render_template("index.html", books=all_books)

@app.route("/edit", methods=["GET","POST"])
def edit():

    if request.method == "POST":
        book_id = request.form["id"]
        book_to_update = Book.query.get(book_id)
        book_to_update.rating = request.form["rating"]
        db.session.commit()
        return redirect(url_for('home'))
```

Favorite Activity: Conservation and Environmental Efforts (John)

- **We learned about the environment and history of the ecology around Fermilab. This was taught by Walter G. Levernier.**
- **We learned about:**
  - Controlled Fires
  - Invasive Species and efforts to control them
  - The Woodlands
- **The Environment is a STEM Topics:**
  - Often Lost in the Field
- **An enjoyable walk in of itself**

REFLECTION

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  - Jeremy Brown
- All of the workshop and tour coordinators
  - Marco Mambelli (Python)
  - Walter G. Levernier (Conservation Efforts)
  - Adam Watts (Robotics)

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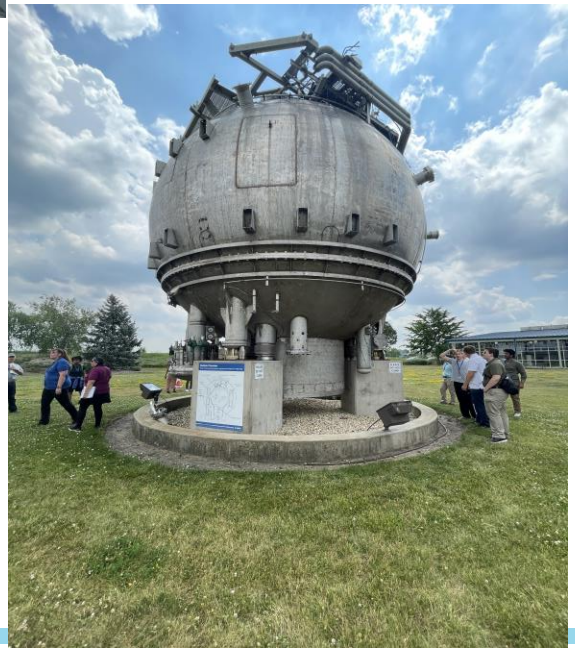
PUBLIC ACCESS HOURS
MONDAY - FRIDAY
7 A.M. TO 5 P.M.



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