Portland State

UNIVERSITY

Department of
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ECE411 Practicum Project
Test Plan

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1.0 – Introduction

1.1 - This Document

The purpose of this document is to develop the test procedures for the temperature controlled fan in order to ensure the product meets the design specifications listed in the PDS and works properly under the worst case scenarios.

1.2 - Recording of Results

The result of this test will be considered in how the project works and how it will be demonstrated in the class. Any failure in the test will be recorded and posted on our wiki page. When each test is done, the tester will complete the testing document and upload it on the wiki page.

2.0 - Reference Documents

2.1 - Design Documents

In addition to this test plan, additional reference documents may include:
- Temperature Controlled Fan schematic drawings , version 1.5
- Temperature Controlled Fan Project Schedule, version 1.1
- Temperature Controlled Fan Project Requirement Document (PDS) , version 1.1

2.2 - Other
- Arduino Forum https://forum.arduino.cc/
- ATMega328 Microcontroller Datasheet
- LM35 Datasheet
- Seven-segment display Datasheet

3.0 - Pretest Preparation

3.1 - Test Equipment
- Arduino Uno
- PC with Arduino IDE
- USB serial with FT232
- Data Cable

- Multimeter
- Oscilloscope
- DC power supply

4.0 - Test cases

4.1 - Subsystem test

4.1.1 - Microcontroller

Objectives

Burn the Arduino Bootloader to the ATmega328 MCU

Resources
- PC with Arduino IDE Library
- Arduino Board Uno
- ICSP wires
- External clock: 16MHz crystal and 22uF capacitors

Test Cases

4.1.1.1 –Circuit Connection Test

4.1.1.2 –FTDI Connection Test

4.1.2 - Seven Segments

Objectives

Verify that the Seven Segments contains no dead segments, and all pins can be displayed as needed.

Resources
- PC with Arduino IDE
- Arduino UNO
- Power supply
- Breadboard

o   Connected Seven Segments

•   Arduino Library

Test Cases

4.1.2.1 – Segments Operation Test

4.1.2.2 – Temperature Value Deliver Test

4.1.4 - Motor

Objectives

Verify the motor will work properly based on the value from MCU.

Resources

•   PC with Arduino IDE

•   Arduino UNO

•   Power supply

•   Breadboard

•   Motor

•   Arduino Library

Test Cases

4.1.3.1 – Motor Speed Test in Low Speed Input

4.1.3.2 – Motor Speed Test in High Speed Input

4.1.4 - Power Supply

Objectives

Verify proper DC conversion and voltage regulation

Resources

•   Multimeter meter

•   Breadboard

•   Voltage Regulator

- Motor
- MCU

Test Cases

4.1.4.1 – Power-Up Test only with MCU

4.1.4.2 – Power Test with MCU and Motor

4.1.5 - Temperature Sensor

Objectives

Verify the temperature sensor respect a properly value

Resources

- Breadboard
- MCU (microcontroller unit)
- Power Supply
- PC with Arduino IDE

Test Cases

4.1.5.1 – Temperature Sensor Send Value Properly

4.1.5.2 – Seven Segments Show Value Properly

4.1.5.3 – Motor Runs As Expected

4.2 - On Board Tests

4.2.1 - MCU Working Condition Test

Objectives

Verify that the MCU have the fully function when it solid in PCB board.

Resources

- PCB Board

- Power Supply

Test Cases

4.2.1.1 – Connection Test

4.2.1.2 – Output Voltage Test

4.2.2 - Temperature Sensor and Motor Value Test

Objectives

Verify that the sensor send the value to motor properly and the motor works as expected

Resources

- Soldered/finished PCB

Test Cases

4.2.2.1 – Low Temperature Test

4.2.2.2 – High Temperature Test

APPENDIX A - Test Case Forms

Test Writer: Yusheng Tian						
Test Case Name:		Motor test		Test ID #:		4.1.4
Description:		Verify the motor will work properly based on the value from temperature sensor.		Type:		black box
Tester Information						
Name of Tester:				Date:		
Hardware Version:		temperature-controlled fan 1.0		Time:		
Setup:		Assemble system and let temperature sensor cool down to below 70 degrees				
Special instructions:		Make sure that the temperature sensor does not have direct contact to any object				

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	Cool down the surrounding of the temperature sensor to below 70 degrees	Fan does not turn on				
2	Heat up the surrounding of the temperature sensor to 70 to 80 degrees	Fan turns on and maintains a low speed				
3	Heat up the surrounding of the temperature sensor to 80 to 90 degrees	Fan stays on, speeds up and maintains a medium speed				
4	Heat up the surrounding of the temperature sensor to above	Fan stays on, speeds up and maintains a high speed (maximum speed)				
5	Cool down the surrounding of the temperature sensor to below 70 degrees	Fan turns off				
Overall Test Result:						

Test Writer: Yusheng Tian						

Test Case Name:	7-segment display test			Test ID #:	4.1.2	
Description:	Verify the 7-segment display will work properly based on the surrounding temperature of the sensor.			Type:	black box	

Tester Information						

Name of Tester:				Date:		
Hardware Version:	temperature-controlled fan 1.0			Time:		
Setup:	Assemble system with an additional thermometer near the temperature sensor and let temperature sensor cool down to below 70 degrees, wait till the displays show correct temperature readings					
Special instructions:	Make sure that the temperature sensor does not have direct contact to any object					

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	Cool down the surrounding of the temperature sensor to below 70 degrees	Fan does not turn on. Temperature readings are below 70 and match the thermometer				
2	Heat up the surrounding of the temperature sensor to 70 to 80 degrees	Fan turns on and maintains a low speed. Temperature readings are between 70-80 and match the				

		thermometer				
3	Heat up the surrounding of the temperature sensor to 80 to 90 degrees	Fan stays on, speeds up and maintains a medium speed. Temperature readings are between 80-90 and match the thermometer				
4	Heat up the surrounding of the temperature sensor to above	Fan stays on, speeds up and maintains a high speed (maximum speed) Temperature readings are above 90 and match the thermometer				
5	Cool down the surrounding of the temperature sensor to below 70 degrees	Fan turns off Temperature readings drop below 70 and match the thermometer				
Overall Test Result:						