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Measuring Voltage and Wire Continuity

PROJECT PLAN VI

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1 Introduction

1.1 PROJECT STATEMENT

Our project is trying to make measuring 3 phase voltage more convenient. Our device will read the voltage from all three wires simultaneously and tell the user if any of the wires appear to be damaged.

1.2 PURPOSE

Currently technicians measure three phase voltage using some sort of multimeter. This is a perfectly functional way to do it, but it isn't very convenient because it requires the technician to hold the probes manually and take multiple readings. Our device will allow all of the wires to be measured at once and provide additional insight into the "health" of the wires.

1.3 GOALS

1. Develop a concept solution during the fall semester.
2. Design and test a prototype device during the spring semester.

2 Deliverables

The only expected deliverable for this project is a working prototype with adequate documentation on how it works and how to use it.

1. Develop a device that can measure the voltage in a 3-phase system.
2. The device would be permanently mounted in an electrical cabinet.
3. The device would be able to determine that the wires connected to the test are not broken.
4. The device would report the presence or absence of voltage.
5. The device would be able to provide indication locally as well as communicate via Ethernet/IP.

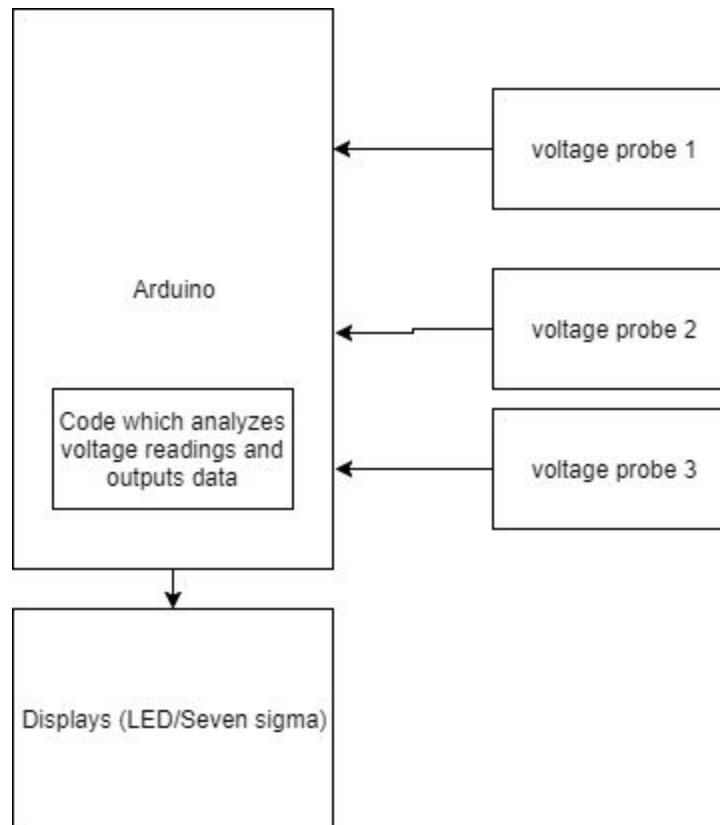
3 Design

Describe any possible methods and/or solutions for approaching the project at hand. You may want to include diagrams such as flowcharts to, block diagrams, or other types to visualize these concepts.

3.1 PREVIOUS WORK/LITERATURE

We were provided a patent for a similar produce developed by another another company. That company used some proprietary methods to measure the voltages which involved oscillators measuring signal frequencies which corresponded to the wire voltages. We also looked online for some guidance on reading voltages using Arduino and found [this page](#). It gave us a lot of good ideas on how to accomplish this task, such as using a diode bridge, smoothing capacitor, and voltage divider. However, there is still more research to be done as we can't rely on having a ground reference while we measure the voltage.

3.2 PROPOSED SYSTEM BLOCK DIAGRAM



This diagram shows the basic structure of our project. The arduino takes input from the three voltage probes, analyzes it, and outputs information to the displays.

3.3 ASSESSMENT OF PROPOSED METHODS

There are several methods which could be used to measure 3 phase voltage, we have decided to use an arduino because it is easy to work with, does not take a lot of power, is small and lightweight, and it can do what we need it to do. An alternative we could have used instead of an arduino is a raspberry pi, but for this system we would need to convert our analog signal to a digital signal and we do not need to do that for an arduino.

3.4 VALIDATION

To validate that our solutions work, we will need to test them by building prototypes of our device and a 3 phase system, like what our device will be used to work on, and testing our device. We will record all of our test results for later analysis, and once we feel like we have a working product, we will send those results to the company for them to verify that the results meet their expectations.

4 Project Requirements/Specifications

4.1 FUNCTIONAL

- Product will be permanently mounted in an electrical cabinet
- Product must report the presence or absence of voltage down to a 3V minimum
- Product must display results locally as well as communicate via Ethernet/IP

4.2 NON-FUNCTIONAL

- Legal: product design must not infringe on existing copyrights of similar products that are owned by other companies
- Accuracy/Reliability: product must be consistently accurate in measurements to avoid misleading technicians
- Security: certain documentation that contains sensitive data about our clients must not be available to everyone (not on our group website)

4.3 STANDARDS

We haven't really started work in labs or with writing code, but we will plan to use IEEE standards in our development.

5 Challenges

Our only challenges as of now are determining a non copyright infringing solution and identifying more specific requirements from our clients. Other challenges will arise as we get farther into the development process.

6 Timeline

Time Line							
Phase	Task Step	Task Description	Team Member(s) Assigned	Status	Start Date	Duration (days)	Must End Date
Define-Measure	1	Measure the voltage in a 3-phase system (up to 600V)	All		8/28/17		TBD
	2	Create a conceptual solution for the device to be able to determine that the wires connected to the test points are not broken	All		8/28/17		TBD
	3	Create a conceptual solution for the device to be able to report the presence or absence of voltage as well as the health of the wires	All		8/28/17		TBD
	4	Provide a indication locally as well as communicate via Ethernet/IP	All		8/28/17		TBD
	5						
Report	6	Final Design Presentation		Planned			
	7	Design Expo					
	8	Final Presentation					
	9	Final Report					
	10	Project Closeout					

6.1 FIRST SEMESTER

During the first semester, we will research our product and develop a plan for implementation that fits our client's requirements. For specific deliverables and approximate due dates, see the timeline above.

6.2 SECOND SEMESTER

During the second semester, we will develop prototypes and a working product based on the research and plans that we made during the first semester. For specific deliverables and approximate due dates, see the timeline above.

7 Conclusions

Our project is to create a device to measure a 3-phase voltage and test the wires to see if they are damaged or broken. Our current plan is to use an Arduino to take the 3 voltage inputs, do some calculations to come up with the 3-phase voltage, and output that voltage onto a display similarly to how a multimeter will do it for a single phase circuit. Our goal is to create a design for our project in the first semester, and then second semester create a device using the design that covers our deliverables.

8 References

1. <http://www.instructables.com/id/To-build-a-voltage-regulator-and-measure-AC-voltag/>

9 Appendices

If you have any large graphs, tables, or similar that does not directly pertain to the problem but helps support it, include that here. You may also include your Gantt chart over here. (Currently Empty)