Engineering Standards and Constraints Review for RS-485 Tester Project (September 2007)

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***Abstract*—This paper will highlight the impacts associated with the engineering design of the RS-485 Tester project in the EE 492 senior design course at Montana State University-Bozeman, Fall 2007.**

***Index Terms*—RS-485, wire tester, test equipment.**

I. Introduction

HIS document explores the impacts associated with the engineering design of a RS-485 Tester project. It is a requirement for the EE 492 course (Electrical Engineering Design II) at Montana State University, Bozeman, MT.

II. Economic constraints

Minimizing cost isn't a major factor in choosing components or design options for this project, due to the extremely low production numbers that are desired being as its purpose is as a rented tool that would be returned to the company and then reissued for a specific specialized purpose.

Of particular notice is the selection of the Microcontroller which was chosen to be excessive, both in internal capabilities and externally available I/O Ports, to allow for ease of further expansion of the design by the sponsor after this process is completed though less expensive parts could meet the design goals. This was done at the request of the sponsor.

III. Environmental constraints

Since the Roving Tester component of this design will be used outside and potentially harsh environments, the Roving Tester portion should be able to withstand usage within such an environment without incurring damage. This will mostly take place in choice of enclosures should time allow for this part of the design to be considered, but may also effect choices of other externally exposed components, such as switches.

The unit should also be able to withstand heat and cold without significant effects on accuracy though this is mostly done through selection of components though this is not being heavily considered as an issue. Should it become an issue in the future, calibration and/or environmental temperature sensors could be added to the product using the features of the larger Microcontroller to help correct these issues without necessitating major design changes.

IV. sustainability constraints

This project is designed and documented as to make it so that the sponsor company should be able to expand the project at a future date to add additional functionality, tests and comparability with other designs of their own. This documentation accompanying the unit to help with this will include the source code and design documentation of theories of operation as well as the expected theoretical maximums of the devices.

Along with this, some physical concerns are also being addressed concerning sustainability, including choice of connectors to the data line being chosen as to allow for the creation of universal adapters for expandability of this tester with other products using differing connectors.

V. manufacturability constraints

Due to the extremely low volume projection for this product, there is no high priority need to optimize the manufacturing process in terms of time and cost, but some considerations should still be taken to allow for ease of population of the PCBs as it will be hand soldered. This will be done though use of silk screening on the board as well as part selections to limit the number or existence of surface mount components, especially in areas susceptible to field damage. Also, part selections are being made to keep possible tolerances under control without necessitating the need to have individualized trimming options available for each measurement circuit.

VI. health and safety constraints

Heath and safety play a role in this design project. The worst case scenario is for the device to come into contact with a cross of a testable line with 220V AC Power resulting in a potentially hazardous situation for both the tester and the end user. The design is taking into account protection of both in such a situation through fusing and/or diode protection of the circuits that this could occur on. This possibility exists and

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must be taken into account due to the product's purpose to verify correct wiring in environments where many different wires are running in close proximity.

VII. Ethical; Social and Political Constraints

There are no special ethical, social and political considerations present in this project.

VIII. Conclusion

The intended destination of this product is for LED Effects, Inc. to use this RS-485 tester in the installation of their architectural exterior lighting displays, either by the company or customers who wish to do the DIY installation approach. In the future, firmware upgrades will expand the functionality of this device.

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