

# **NAU Solar Thermal Capstone**

## **Hardware Review II**

**Drew Bandhauer**

**Drake Cleveland**

**Cole Jennings**

**2020**

**Project Sponsor: Jon Heitzinger**

**Faculty Advisor: Dr. Jennifer Wade**

**Instructor: Dr. Sarah Oman**

## Introduction

Since the time of the first hardware review report, the team has made many improvements to the solar panel test plan and has conducted the test. The majority of the work has been focused on gaining access to the equipment needed from NAU faculty as well as configuring the measurement devices to the system to ensure correct data could be taken. The team used a LabView VI to record and interpret data taken by the thermocouples, and an analog to record differences in pressure and the flowrate. At the time of this memo, the team finished testing and is in the process of interpreting the results to understand the functionality of the system in terms of temperature change, pressure change, and flow rate. In figures 1-4 below, photos of the team's testing system and LabView VI are attached.



Figure 1. Panel system during test



Figure 2. Barometer and thermocouple at inlet during test



Figure 3. Barometer and thermocouple at outlet

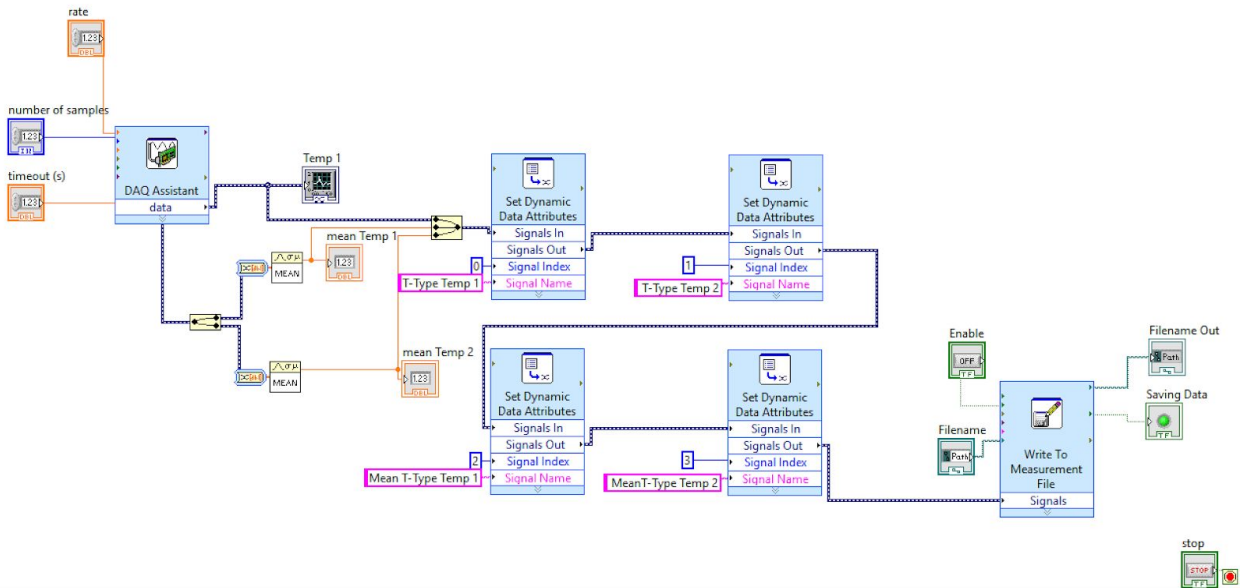


Figure 4: LabView VI

The following are the Action Items each person completed between Hardware Review 1 and Hardware Review 2:

Team Member: Drew Bandhauer

Action Item	Date Completed	Result/Proof of Completion
Assemble fittings and instruments for panel with team	10/1/20	See photos.
Create LabView VI to record test results	10/10/20	LabView VI features a front panel which records temperature continuously at 1Hz a sample for 5 samples.
Conduct Test with Team	10/15/20	See photos from test

Team Member: Drake Cleveland

<b>Action Item</b>	<b>Date Completed</b>	<b>Result/Proof of Completion</b>
Iron out final testing procedure	10/1/20	Due to difficulties implementing a pyranometer into the design, it was left out and the experiment was run only with temperature and pressure measurements. The experimental setup is shown in figures 1-3 above.
Assemble fittings and instruments for experiment	10/14/20	See figures 1-3
Conduct test with the team	10/15/20	The experiment was run on 10/15/20 with temperature and pressure change measurements recorded and ready for interpretation and manipulation.

Team Member: Cole Jennings

<b>Action Item</b>	<b>Date Completed</b>	<b>Result/Proof of Completion</b>
Assemble fittings and instruments for the panel with team	10/1/20	See photos
Manage budget and oversee purchasing for team	Ongoing	Team has spent \$442 of \$520 allocated by GreenFund for testing
Conduct test with team	10/15/20	See photos from test

The following are the Action Items for each team member between HR 2 and the Final Product presentation:

<b>Team Member</b>	<b>Action Items</b>	<b>Date Due</b>
Drew Bandhauer	<ul style="list-style-type: none"> <li>• Interpret data from test</li> <li>• Extrapolate heat transfer rate through panel               <ul style="list-style-type: none"> <li>• Develop final proposal with team</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• 10/25/20</li> <li>• 11/1/20</li> <li>• 11/20/20</li> </ul>
Drake Cleveland	<ul style="list-style-type: none"> <li>• Interpret data from test</li> <li>• Extrapolate useable heat to entire solar system</li> <li>• Develop final design proposal with team</li> </ul>	<ul style="list-style-type: none"> <li>• 10/25/20</li> <li>• 11/1/20</li> <li>• 11/20/20</li> </ul>
Cole Jennings	<ul style="list-style-type: none"> <li>• Develop equations to interpret pressure and flow rate</li> <li>• Work with team to develop final proposal</li> </ul>	<ul style="list-style-type: none"> <li>• 11/1/2020</li> <li>• 11/20/20</li> </ul>