



*Dwight Look College of*

**ENGINEERING**  
TEXAS A&M UNIVERSITY

# **Team 38: Fuel Cell Monitor Bi-Weekly Update 2**

**Rana Kortam**

**Russell Wells**

**Sameer Osama**

**Jessica Odutola**

**Sponsor: Dr. Lusher**

**TA: Dalton Cyr**

# Project Summary

- Problem statement: A single fuel cell is an easy power source to monitor, but to achieve any level of real usable power they must be connected in a stack. If only monitored as a whole, each cell would have to be tested individually to determine the issue. This causes longer down times and more technician wages to trouble shoot.
- The Fuel Cell Monitor System will give the operator real time voltages of both the individual cells and stack. The voltages will be monitorable from an android based mobile app. In case of over or under voltage, the app will notify the operator of not only the error but which cell has fallen or risen outside of expected ranges. Saving both time and money for repairs.



# Fuel Cell Monitor Subsystem Diagram

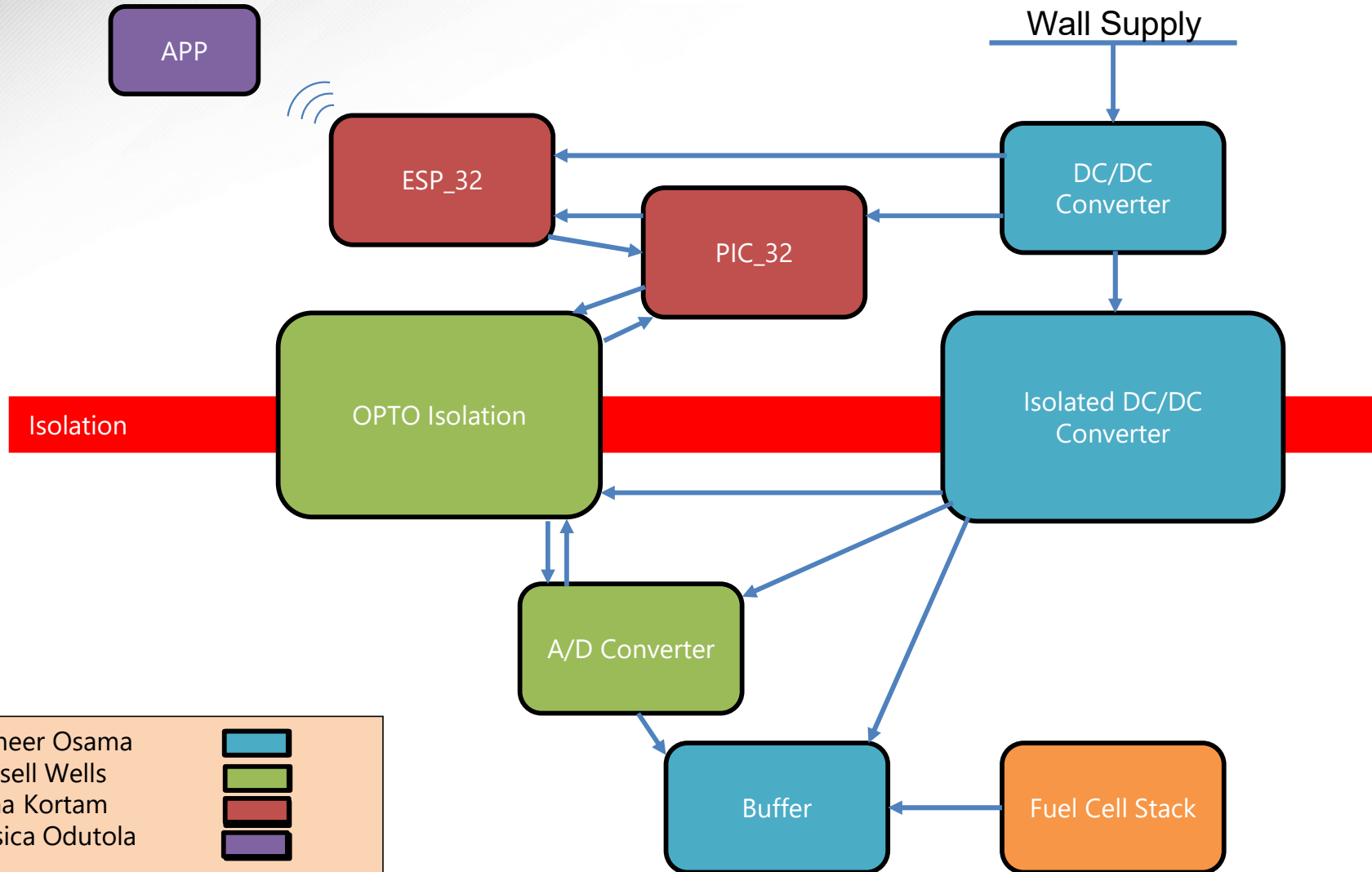


Figure 1: Fuel Cell Monitor Block Diagram



# Project Timeline

Power Subsystem does not produce 2.048 Volts when connected to op-amp buffer system. Troubleshooting in progress. Disassemble and step by step reassemble

Finalize Subsystems  
[Late January]

Validate PCB and  
start assembly  
[February]

Debug and Integrate  
[late February and  
March]

Validation  
[mid February through  
late March]

Final Demo [late April]

PCB Design is finished and BOM has been reviewed. Cannot Order until Power system is complete to avoid overbudget costs.





# Power Supply

Sameer Osama

Accomplishments since Update 1 <b>8 hrs of effort</b>	Ongoing progress/problems and plans until the next presentation
<ul style="list-style-type: none"><li>- Replaced a resistor and diode to get 5V input on voltage reference</li></ul>	<ul style="list-style-type: none"><li>- Ongoing: Troubleshoot system to get output voltage of voltage reference working</li></ul>

# Power Supply

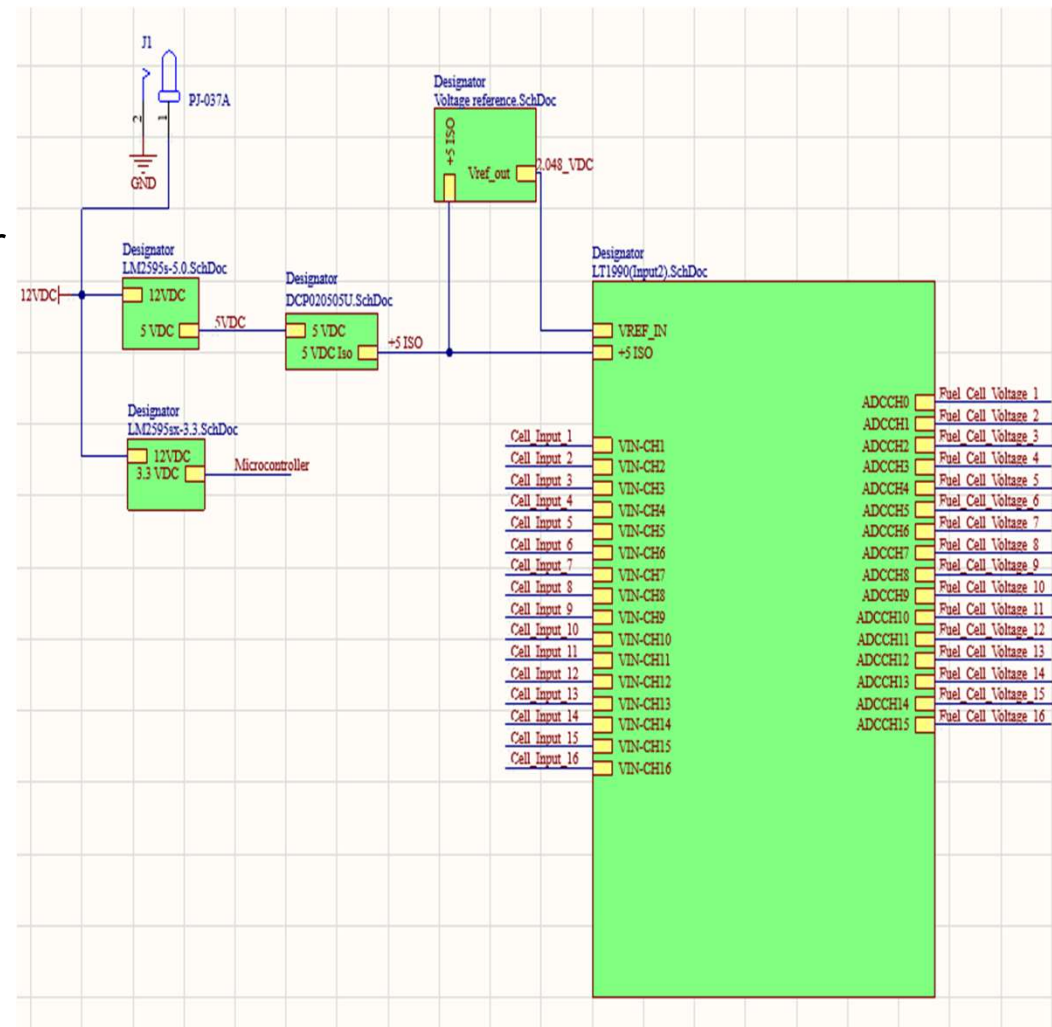
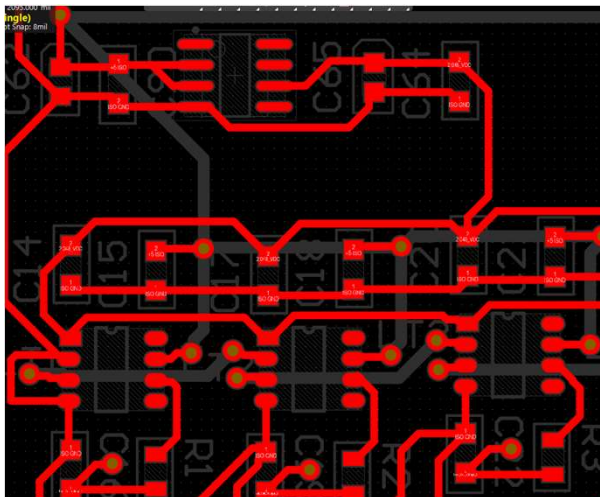
Sameer Osama

Works:

- 3.3V outputs from DC/DC converter
- 5V outputs from DC/DC converter
- 5V outputs from isolated DC/DC converter

Doesn't work:

- Output of voltage reference higher than expected (getting 3.5V instead of 2.048V)





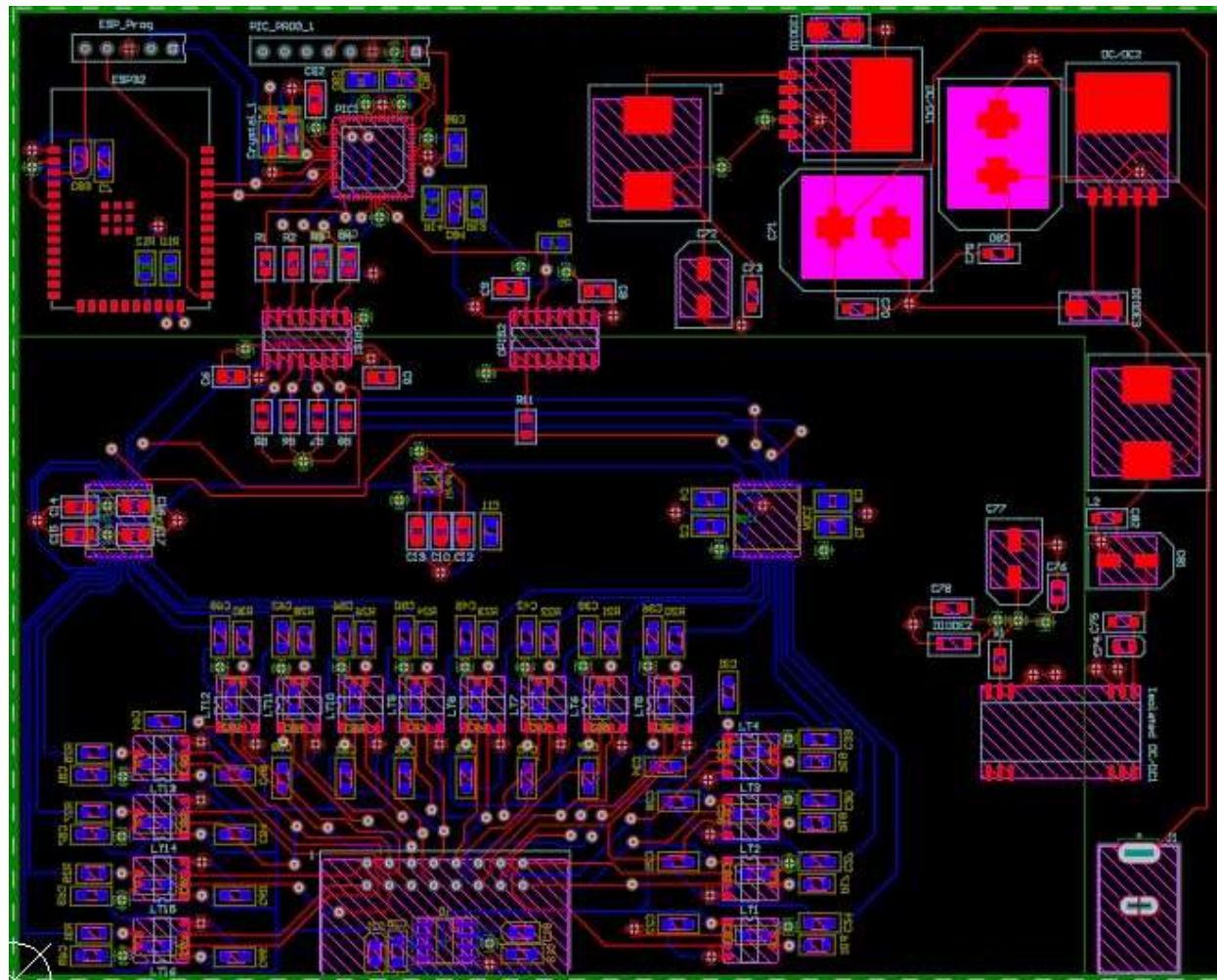
# Internal Signal Transfer and Conversion

Russell Wells

Accomplishments since Update 1 10 Hours Worked	Ongoing progress/problems and plans until the next presentation
Finished PCB Design	<p>Ongoing: Follow BOM to ensure all parts are ordered or in inventory.</p> <p>Solder and Testing of PCB</p> <p>Help Sameer with Voltage reference diagnosis</p>



# Russell Wells







# PIC32 and ESP32

Rana Kortam

Accomplishments since update 1 15 hrs of effort	Ongoing progress/problems and plans until the next presentation
Worked with Russ on PCB design for MCU.	Ongoing: Errors occurring with SPI communication (peripheral library is in the wrong directory). Need to be reviewed with Dr. Lusher and Dr. Nowka. Future: Order parts needed for PCB board



# Android Application

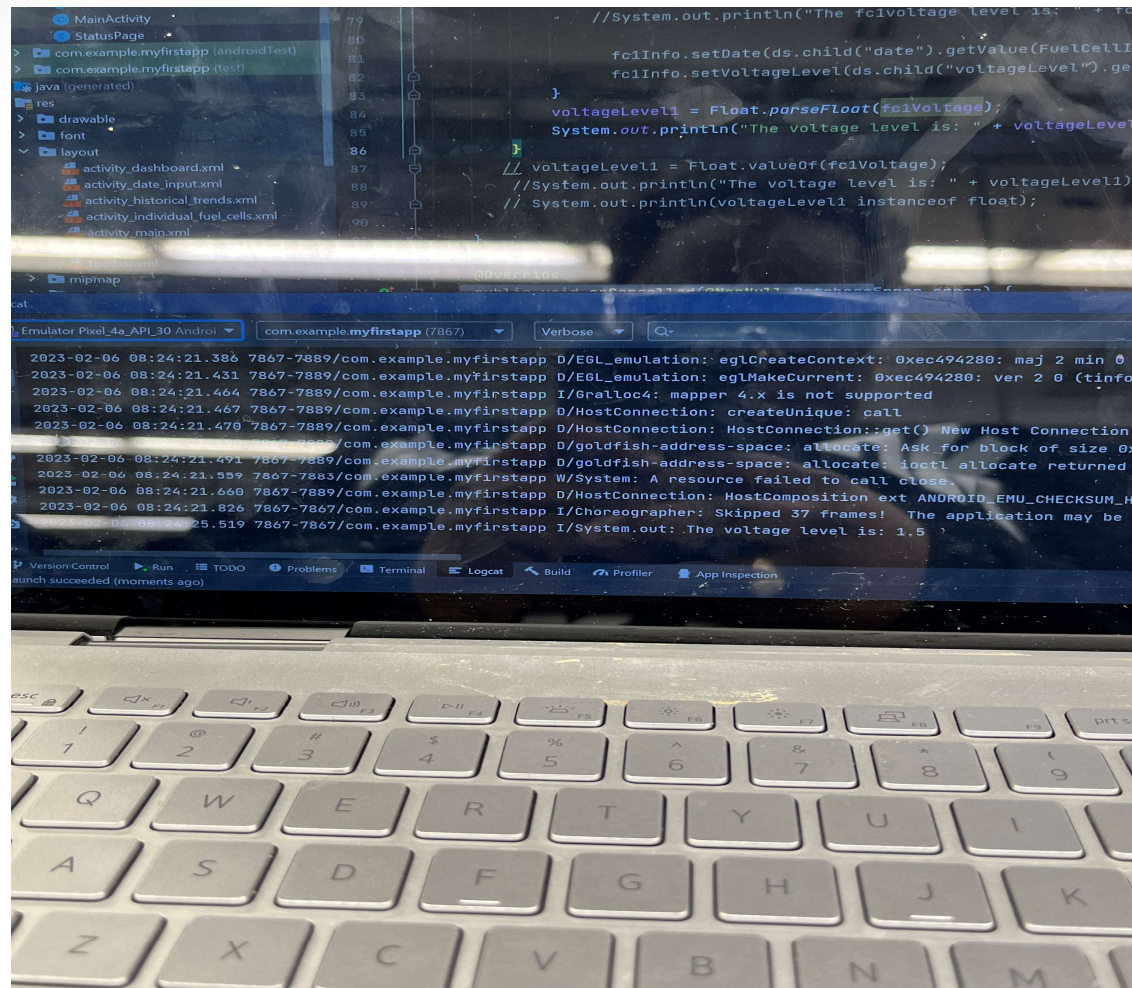
Jessica Odutola

Accomplishments since update 1 10 hrs of effort	Ongoing progress/problems and plans until the next presentation
<ul style="list-style-type: none"><li>- Able to read from database now, values are as expected</li></ul>	<ul style="list-style-type: none"><li>- Ongoing: Issues showing values on graph.</li><li>- Future: Fix graphs and improve overall UI. Will meet with our sponsor to discuss design changes to historical graph.</li></ul>



# Android Application

Jessica Odutola







# Execution Plan

[illegible]



# Validation plan

Paragraph #	Test Name	Success Criteria	Methodology	Status	Responsible Engineer(s)	Notes
3.2.4.2	Power Devices On PCB	PCB transfers power without overheating or burnout	Power Board and watch, smell, listen	Untested	Russell, Sameer	
3.2.1.1	Opto Isolator Capable of Transferring Digital Signal	Opto Isolators are capable of transferring a digital signal at no less than 200kHz	Connect Arduino and pass signal across optoisolator	Passed	Russell	Signal successfully transferred a signal at frequencies up to 2MHz
3.2.1.1	Internal signal voltage range	System can properly handle the specified voltages with minimal difference between tests.	Introduce voltages of 0-4V and measure output signals	FAIL	Russell	Subsystem was tested on a bread board. Signal transfer was successful but ADC failed to convert. Will retest on PCB
3.2.1.1	Differential voltage tests	Pass a differential voltage through the Opamp buffer and receive the proper digital signal from the optoisolator	Introduce a range of voltages including edge cases and ensure proper output	Untested	Russell, Sameer	
3.2.4.4	Android application graphical functionality	Application can properly display accurate voltage levels to user.	Use application on android device and verify voltages are accurately displayed	Passed	Jessica	
3.2.4.4	Android application database read and write data functionality	Application can properly read and write data from Firebase Database	Graph uses data pulled from the database as values	Fail	Jessica	
3.2.4.4	Android application database connectivity	Application can connect to Firebase Database	Verify connection status within application	Passed	Jessica	
3.2.4.4	Android application alarm functionality	Application send alarm to user when voltage goes above or below ranges	Add set points to app and introduce alarm level voltages	Untested	Jessica	
3.2.4.2	Power system functionality test	Power is applied from wall outlet and proper power transfer is read at outputs	Apply power to system and read voltage output at device trace	Untested	Sameer	
3.2.4.1	Opamp system functionality test	Differential voltages are passed to the opamp and expected voltage is seen on the output	Power opamps and apply varying differential voltages and read output voltage	Untested	Sameer	
N/A	PIC32 Microcontroller functionality test	The code for receiving the voltage signal for data acquisition	PCB board and coding on IDE	Untested	Rana	
N/A	ESP32 Microcontroller functionality test	The code for communicating with the application	PCB board and coding on IDE	Untested	Rana	



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**Thank you!**  
**Any questions?**