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| **Setup** | **1.5.1. Scan Label Step** | | |
| Scan the label of the unit under test and store the values for later use. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Prompt the operator to scan the product label using a handheld  barcode reader | None |
| 2 | Store the label information | None |
| **Setup** | **1.5.2. Connect to unit over USB Step** | | |
| This step will connect to the unit using USB to perform all tests. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Connect over USB | Ability to run diagnostic commands over the USB connection |
| 2 | Send data to the unit under test and receive an expected response | Diagnostic command responds correctly to commands |
| 3 | Pass or fail the unit depending on the results | None |

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| **Setup** | **1.5.3. Update Firmware Step (NPI only)** | | |
| This step will verify the firmware version of the unit under test and update it if necessary. This step will be removed when the product is released to full production. The expectation is that the firmware will be pre-programmed at Beta/RTM. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Query the current application, apploader and failsafe version of the unit under test | Diagnostic commands to perform the stated functions |
| 2 | Update the firmware, apploader, and failsafe as necessary | Diagnostic commands to upload stated firmware |
| 3 | Pass or fail the unit depending on the results | None |
| **Sequence 1** | **1.5.4. Label Configuration Test** | | |
| This test will write and/or verify the device’s configuration information (serial number, MAC Address, part number, hardware revisions, firmware revisions etc.) on the unit under test. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Write or verify the serial number, focus distance, part number, and revision information | Diagnostic commands to read and write serial number, focus distance, mac address, part number and revision information |
| 2 | Write EEPROM information to the IO board | Diagnostic commands to read and write the IO board EEPROM |
| 3 | Verify any required hardware versions | Diagnostic commands to read necessary hardware revision numbers |
| 4 | Verify firmware versions | Diagnostic commands to read the firmware versions |

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| **Sequence 2** | **1.5.5. Image Acquire Test** | | |
| This test will verify that the unit under test will complete an image acquisition. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Acquire and transfer an image to the test PC. | Diagnostic commands to set exposure, gain, offset, and acquire and transfer an image to the test PC |
| 2 | Run histogram on acquired image to verify image is reasonable (not all black, all white, etc.) | None |
| 3 | Fail unit under test if image doesn’t acquire, or image is unreasonable | None |
| **Sequence 3** | **1.5.6. Sensor Data Path Test** | | |
| This test step will verify that none of the imager data lines are open/shorted (legacy test). | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Turn on wedge (linear gradient) pattern | Diagnostic commands to enable linear gradient pattern |
| 2 | Acquire and transfer an image to the test PC | Diagnostic commands to acquire and transfer an image to the test PC. |
| 3 | Verify 8-bit data using histogram tool | None |
| 4 | Pass or fail the unit depending on the results | None |

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| **Sequence 4** | **1.5.7. Debris Test** | | |
| This test step will verify that the optical path of the unit under test is clean and free of debris. The test fixture will have appropriate hardware necessary to preform a course search to detect debris. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Acquire and transfer an image to the test PC | Diagnostic commands to set exposure, gain, offset, and acquire and transfer an image to the test PC |
| 2 | Run CVL vision job on the acquired image to detect debris blobs | None |
| 3 | Pass or fail the unit depending on the results | None |
| **Sequence 5** | **1.5.8. LED Ring Test** | | |
| This test step will verify the functionality of the ring LEDs. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Activate/deactivate each ring LEDs | Diagnostic commands to turn on and off ring LEDs |
| 2 | Activate/deactivate any other LEDs | Diagnostic commands to turn on and off miscellaneous LEDs |
| 3 | Pass or fail the unit depending on the results | None |

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| **Sequence 6** | **1.5.9. Internal Illumination Connectivity Test** | | |
| This test step will verify the Internal illumination functionality. This is a go/no-go test, since all illumination modules will be tested and programmed elsewhere. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Acquire an image with internal illumination turned on, UUT looking at a flat target. | Diagnostic commands to turn on and off internal illumination  Diagnostic commands to set exposure, gain, offset, and acquire and transfer an image to the test PC |
| 2 | Verify expected response or state | None |
| 3 | Pass or fail the unit depending on the results | None |
| **Sequence 7** | **1.5.10. Liquid Lens Connectivity Test** | | |
| This test step will verify the liquid lens connectivity. This is a go/no-go test, since all liquid lens modules will be tested and programmed elsewhere (during Wren II process). | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Read the temperature sensor contents of the liquid lens | Diagnostic commands to read the liquid lens temperature sensor |
| 2 | Change liquid lens register value, unit responds indicating it correctly received the command | Diagnostic commands to change the liquid lens value |
| 3 | Pass or fail the unit depending on the results | None |

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| **Sequence 8** | **1.5.11. Trigger Button Test** | | |
| This test step will verify the functionality of the trigger. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Activate/De-activate trigger | None |
| 2 | Query the state of the trigger | Diagnostic commands to independently read the state of the trigger |
| 3 | Pass or fail the unit depending on the results | None |
| **Sequence 9** | **1.5.12. UI Button Test** | | |
| This test step will verify the functionality of the UI Buttons. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Activate/De-activate left arrow button | None |
| 2 | Query the state of the left arrow button | Diagnostic commands to independently read the state of the left arrow button |
| 3 | Activate/De-activate center button | None |
| 4 | Query the state of the center button | Diagnostic commands to independently read the state of the center button |
| 5 | Activate/De-activate right arrow button | None |
| 6 | Query the state of the right arrow button | Diagnostic commands to independently read the state of the right arrow button |
| 7 | Pass or fail the unit depending on the results | None |

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| **Sequence 10** | **1.5.13. Beeper Test** | | |
| This test step will verify the functionality of the beeper. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Activate the beeper at a specified frequency | Diagnostic commands to turn on and off the beeper at a specified frequency |
| 2 | Read the frequency and amplitude of the response | None |
| 3 | Pass or fail the unit depending on the results | None |
| **Sequence 11** | **1.5.14. Vibration Motor Test** | | |
| This test step will verify the functionality of the vibration motor. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Activate the vibration motor | Diagnostic commands to turn on and off the vibration motor |
| 2 | Read the frequency and amplitude of the response | None |
| 3 | Pass or fail the unit depending on the results | None |

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| **Sequence 12** | **1.5.15. UI Screen Connectivity Test** | | |
| This test step will verify that the UI screen powers on, illuminates, and changes pixel color. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Activate the UI Screen to produce a various colored screen | Diagnostic commands to turn control pixels on the UI screen |
| 2 | Read the brightness and color of the UI screen | None |
| 3 | Pass or fail the unit depending on the results | None |
| **Sequence 13** | **1.5.16. Accelerometer Connectivity Test** | | |
| This test will verify that the accelerometer can provide data to the unit under test. | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Query the accelerometer’s orientation | Diagnostic command to query the accelerometer |
| 2 | Pass or fail the unit if any orientation is recorded | None |

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| **Sequence 14** | **1.5.17. On-Axis Aimer Test** | | |
| This test will verify that On-Axis Aimer can turn on/off and is within tolerance of “center”. The test fixture will have the appropriate hardware for this test | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Activate/Deactivate the LED for the On-Axis Aimer | Diagnostic to enable to On-Axis Aimer |
| 2 | Pass or fail the unit if any orientation is recorded | None |
| **Sequence 15** | **1.5.18. Accessory Port Test** | | |
| This test will verify that Accessory Port of the reader can receive signal and power (Wireless Version only) | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Connect over to the Accessory Port | Ability to run diagnostic commands over the Accessory Port connection |
| 2 | Send data to the unit under test and receive an expected response | Diagnostic command responds correctly to commands |
| 3 | Pass or fail the unit depending on the results | None |

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| **Sequence 16** | **1.5.19. Wifi Communication Test** | | |
| This test will verify that the Wifi communication module is able to connect and communicate to other devices (Wireless version only). | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Connect to the unit under test via Wifi | Diagnostic command to preform Wifi connection |
| 2 | Transfer data from a computer to the unit under test | Diagnostic command to receive and send data via Wifi connection |
| 3 | Pass or fail the unit ifdepending on the results | None |

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| **Sequence 17** | **1.5.20. Bluetooth Communication Test** | | |
| This test will verify that the Bluetooth communication module is able to connect and communicate to other devices (Wireless version only). | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Connect to the unit under test via Bluetooth | Diagnostic command to preform Bluetooth connection |
| 2 | Transfer data from a computer to the unit under test | Diagnostic command to receive and send data via Bluetooth connection |
| 3 | Pass or fail the unit depending on the results | None |

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| **Sequence 18** | **1.5.21. Battery Charging Test** | | |
| This test will verify that the unit under test is able to regulate battery charging (Wireless version only). | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Use hardware to electrical properties of charging connectors | Diagnostic commands to control battery charging mode |
| 2 | Pass or fail the unit depending on the results | None |

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| **Sequence 19** | **1.5.22. Download Focus Results** | | |
| This test step will download the focus results from the Wren II Focus Fixture that have been saved on the Wren II Unit and preform an MTF evaluation of the image | | |
| **Strategy** | | **Diagnostic Firmware Requirements** |
| 1 | Download the Focus Log from the Wren II Unit | Diagnostic commands to download focus results |
| 2 | Run CVL vision job on the final image to obtain an MTF Score | None |
| 3 | Pass or fail the unit depending on the results of the MTF Score (min score 0.2 lp/px) | None |