Aegis VPX Test Rack

Aegis Power Systems, Inc.

PROBLEM STATEMENT

Aegis is seeking to increase the number of VPX cards they test per day. The testing operations will be conducted in three 8-hour shifts. The tests will be performed in a controlled environment at 100°F, with each unit operating at 80% of its rated load capacity. The primary motivation is to expand production by developing an efficient and standardized method for testing the power supplies before they are delivered to the customers. At present, no such automated testing process exists, and the team is tasked with creating a solution to address this need. The implementation of this solution will decrease the primary bottleneck in the production process.

REQUIREMENTS

#	Description
1	Hardware is modular
2	Design is expandable
3	Can withstand 100˚ F temperatures
4	Safety Features

CONCEPTS

- The Team produced the idea to use a relay matrix.
- The relay matrix allows 3 batches of VPX cards to be tested in 24 hours (3 x 8 hours)

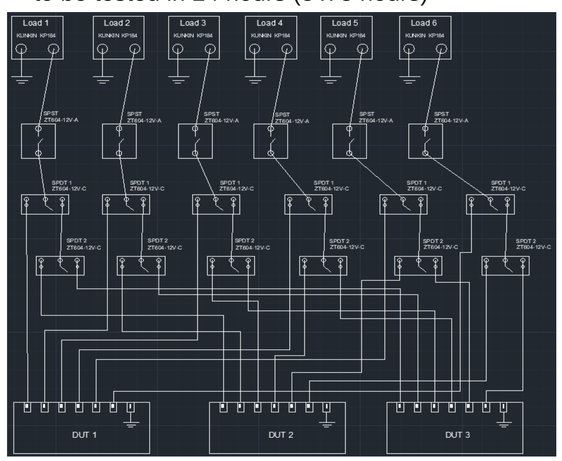

Figure 1. Initial design of Relay Matrix

FINAL DESIGN, APPROACH, PLAN

The team has devised a solution that utilizes the following:

- A program written in LabVIEW to control the power supply, load testers, and relays.
- A DAQ-USB-6000 that will control relays via LabVIEW
- 3 low-level trigger relays that can be switched with the DAQ board
- 6 heavy duty SPST relays as a fail safe
- 12 heavy duty SPDT relays to switch the DUT
- 6 Kunkin load testers to test individual outputs.
- 1 Chroma power supply to disturb the necessary power to test the VPX cards
- 7 FTDI RS232 connectors to communicate with the load testers and power supply

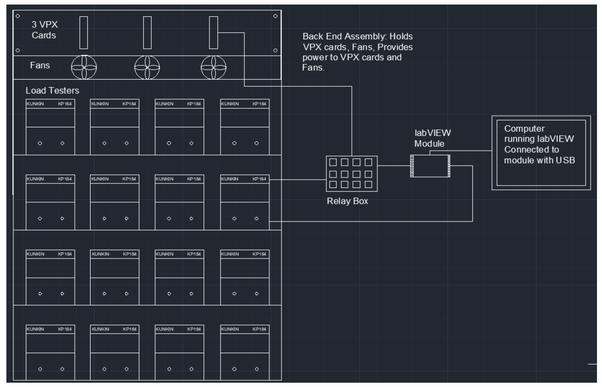

Figure 2. Initial Rack Design

The team decided on specific design methods to optimize modularity with replacement of parts as a priority. One example is connecting the wires to the relays with lug-nuts to allow for easy replacement if a relay burns out (Figure 3). With the chosen modularity method, the team had to design a relay box to hold the relays in a safe manner (Figure 4). The box will fit on the rack and hold enough relays to run 3 VPX cards sequentially.

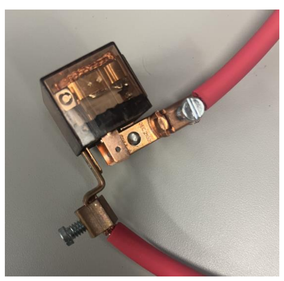

Figure 3. Relay with Lug Nuts

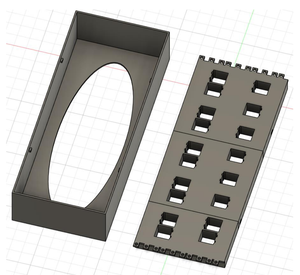

Figure 4. Relay Box

RESULTS

LabVIEW

- The program written in LabVIEW can control the load testers and the power supply based on user input (Figure 5), and the relays based on time.
  - Sets the power on the load testers
  - Sets the voltage on the power supply
  - Controls the larger relays using the smaller low-trigger relays (Figure 7)
  - Collects and displays data for stress test results in excel format (Figure 6).
    - Voltage, current, and power are collected and displayed.

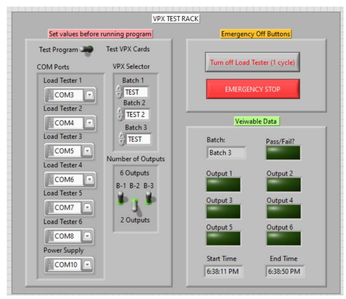

Figure 5. User Interface of LabVIEW

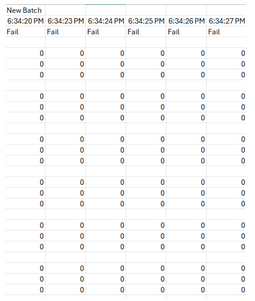

Figure 6. Stress-Test Data

Rack

- A rack that contains the power supply, load testers, relays, and DAQ board has been assembled by the team.
  - The prototype contains a modified version of the relay matrix containing 3 smaller low-trigger relays that can be switched using the DAQ board.
  - The rack allows for easier movement of the VPX burn-in system in and out of the oven.
  - The rack built by the team can test 3 VPX cards sequentially over 24 hours.

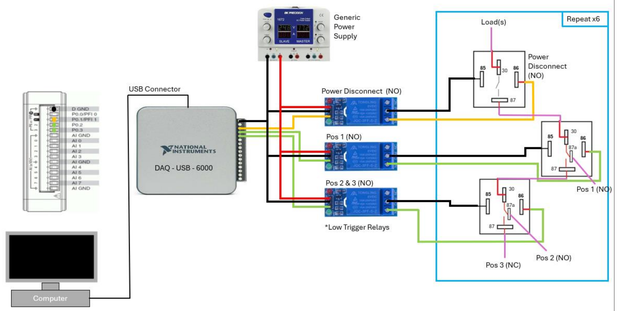

Figure 7. Final design of Relay Matrix

SUMMARY AND CONCLUSIONS

The team will deliver a working solution including the following:

- A working LabVIEW program that can control 6 Load Testers, 1 Power Supply, and 3 low-trigger relays.
  - The load testers and power supply are set with pre-loaded serial codes that are specific to the VPX card that is being tested.
    - Example load tester serial code (10 W): \01\06\01\1E\00\01\04\00\00\03\E8\9F\B8
    - Example power supply serial code (12 V): OUTP\sOFF\n;CONF:COUP\sDC\n;OUTP:COUP\sDC\n;VOLT:RANG\sLOW\n;VOLT:DC\s12\n
  - The low trigger relays are controlled using the DAQ board
- Fully assembled rack including a connected back plane to test VPX cards.

FUTURE WORK

The team is delivering a working solution that can be expanded. Aegis will have the program and rack that was assembled by the team to expand in their facility.

TEAM & ACKNOWLEDGEMENTS

- Gabriela Morales (EE), Sage Sorensen (ECET), Peyton Yarbrough (ECET)
- Brent Stayer (Aegis Sponsor), Andy Ritenour (Faculty Mentor)

References

Chorma Power Supply Manual, https://xdevs.com/doc/Chroma/61600/UM-61601~4-acsource-v1.9-102015.pdf, Accessed Feb 12, 2025

Relay Interfacing using LabVIEW Tutorial, https://youtu.be/tcFvADuqY1k?si=ZiAaK0dJeqk5qTq7, Accessed Jan 26, 2025.

Type Cast Function, https://www.ni.com/docs/en-US/bundle/labview-api-ref/page/functions/type-cast.html?srsltid=AfmBOoqCSlIH1OGtcHqqlU_fT7ocsBQLnTSmiFc-W8i3yJ7oLWATHK_E, Accessed Feb 17, 2025