

**sdmay18-13: Measuring Voltage and Wire Continuity**

Week 9 Report

November 5 - November 11

**Team Members**Aaron Eaton — *Chief Engineer*Mohamed Almansoori — *Report Manager*Christopher Williams — *Test Engineer*Samuel Kline — *Meeting Facilitator*Matthew Kelly — *Meeting Scribe***Summary of Progress this Report**

Voltage: Designed and conducted simulations on capacitor divider approach. Designed and conducted simulations on three phase transformer approach.

Wire Continuity: found a way to measure reflections and made block diagram of potential solution to measuring continuity

**Pending Issues**

Voltage: Need to share work that has been done by different team members on capacitor divider approach. Need to propose an approach for detecting DC voltage.

Wire Continuity: dont know if the proposed solution will work

**Plans for Upcoming Reporting Period**

Voltage: Compare findings from testing capacitor divider circuit. Design circuit that can measure phase to phase DC.

Wire Continuity: come up with exact values for a signal to send and a coupler. Learn more about couplers and db loss

**Individual Contributions**

| Team Member        | Contribution  | Weekly Hours | Total Hours |
|--------------------|---|--------------|-------------|
| Aaron Eaton        | Found a way to measure a reflection using a directional coupler. We would send a signal through the non coupled port of the directional coupler so it wouldn't be coupled, then if the signal gave a reflection the directional coupler would pick up that signal. I a made a block diagram of what i think is a very promising solution. | 4            | 50          |
| Mohamed Almansoori | I continued looking for reflection coefficient  | 5            | 46          |

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|                      | <p>applications and I find out that the Time-Domain reflectometry circuit is the well known app for it. The TDR is a high frequency method with the advantage of using only one cable and then obtaining an image of its state while measuring from only one end.</p> <p>However, we can't use it in our case as the oscilloscope will not be provided. I have looked into two methods: Continuity measurement and Reflectometry. The Continuity measurement provides quick continuity information, but it requires two access points to the cable, does not give location information. On the other hand, Reflectometry only needs one access point, provides location information, suited for complex topology networks. However, it has a blind zone.</p>   |   |      |
| Christopher Williams | <p>This week I looked into measuring AC voltage with the three phase transformers. This was one of the two circuits recommended by Grace Eng in a document they sent. The circuit I made takes in the input from three transformers, each of which are connected to two of the phases. Then, it uses a summing amplifier to shift the output into a range that the arduino can read. Zener diodes are used to clip high voltages, which protects the op amp from being damaged. The circuit behaved mostly as was expected on simulation, but exhibited some strange resonant behavior on runs where the zener diode clipped the voltage at least once. Additionally, the device will need to measure phase to phase DC in delta systems, so the transformers might be redundant. Next week I will look into making a circuit which can measure phase to phase DC.</p> | 5 | 53   |
| Samuel Kline         | <p>Different output range for capacitor divider circuit was decided on at a team meeting, so new conversion ratios and capacitor dividers needed to be calculated. Client specified the maximum power that the circuit should have, so that was taken into account when calculating what the total capacitive reactance of the divider would have to be. Will compare my circuit and its component values with other members of the voltage</p>  | 4 | 43.5 |

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|               | team to check our work and confirm what the right solution is.  |   |    |
| Matthew Kelly | <p>Individual Contribution: I tested a capacitor divider circuit but need to add the full-wave rectifier to analyze how the circuit will work. I calculated the capacitor divider ratios needed to test voltages levels from 0 to 600V keeping in mind that the 600V is rms value and not peak value. This is important because the maximum voltage the Arduino can handle is 5V which is a peak value. Otherwise, the Arduino can burn out or be damaged. The advantage of a capacitor divider is that it will block any DC from reaching the full-wave rectifier.</p> | 5 | 46 |
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