Capstone Team 12 Test Plan

December 7, 2020
Version 1.0

Miguel Higgins Moy
Noah Page
Miles Breslin
John Sharpe

Referenced Documents:

Requirements Document:

Smart RFID Door Lock Project Design Requirements and Specifications, version 3.0, last revised December 6, 2020

System Documents:

System Block Diagrams, version 1.0, last revised November 20, 2020

ESP RFID Code and Sensor pinout - Access Control with ESP8266, RC522, PN532 Wiegand RDM 6300, version 2020.12.7.1, last revised December 7, 2020

Testing Objectives:

The objective of this test plan is to ensure that our 3D printed parts fit onto a deadbolt lock and have enough strength to lock and unlock the deadbolt using battery power. We also are checking the integration of our RFID sensor with the ESP8266 and the servo on our custom PCB, and the ability to flash our code onto the ESP8266 processor. Finally we did a stress test to measure the battery life of the system when using standard AA batteries.

Testing Resources:

Personnel:
Miguel Higgins Moy
Noah Page
Miles Breslin
John Sharpe

Skills/Education:
Fluency with reading English
Proficiency with a computer
Basic knowledge working with microcontrollers (to flash code)
Basic knowledge of wiring breadboards and understanding of pinout diagrams

Hardware:
ESP8266 development board
MFRC 522 RFID reader (with RFID card)
MG90s micro servo
Breadboard jumper wires (at least 10)
3 AA batteries
3 AA battery holder with wires
Through-hole push button
Deadbolt door lock
3D printed housing

Test Equipment:
Computer (with internet connection)
Micro USB cable to connect development board to computer
Multimeter with probes
Bench power supply

Prototypes/components:
Breadboard
ESP8226 development board
3D door model

Software:
Windows, Linux, or MacOS
Fusion 360
EagleCAD
Python2
PlatformIO toolchain
esp-tool
Git

Versions:
Using code version 2020.12.7.1 ID 40c2ba2f

Testing Outline:

1 Integration Tests
- 1.1 Check components power usage with batteries on prototype
- 1.2 Check interface between RFID module and processor on prototype
- 1.3 Microcontroller outputs PWM signal when exit button is pressed
- 1.4 Check interface between processor and servo on prototype
- 1.5 Fully assembled PCB integration test

2 Functional Test
- 2.1 Servo arm 3D printed enclosure adapts to standard deadbolt
- 2.2 Test servo strength against real deadbolt
- 2.3 Test base code works by flashing forked binary onto processor
- 2.4 Test 3D parts fit together
- 2.5 Test fully assembled PCB USB power connection

3 Stress Testing
- 3.1 Battery life test

Tests by Module:
Referencing System Block Diagrams, revision 1.0

Power Supply
- 1.1 Check components power usage with batteries on prototype
- 2.5 Test fully assembled PCB USB power connection
- 3.1 Battery life test

RFID Sensor
- 1.2 Check interface between RFID module and processor on prototype
- 1.5 Fully assembled PCB integration test

Development Board
- 1.3 Microcontroller outputs PWM signal when exit button is pressed
- 1.4 Check interface between Processor and Servo on prototype
- 2.3 Test base code works by flashing forked binary onto processor

Servo
- 2.1 Servo arm has has an adapter allowing it to connect to deadbolt
- 2.2 Test Servo strength against real deadbolt

Locking Mechanism

2.4 3D Printed Items Fitment

Test Cases:

Test Case Name:	Fully assembled PCB integration test		
Description:	Confirm functionality of assembled PCB with RFID sensor, exit button, and servo	**Type:**	White box
Tester Information			
Name of Tester:	John Sharpe	**Date:**	December 6, 2020
Hardware Version:	E	**Time:**	6:02 PM
Setup:	Connect RFID sensor and servo to assembled PCB, connect USB power to board		

Step	**Actions:**	**Expected Result**	**Pass**	**Fail**	**N/A**	**Comments**
1	Connect USB to board	Power light turns on		✓		LEDs flash on connection, but do not stay lit.
2	Press board reset button	Power light flashes for a few seconds, then remains a solid color		✓		LEDs flash on connection, but do not stay lit.
3	Measure voltage at 3.3 V pinouts with multimeter relative to board ground pin	Multimeter reads 3.3 V	✓			
4	Hold RFID card up to card reader	Servo arm rotates to open position	✓			
5	Swipe RFID card to reader again	Servo arm rotates to closed position	✓			
6	Press exit button	Servo arm rotates to open position	✓			
7	Press exit button again	Servo arm rotate to closed position	✓			
8	Toggle lock state from WebUI test button	Servo arm toggles between open/closed positions	✓			
Overall Test result:			✓			

Test Case Name:	3D Printed Items Fitment		
Description:	After each major version of CAD, check for fitment against other existing parts	**Type:**	White box
Tester Information			
Name of Tester:	Miguel	**Date:**	November 21, 2020
Hardware Version:	D	**Time:**	10:00 PM
Setup:	All parts are disassembled		

Step	Actions:	Expected Result	Pass	Fail	N/A	Comments
1	Assemble front plate with RFID	Plastic fits well together with no gaps		✓		RFID reader does not fit and bulges the plastic apart
2	Assemble rear lock portion (turn knob, override, plate, servo)	All portions fit together correctly	✓			
3	Connect both sides of the lock together while managing wire from the RFID	These fit snugly, but keep little overlap. The RFID wires should not interfere with the lock mechanism.		✓		Wires interfere with the locking mechanism and cause it to bind. Reassembling with interference in mind solved this, but possible to add a cable channel to prevent this.
4	Integrate electronics (manage the wires from the button and insert PCB)	The wires should have enough room to move when pulled, but will not move when the lock is actuated. PCB should fit the mounting holes.	✓			
5	Add covers (battery housing, button housing, battery cover)	Screw holes should line up and little gaps should be present. The battery cover should fit snugly, but be easy to remove.	✓			Trimming support material correctly is required for the battery cover to work correctly
6	Inspect entire product	Product should fit well together	✓			
Overall Test result:			✓			