**EE 478 Lab 2**

**Designing a High Reliability Microprocessor Based Remote Surgery System**

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TABLE OF CONTENTS

[**I.** **ABSTRACT** 3](#_Toc386288274)

[**II.** **INTRODUCTION** 3](#_Toc386288275)

[**III.** **SYSTEM REQUIREMENTS** 3](#_Toc386288276)

[**IV.** **DESIGN SPECIFICATION** 3](#_Toc386288277)

[**V.** **DESIGN PROCEDURE** 3](#_Toc386288278)

[**VI.** **SYSTEM DESCRIPTION** 3](#_Toc386288279)

[**VII.** **HARDWARE IMPLEMENTATION** 3](#_Toc386288280)

[**VIII.** **SOFTWARE IMPLEMENTATION** 3](#_Toc386288281)

[**IX.** **TESTING** 3](#_Toc386288282)

[a. Test Plan 3](#_Toc386288283)

[b. Test Specification 3](#_Toc386288284)

[**c.** Test Cases 3](#_Toc386288285)

[**X.** **RESULTS** 3](#_Toc386288286)

[a. Presentation 3](#_Toc386288287)

[b. Discussion 3](#_Toc386288288)

[c. Analysis 3](#_Toc386288289)

[**XI.** **ANALYSIS OF ERRORS** 3](#_Toc386288290)

[**XII.** **WHY PROJECT DIDN’T WORK** 3](#_Toc386288291)

[**XIII.** **SUMMARY** 3](#_Toc386288292)

[**XIV.** **CONCLUSION** 3](#_Toc386288293)

[**XV.** **APPENDIX** 3](#_Toc386288294)

[a. Charts and Tables 3](#_Toc386288295)

[b. Graphs 3](#_Toc386288296)

[c. Code 3](#_Toc386288297)

1. **ABSTRACT**

This lab provides experience in using the MPLabX development environment for programming the PIC18F25K22 microchip

1. **INTRODUCTION**
2. **SYSTEM REQUIREMENTS**
   1. **Use Cases**
   2. **Requirements**

## Specification

### System Description

This specification is a draft for the requirements in embedded circuitry for a microprocessor based remote surgery system. The system is a prototype and proof of concept for a larger system. The circuitry must be able to communicate between a local node, connected to a computer, and a remote node, connected to a surgery robot motor. A remote node must be able to maintain motor speed, and the local node must be able to communicate with a PC to send information and receive commands. The product is meant to be developed in two phases. The first phase would be to implement the local and remote communication networks, and the user interface. The second phase will include adding support for the remote feedback channel through which warnings, data, and alarms are sent.

### Specification of External Environment

The unit is meant to be used in the medical environment. Concerns will be blood and corrosion, water, gasses, and sterilization. The system may have to operate in a frequency that does interfere with other medical devices, or produce any gasses that would contaminate a sterile environment. Finally, the system should not have a negative effect on the power draw of the environment.

### System Input and Output Specification

#### System Inputs

User commands from PC terminal output.

Set motor speed

Increment motor speed

Decrement motor speed

Start motor

Stop motor

Motor voltage level

Power On/Off

#### System Outputs

Voltage control to motor

Display to PC Terminal

Warnings

Alarms

Current motor speed

### User Interface

The user interface will be a command line presented through a terminal window. The user can enter the following commands:

Set speed:

Sets the speed of the motor to a specified value

Increment speed:

Increments the current motor speed by 0.5%.

Decrement speed:

Decrements the current motor speed by 0.5%.

Start:

Start the motor.

Stop:

Stop the motor.

In addition to the command line interface, the system will have an ON/OFF button for power.

### System Functional Specification

The system takes and executes user commands from the PC terminal with the intent of remotely operating motor speed through a network. These commands are turning the motor on/off, setting the motor speed, and increasing and decreasing the motor speed.

The system has two main parts – the local and remote node. Both nodes communicate with each other and have a separate memory to store data. The user interface (PC terminal) is connected to the local node, which processes user input. The commands are then sent to the remote node to control the motor, which in turn measures the current status and sends it back through the local node to the PC.

### Operating Specifications

The system shall operate in a sterile medical environment.

Temperature Range 20-23 C

Humidity Rang is 20-60%

Power 5V

### Reliability and Safety Specification

The robot surgery system shall comply with the following safety standards

* Meet government regulations regarding medical devices as outlined by the FDA’s CFR (Code of Federal Regulations)
* Continue to safely function in the absence of power (blackout, etc.)
* All outer parts of must be sterilized before use

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   1. Test Plan
   2. Test Specification
   3. Test Cases
7. **RESULTS**
   1. Presentation
   2. Discussion
   3. Analysis
8. **ANALYSIS OF ERRORS**
9. **WHY PROJECT DIDN’T WORK**
10. **SUMMARY**
11. **CONCLUSION**
12. **APPENDIX**
    1. Charts and Tables
    2. Graphs
    3. Code