SE 3XA3: Test Plan
Ohm: Resistor Scanner

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Table 1: **Revision History**

Date	Version	Notes
December 8th 2016	0.0	First Revision of Testing Report

1 General Information

1.1 Purpose

This document will describe the testing results and improvements from testing of Group 4's 3XA3 Project, Ohm. Wholistic testing has been valuable in tuning key algorithms. Unit tests have allowed for iteration without fear of feature regression in key components.

1.2 Scope

The tests described in this test report verify the efficacy of the resistor band detection, the colour selection, the resistor body detection, and general user interface behaviors.

2 Tests for Functional Requirements

2.1 User Input

Warning Box

1. F-FDM-1
   Type: Functional, Dynamic, Manual

   Initial State: App is not open

   Input: App is launched

   Output: Camera starts, warning AlertDialog appears over camera view

   Results: The user launches the app, the AlertDialog containing our on-launch disclaimer appears.

2. F-UDM-2
   Type: Unit, Dynamic, Manual

   Initial State: Warning AlertDialog is displayed

   Input: The user taps anywhere on screen

   Output: Warning AlertDialog closes, showing camera

   Results: The user presses anywhere on screen and the AlertDialog dismisses.

Screen

1. F-UDM-4
   Type: Unit, Dynamic, Manual

   Initial State: App is open, ready to scan

   Input: Screen is tapped

   Output: No output

   Results: Any screen touches have no effect on the application.

2.2 Resistor Scanning

1. F-FDM-5
   Type: Functional, Dynamic, Manual

   Initial State: App is open, camera is on

   Input: Camera is pointed at resistor in incorrect orientation

   Output: No output

   Result: Touching the screen has no effect while the camera preview is being displayed.

2. F-FDM-6
   Type: Functional, Dynamic, Manual

   Initial State: App is open, camera is on

   Input: Camera is pointed at resistor in correct orientation with red line crossing through first stripe from either side

   Output: No output

   Result When the camera is pointed at a resistor with the red line intersecting one of the four bands of the resistor, no resistance can be identified, so no text is shown on screen.

3. F-FDM-7
   Type: Functional, Dynamic, Manual

   Initial State: App is open, camera is on

   Input: Camera is pointed at resistor in correct orientation with red line crossing through two stripes from either side

Output: No output

Result When the camera is pointed at a resistor with the red line intersecting two of the four bands of the resistor, no resistance can be identified, so no text is shown on screen.

4. F-FDM-8

Type: Functional, Dynamic, Manual

Initial State: App is open, camera is on

Input: Camera is pointed at resistor in correct orientation with red line crossing through three stripes from either side

Output: No output

Result When the camera is pointed at a resistor with the red line intersecting three of the four bands of the resistor, no resistance can be identified, so no text is shown on screen.

5. F-FDM-9

Type: Functional, Dynamic, Manual

Initial State: App is open, camera is on

Input: Camera is pointed at resistor in correct orientation with red line crossing through four stripes from either side

Output: Resistance value is displayed on the screen

Result When the camera is pointed at a resistor with the red line intersecting all four bands of the resistor. A resistance value is likely shown, however it is rarely correct as very rarely are all 4 colors identified with complete correctness.

6. F-FDM-10

Type: Functional, Dynamic, Manual

Initial State: App is open, camera is on

Input: Camera is on with no resistor visible on screen

Output: No output

Result: The camera preview and red line are shown on the page

3 Tests for Nonfunctional Requirements

3.1 User Tests

1. NF-FDM-11

   Type: Functional, Dynamic, Manual

   Initial State: App is open, camera is on

   Input/Condition: 100 resistors scanned

   Output/Result: 95 resistors or more will be identified accurately

   Results: This testing was not conducted because color identification never reached sufficient accuracy that resistance identification was ever meaningful.

2. NF-FDM-12

   Type: Functional, Dynamic, Manual

   Initial State: App is open, camera is on

   Input: Give the app and a resistor to a user between the ages of 8 and 70

   Output: The user will be able to identify the value of the resistor.

   Results: This testing was not conducted because color identification never reached sufficient accuracy that resistance identification was ever meaningful.

3. NF-FDM-13

   Type: Functional, Dynamic, Manual

   Initial State: App is open, camera is on

   Input: Give the app to a user who doesn't have Internet connection

   Output: The user will be able to identify the value of the resistor

   Result: The application does not require the android Internet permission, the application cannot connect to the internet

3.2 Launch Tests

1. NF-FDM-14

   Type: Functional, Dynamic, Manual

Initial State: App is not open

Input: App is launched

Output: The warning box will display text

How test will be performed: The app will be launched and display a warning box which contains text. The text will notify the user that the app should not be used in safety critical systems.

2. NF-FDM-15
Type: Functional, Dynamic, Manual

Initial State: App is not open

Input: App is launched

Output: The app will display the warning box within 5 seconds

Results: The app reliably launches reliably in less than five seconds on all available test phones.

3.3 Band Identification

1. PC-BI-1

Type: Functional, Dynamic, Manual

Initial State: Software not running

Input: Run Command

Output: Software displays static image of resistor with no bands selected.

Results: The software launches to a resistor image preselected, and no sampling line selected.

2. PC-BI-2

Type: Functional, Dynamic, Manual.

Initial State: Software running, no axis selected

Input: Select axis directly across resistor body.

Output: A ring centered around each band of the appropriate colour.

Results: After selecting an axis, most of the time, the bands will be identified and rings will be drawn.

3. PC-BI-3

   Type: Functional, Dynamic, Manual

   Initial State: Software not running

   Input: Select axis incorrectly.

   Output: Exception is thrown

   How test will be performed: Manual execution.

4   Comparison to Existing Implementation

There are two tests that compare the program to the Existing Implementation of the program. Please refer to:

- test F-FDM-9 in Resistor Scanning for Functional Requirements

  Result: The resistance is close to recognized, but some bands are recognized incorrectly leading to incorrect resistances

- test NF-FDM-15 in Launch Tests for Nonfunctional Requirements Result: The application launches similarly quickly. Both are limited by loading the OpenCV library.

  Result

5   Unit Testing Results

Unit Testing was exceptionally valuable for being able to rapidly improve the Color Mapping module. By having a set of tests that verify the correct mapping of known colors, the development team was able to confidently move from identifying colors by euclidean distance to reference values to an approach of using a k-nearest neighbors algorithm. This iteration would have been appreciably slower with manual testing.

However, there is far from 100% unit test coverage. As this problem is difficult and poorly defined, many modules lack a rigid form of correct behavior. Therefore we've focused on the development of development modes

of the application that will show the tester an image produced by algorithmic components. This allows us to use a human developer's subjective opinion of the algorithm's performance so it can be further adjusted and tuned.