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| Arena\_CCU\_GUI\_19; Arena\_CCU\_Firmware\_19\_0\_1 – Testing Documentation | | |
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| Summary |
| This document contains the relevant testing procedures followed to ensure the released version of the software is fit for use, as well as relevant hardware tests and certifications required for use. This document will need updating for any future versions of software being issued for use with the UoL Fighting Robot Arena and its relevant hardware. All these tests were performed on a Microsoft Windows 11 Pro, 64-bit operating system machine with an AMD Ryzen 5900X CPU at 4.20GHz and 32 GB of DDR4 RAM. The arena hardware includes the arena CCU, 9 lighting modules, 2 door sensors, pit trap motor and turntable trap motor. Cameras were not connected to the CCU for these tests. |

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# Introduction

## Data Validation

The GUI can only accept user input in the form of mouse clicks so testing for data validation can be excluded from this testing procedure. All data being sent over the serial line is predefined in the source code and should not be changed end user.

## Types of Testing

All tests completed for these systems will be black box tests. This means that the software will be given an input from the user in the form of mouse clicks, and then the output from both the software and hardware will be recorded. This allows the predicted response to be compared with the actual response and allow issues to be identified.

It is outside of the scope of this documentation to complete any extra testing on the software in the form of penetration tests, vulnerability tests, or memory leak tests. This testing procedure is only in place to ensure the software and hardware performs as expected for the end user.

# Tests

## Ensure Stable Launch

This test has been designed to ensure the GUI launches from the file stored on the CCU onboard storage.

Table 1

|  |  |  |  |
| --- | --- | --- | --- |
| Conditions | Expected Outcome | Actual Outcome | Evidence |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED | GUI opens up on host pc with no errors reported. All trap controls, lighting controls, and stop/resume buttons should be greyed out | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be OPEN | GUI opens up on host pc with no errors reported. All trap controls, lighting controls, and stop/resume buttons should be greyed out | As Expected |  |

## COM Connection

Ensure when the COM connection is initiated, the relevant buttons become active, and the serial connection is correct.

Table 2

|  |  |  |  |
| --- | --- | --- | --- |
| Conditions | Expected Outcome | Actual Outcome | Evidence |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. CCU Arduino selected from Tools -> Select COM port | GUI opens up on host pc with no errors reported. All trap controls and resume should be greyed out, lighting and stop buttons should become active when port selected. Serial monitor should print “DOOR CLOSED @ START” and “Connected to Arena” | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be OPEN. CCU Arduino selected from Tools -> Select COM port | GUI opens up on host pc with no errors reported. All trap controls and resume should be greyed out, lighting and stop buttons should become active when port selected. Serial monitor should print “DOOR OPEN @ START” and “Connected to Arena” | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. No COM port selected. Click Tools -> Door Sensors Enabled | Error should appear saying no connection. Door sensor enable checkbox should remain unchecked | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. No COM port selected. Click Tools -> Turntable Enabled | Error should appear saying no connection. Turntable enable checkbox should remain unchecked | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. No COM port selected. Click Tools -> Pit Trap Enabled | Error should appear saying no connection. Pit trap enable checkbox should remain unchecked | As Expected |  |

## Exit Methods

This test has been designed to ensure the GUI closes correctly from either the red X or File -> Exit.

Table 3

|  |  |  |  |
| --- | --- | --- | --- |
| Conditions | Expected Outcome | Actual Outcome | Evidence |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. Red X is pressed on GUI window | GUI closes with no errors shown in monitoring python shell | As Expected | N/A |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. File -> Exit is pressed | GUI closes with no errors shown in monitoring python shell | As Expected | N/A |

## Emergency Stops

This test has been designed to ensure the software and hardware emergency stops perform correctly.

Table 4

|  |  |  |  |
| --- | --- | --- | --- |
| Conditions | Expected Outcome | Actual Outcome | Evidence |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. Emergency stop button in software clicked | All trap buttons, lighting buttons and the emergency stop button should become greyed out. The resume button should become active. The LED lighting should be set to red. Serial monitor should show “EMERGENCY STOP ACTIVATED” | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. Hardware emergency stop pressed | All lighting and traps should turn off/stop. The CCU green indicator and illuminated switch should turn off. The emergency stop button should stay engaged. | As Expected | N/A |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED but enabled from tools menu. Door sensors to be opened | All trap buttons, lighting buttons and the emergency stop button should become greyed out. The resume button should become active. The LED lighting should be set to red. Serial monitor should show “DOOR OPENED – EMERGENCY STOP” | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be OPEN but enabled from tools menu. Door sensors to be closed | Serial monitor should display “DOOR SHUT - SAFE TO RESUME” | As Expected |  |

## Resuming

These tests are to ensure that when an emergency stop has been triggered, the appropriate actions are completed on the click of the resume button.

Table 5

|  |  |  |  |
| --- | --- | --- | --- |
| Conditions | Expected Outcome | Actual Outcome | Evidence |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. Pit trap enabled and in raised position, pit trap enabled @ 40%. Software emergency stop button pressed once, then resume button pressed. | When resumed, lights back to previous colour, spin trap back to 40%, corner trap still in raised position. | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED and enabled. Pit trap enabled and in raised position, pit trap enabled @ 40%. Door sensors should be opened and closed once, then resume button pressed. | When resumed, lights back to previous colour, spin trap back to 40%, corner trap still in raised position. | As Expected |  |

## Feature Enablement

Some traps and features can be enabled/disabled at the user’s leisure depending on the setup for their current arena. These tests ensure that the buttons react accordingly and do not affect the control of the arena unexpectedly.

Table 6

|  |  |  |  |
| --- | --- | --- | --- |
| Conditions | Expected Outcome | Actual Outcome | Evidence |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be CLOSED. Door sensor enabled button in Tools menu clicked. The door sensor will then be opened to see if an emergency stop is triggered | The serial monitor should display “Door Sensors Enabled”. When door sensor is opened, emergency stop should occur | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Door sensors should be OPENED. Door sensor enabled button in Tools menu clicked. | The serial monitor should display “Door Sensors Enabled”. When door sensor is opened, emergency stop should occur immediately | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Turntable Trap Enabled button in Tools menu clicked to enable | Spin Speed buttons should become active | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Turntable Trap Enabled button in Tools menu clicked to disable | Spin speed buttons should be disabled | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Pit Trap Enabled button in Tools menu clicked to enable | Corner trap “LOWER” button should become active | As Expected |  |
| CCU connected to host PC with all hardware stated in the introduction connected. Pit Trap Enabled button in Tools menu clicked to disable | All corner trap buttons should be disabled | As Expected |  |