sdmay18-13: Measuring Voltage and Wire Continuity
Week 6 Report
October 8 - October 14

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:
Proposed a circuit diagram which stepped down voltage difference between all of the leads with 3 transformers, then converted that measured voltages to DC using diode bridges and capacitors. It was decided that this would not work because of its inability to measure low voltages.

Wire continuity:
Proposed a switch circuit that could be a solution to separating our device from the power line.

Pending Issues
Voltage:
Circuit must be able to read low voltages accurately. Transformer might be overkill for our needs.

Wire continuity:
Need to come up with new ideas for how to measure the wire continuity, potentially using something similar to ethernet over power

Plans for Upcoming Reporting Period
Voltage:
We are going to design a circuit which uses a zener diode to clip the input voltage. This will make it so we have high resolution at low voltages and don't care about the exact value of voltages which are high.

Wire continuity: research ethernet over power and find out if we can use it as a solution to sending signals over power lines without disconnecting from the power lines. Look for new solutions to solving wire continuity problem possibly with inductive coupling.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Aaron Eaton	Redrew my switch circuit so the switches connect directly to the power lines. I researched some switches that are higher voltage to get a general idea of the feasibility	5	34

	of the circuit i am proposing. I found some switches that were about $100 that i think would work so i believe it would be possible to build the circuit. I think the circuit could be used to separate our system from the power system if we needed to do that, but instead we are thinking we will use a high frequency signal similar to ethernet over power that we will not need to separate our device from the power line to send the signal, i will continue to research this over the next week.		
Mohamed Almansoori	Discussed with Grace Engineered Products clients more about the wire continuity and we find out that the cable will 18 ft length. What we really need to do to check wire continuity by sending a high frequency signal using ethernet over power. I have read the coupling chapter of Power Line Communication book by John Burry. The Power Line communications PLC coupler may defined as a device that allows a communication signal to be superimposed onto and extracted from a power waveform while preventing the power waveform from entering the modem. I am continuing researching more on how to apply it in checking wire continuity.	4	32
Christopher Williams	Designed the circuit discussed in the summary, and tested it with simulation. It was decided that this circuit would not work because it couldn't measure voltages that were particularly low. In general, it seems that a transformer isn't necessary for reading the voltage as they aren't used in multimeter circuits which read AC voltage. Reached out to Grace Eng about IP/Non Disclosure forms. Looking into zener diode circuit next week.	5	33
Samuel Kline	Learned about circuits that voltmeters use to measure AC and DC voltage. The AC voltmeters used capacitor voltage dividers, which could be useful for stepping down the voltage in our circuit. The DC voltmeters used rheostats, which are variable resistors. I learned about some of the math behind calculating the needed values for the capacitors and resistors in the voltmeter circuits, and drew some basic circuit diagrams	4	29.5

	for each type of voltmeter.		
Matthew Kelly	I looked at how a differential amplifier works with two voltages sources, one for each terminal. The negative terminal is dependant on the ratio of the feedback resistor to input resistor, while the positive terminal is dependant on a voltage divider. The difference of these two terminals would then be amplified to attain the output voltage. My idea was to use a differential amplifier that would feed into a rectifier and then be analyzed by the arduino in the sense of if it was above or below 3V. This would require a switch that would vary the gain of the differential amplifier to approximately attain 3V. The problem with this idea is that the circuit would need to be adjusted based on the input. Our faculty advisor recommended looking at a zener diode which would eliminate this need for a varying gain on the differential amplifier. I will look at how to implement a zener diode into our current circuit plan for the next week.	4	30