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T06 – Test Plan

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NES LockBox

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# Introduction

This test plan is designed to test the performance, functionality, reliability, and usability of NES lock box. The NES lock box employs an NES controller for user input, an LCD screen for user interface, a solenoid to lock and unlock box lid, and simple wood box design.

## Objective

The unit should maintain a locked state until the user enters the appropriate code using the NES controller. The unit should display the user input from the NES controller on the LCD screen. The LCD screen should also display whether the input code was correct or incorrect.

# Testing Equipment

* Power Supply
* Multi-meter
* Atmega Debugger/programmer
* Atmel Studio
* K-Type thermocouple
* Data logger
* Kapton tape

# Test Methods

* Pass/Fail result

# Reference Documents

1. Atmega Datasheet

<http://www.atmel.com/Images/doc8161.pdf>

1. LCD datasheet

<http://www.newhavendisplay.com/specs/NHD-C0220BiZ-FSRGB-FBW-3VM.pdf>

1. NES controller Information

<https://github.com/jalcok1/practicum/tree/master/parts/controller>

1. Encoder Datasheet

<http://www.ti.com/lit/ds/symlink/sn74hc148.pdf>

1. Solenoid Info Sheet

<https://github.com/jalcok1/practicum/blob/master/parts/lock/solenoid_driver.pdf>

# System Tests

## Module Tests

* Each button on controller outputs correct 3-bit binary code from encoder
* LCD correctly displays red, green, or blue when correct voltages applied
* Test 12V and 3.3V power on board, test at each input to component
* Test output signals of chip to unlock solenoid
* Test output signals of chip to RGB backlight of LCD
* Test line, cursor and character display on LCD

## Stress Tests

* Check solenoid ability to actuate at a 50% duty cycle over an interval of 1minute
* Solenoid ability to remain in unlocked state for length of time

## Integration Tests

* Each button pressed displays correct symbol on LCD
* When correct button combination is pressed, solenoid unlocks

## Error Tests

* Once user generated code has been saved, is it still saved after power has been removed

## Use Test

* User is able to unlock box when provided with available documentation
* Ability to unplug and plug power to box
* Box remains securely locked when solenoid is in lock state

# Test Case

## Controller/LCD Verification

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Writer: Chelsea Throop** | | | | | | | | |
| **Test Case Name:** | | Controller/LCD Verification | | | **Test ID #:** | | | NES\_1 |
| **Description:** | | Test for proper decoding of NES controller buttons to their corresponding symbol the LCD screen | | | **Type:** | | | Black Box |
| **Tester information** | | | | | | | | |
|  | **Name of tester:** |  | | | **Date:** | | |  |
| **Hardware Version:** | | 1.0 | | | **Time:** | | |  |
| **Setup:** | | Connect NES LockBox to power and NES controller is plugged in. | | | | | | |
| **Step** | **Action** | **Expected result** | **Pass** | **Fail** | | **N/A** | **Comments** | |
| 1 | Power on components | LCD should say, “Press start to Begin” |  |  | |  |  | |
| 2 | Press Start button on controller | LCD turns blue and displays “Enter Code to Unlock” |  |  | |  |  | |
| 3 | Press and release each button on NES controller, except start or select. Using an incorrect code. | Each button should display its corresponding symbol on LCD screen. Ten buttons must be pressed. This is the incorrect code. Screen should turn red and display, “Try Again :(” |  |  | |  |  | |
| 4 | Press Start button on controller | LCD turns blue and displays “Enter Code to Unlock” |  |  | |  |  | |
| 5 | Enter code  **BA** | LCD screen should turn green, and display, “Open Sesame !!!” |  |  | |  |  | |

## Solenoid Stress Test

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Writer: Chelsea Throop** | | | | | | | | |
| **Test Case Name:** | | Solenoid Stress Test | | | **Test ID #:** | | | NES\_2 |
| **Description:** | | Will test solenoid ability to open and close rapidly | | | **Type:** | | | White Box |
| **Tester information** | | | | | | | | |
|  | **Name of tester:** |  | | | **Date:** | | |  |
| **Hardware Version:** | | 1.0 | | | **Time:** | | |  |
| **Setup:** | | Solenoid must have power and 3.3V to input labeled Arduino\_digital\_out to lock and unlock. Solenoid must have transistors set up for switch. Involves reference document 5.  Using Kapton tape, tape the K-type thermocouple to the solenoid and connect the thermocouple to the data logger.  Set the data logger to log temperature in **°**C on a 5 second interval. | | | | | | |
| **Step** | **Action** | **Expected result** | **Pass** | **Fail** | | **N/A** | **Comments** | |
| 1 | Set up circuit without 3.3V input | Solenoid should remain unlocked |  |  | |  |  | |
| 2 | Start data-logger | Data logger should start to log temperature data |  |  | |  |  | |
| 3 | Provide 3.3V for 5 seconds, remove for 5 seconds. Repeat for 5 minutes. | Solenoid should lock and unlock appropriately. |  |  | |  |  | |
| 4 | Turn off data logger | Data logger should stop logging data |  |  | |  |  | |
| 5 | Save data to file | Save the logged temperature data to  File with the name of the file being  <Solenoid Part #>\_temp.csv |  |  | |  |  | |

## EEPROM Verification

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Writer: Chelsea Throop** | | | | | | | | |
| **Test Case Name:** | | EEPROM Verification | | | **Test ID #:** | | | NES\_3 |
| **Description:** | | When user inputs personalized code to unlock box, the code must be saved after power is disconnected. | | | **Type:** | | | Black Box |
| **Tester information** | | | | | | | | |
|  | **Name of tester:** |  | | | **Date:** | | |  |
| **Hardware Version:** | | 1.0 | | | **Time:** | | |  |
| **Setup:** | | Fully assembled box with power and everything assembled. | | | | | | |
| **Step** | **Action** | **Expected result** | **Pass** | **Fail** | | **N/A** | **Comments** | |
| 1 | Press start at “Press start to begin screen” | LCD turns blue and displays “Enter Code to Unlock” |  |  | |  |  | |
| 2 | Enter code to unlock box  **BA** | Screen should turn green and say, “Open Sesame !!!” Solenoid should unlock |  |  | |  |  | |
| 3 | While screen remains green, press start and select at same time | Screen should remain green, and say “Enter New Code” |  |  | |  |  | |
| 4 | Enter a tester generated custom code, 10 symbols | Screen should display each button symbol as it is depressed, once 10 symbols have been entered the LCD will then display, “Code saved” and the backlight will flash a sequence of Red Green and Blue |  |  | |  |  | |
| 5 | Unplug box from power | LCD should turn off |  |  | |  |  | |
| 6 | Plug box power in | LCD should turn on and display, “Press start to Begin” |  |  | |  |  | |
| 7 | Press start | LCD should turn blue and display “Enter Code to Unlock” |  |  | |  |  | |
| 8 | Enter user the tester generated custom code from step 4 | LCD should turn green, display “Open Sesame !!!” Solenoid should unlock |  |  | |  |  | |

## User Input Time Out Test

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Writer: Chelsea Throop** | | | | | | | | |
| **Test Case Name:** | | User input time out test | | | **Test ID #:** | | | NES\_4 |
| **Description:** | | Verifies system recovery from a time out that may occur during user input | | | **Type:** | | | White Box |
| **Tester information** | | | | | | | | |
|  | **Name of tester:** |  | | | **Date:** | | |  |
| **Hardware Version:** | | 1.0 | | | **Time:** | | |  |
| **Setup:** | | Uses reference document 2. LCD must be wired appropriately. | | | | | | |
| **Step** | **Action** | **Expected result** | **Pass** | **Fail** | | **N/A** | **Comments** | |
| 1 | Press start at “Press start to begin screen” | LCD turns blue and displays “Enter Code to Unlock” |  |  | |  |  | |
| 2 | Wait (approx. 30sec) | At time out the LCD backlight should turn white and return to home screen “Press start to begin screen” |  |  | |  |  | |
| 3 | Press start at “Press start to begin screen” | LCD turns blue and displays “Enter Code to Unlock” |  |  | |  |  | |
| 4 | Enter code to unlock box  **BA** | Screen should turn green and say, “Open Sesame !!!” Solenoid should unlock |  |  | |  |  | |
| 5 | While screen remains green, press start and select at same time | Screen should remain green, and say “Enter New Code” |  |  | |  |  | |
| 6 | Wait (approx. 30sec) | At time out the LCD backlight should turn white and return to home screen “Press start to begin screen” |  |  | |  |  | |
| 7 | Press start at “Press start to begin screen” | LCD turns blue and displays “Enter Code to Unlock” |  |  | |  |  | |
| 8 | Enter code to unlock box  **BA** | Screen should turn green and say, “Open Sesame !!!” Solenoid should unlock |  |  | |  |  | |
| 9 | While screen remains green, press start and select at same time | Screen should remain green, and say “Enter New Code” |  |  | |  |  | |
| 10 | Enter code **BBBB** (wait approx. 30sec) | At time out the LCD backlight should turn white, display “timed out, try again” and then return to home screen |  |  | |  |  | |