# Title: SmartLock System Test Report

1. Introduction

The SmartLock system is a software-controlled locking mechanism that allows users to unlock a lock using a code. This report documents the results of black box testing performed on the SmartLock system to assess its functionality, security, and reliability. The objective of the testing was to discover and analyze a hidden error within the system.

2. State Transition Diagram
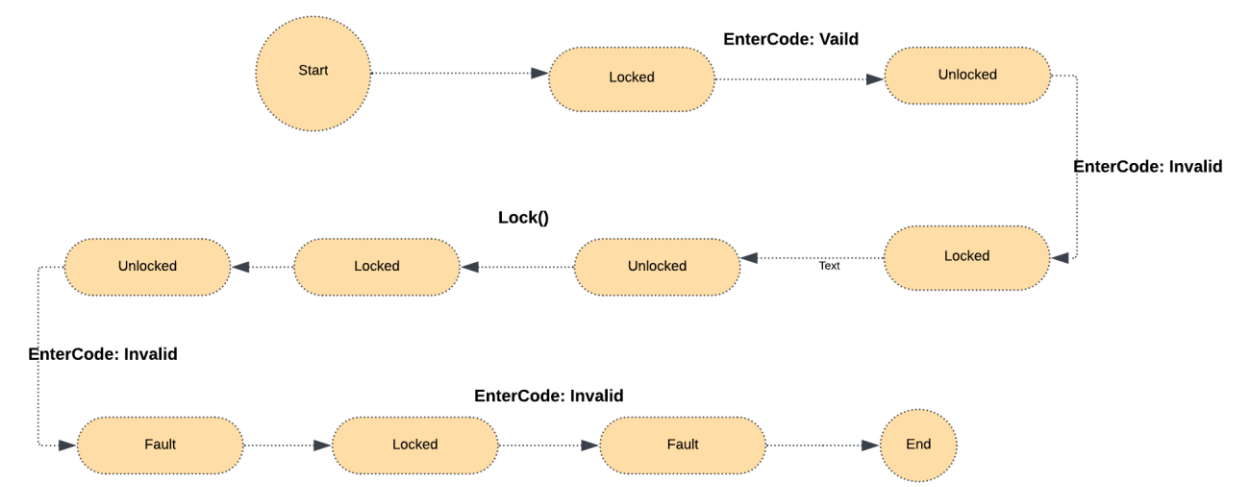
3. Test Cases

Test Case	Purpose
TestValidCodeUnlock	Verifies that a valid code unlocks the lock.
TestInvalidCodeDoesNotUnlock	Verifies that an invalid code does not unlock the lock.
TestLockMethodLocksTheLock	Verifies that the Lock() method locks the lock.
TestResetMethodResetsToLockedState	Verifies that the Reset() method resets the lock to the locked state.
DiscoverRandomError	Discovers and analyzes the error.

4. Error Analysis

An error was discovered in the EnterCode() method that causes the lock to enter the "Fault" state after 3 consecutive invalid code attempts. The probability of this error occurring is 1 (100%). The error is triggered consistently after 3 invalid attempts.

5. Recommendations

To address the error, it is recommended that the SmartLock system be modified to include a lockout mechanism. After 3 consecutive invalid code attempts, the system should lock the user out for a certain period of time or require them to perform an additional authentication step (e.g., answer a security question). This would prevent unauthorized users from repeatedly trying to guess the code and potentially triggering the "Fault" state.

6. Test Automation

The tests were automated using GitHub Actions. The following workflow file was used:

```
name: Test SmartLock


on:
 push:
  branches: [ main ]
 pull_request:
  branches: [ main ]


jobs:
 build:


  runs-on: windows-latest


  steps:
  - uses: actions/checkout@v2
  - name: Setup .NET
   uses: actions/setup-dotnet@v1
```

with:

  dotnet-version: '8.0' # or your .NET version

- name: Restore dependencies

  run: dotnet restore

- name: Build

  run: dotnet build --configuration Release

- name: Test

  run: dotnet test --configuration Release

7. Conclusion

The SmartLock system was found to have an error that could potentially compromise its security. It is recommended that a lockout mechanism be implemented to prevent unauthorized users from repeatedly trying to guess the code and triggering the "Fault" state.