**A.Appendix**

# A.1TestCaseDocuments

A.1.1BTC1

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| TestWriter | | Nathaniel Dusciuc | | | | | | |
| TestCaseName | | Power regulator test | | | | TestID |  | |
| Description | | Verifying voltage levels of power rails and voltage regulator, over a range of supply voltages from 3.3v to 5v. | | | | Type | BlackBoxWhiteBox |  |
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| TesterInformation | | | | | | | | |
| NameofTester | |  | | | | Date |  | |
| HardwareVersion | |  | | | | Time |  | |
| Setup | | Populate all the power circuitry hardware on the PCB. Connect a 5v power supply limited to 50mA max to the battery input terminal. Connect voltage probe to power rail. | | | | | | |
| AdditionalEquipment | | Oscilloscope, Current limiting power supply | | | | | | |
| Step | Action | Expected Result | Pass | Fail | N/A | Comments | | |
| 1 | Apply logic 1 to the enable pin (p5) on the power regulator (U3). | 3.3v on power rail and current consumption in single-digit mA range. |  |  |  |  | | |
| 2 | Change power supply to 3.3v | Approximately 3.3v on power rail. |  |  |  |  | | |
| 3 | Increase current limit of power supply to 150mA. | Approximately 3.3v on power rail and no major change in current consumption. |  |  |  |  | | |
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| TestWriter | | Nathaniel Dusciuc | | | | | | |
| TestCaseName | | Power on circuit test | | | | TestID |  | |
| Description | | Verify the on button behavior. | | | | Type | BlackBoxWhiteBox |  |
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| TesterInformation | | | | | | | | |
| NameofTester | |  | | | | Date |  | |
| HardwareVersion | |  | | | | Time |  | |
| Setup | | Place button header on PCB and connect button breakout board to main PCB. Connect a 5v power supply limited to 50mA max to the battery input terminal. Attach probe to the enable pin (p5) of the power regulator (U3). | | | | | | |
| AdditionalEquipment | | Oscilloscope, Current limiting power supply | | | | | | |
| Step | Action | Expected Result | Pass | Fail | N/A | Comments | | |
| 1 | Center button press (short) | Logic 1 |  |  |  |  | | |
| 2 | Center button press (short) | Logic 1 (no change) |  |  |  |  | | |
| 3 | Center button press (long) | Logic 0 |  |  |  |  | | |
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| Test Writer | | Nathaniel Dusciuc | | | | | | |
| Test Case Name | | USB power defeat circuit test | | | | Test ID |  | |
| Description | | Verify correct logic output levels when USB is plugged in and when it is not plugged in. | | | | Type | BlackBoxWhiteBox |  |
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| Tester Information | | | | | | | | |
| Name of Tester | |  | | | | Date |  | |
| Hardware Version | |  | | | | Time |  | |
| Setup | | Connect a 5v power supply limited to 50mA to the battery input terminal. Connect voltage probe to power rail. Turn on power by pressing the center button. | | | | | | |
| Additional Equipment | | Oscilloscope, Current limiting power supply | | | | | | |
| Step | Action | Expected Result | Pass | Fail | N/A | Comments | | |
| 1 | Connect 5V power to USB inlet. | GND on power rail. |  |  |  |  | | |
| 2 | Disconnect USB power. | 3.3v returns to power rail after a short delay. |  |  |  |  | | |
| 3 | Connect 4.0V power to USB inlet. | GND on power rail. |  |  |  |  | | |
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| Test Writer | | Nathaniel Dusciuc | | | | | | |
| Test Case Name | | Charge controller test | | | | Test ID |  | |
| Description | | Verify the charge controller is outputting | | | | Type | BlackBoxWhiteBox |  |
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| Tester Information | | | | | | | | |
| Name of Tester | |  | | | | Date |  | |
| Hardware Version | |  | | | | Time |  | |
| Setup | | Connect a 3.3v power supply limited to 50mA in series with a current probe connected to the battery input terminal. Turn on power by pressing the center button. | | | | | | |
| Additional Equipment | | Oscilloscope, Current limiting power supply | | | | | | |
| Step | Action | Expected Result | Pass | Fail | N/A | Comments | | |
| 1 | Connect a 5V power supply to the USB power inlet. | .Current flowing toward the “battery” power supply. |  |  |  |  | | |
| 2 | Raise the “battery” power supply voltage to 5V. | Current flow reduces as “battery” power supply approaches 4.95v and then shuts off above 4.95v. |  |  |  |  | | |
| 3 | Reduce the “battery” power supply voltage to 3.3V | Current begins to flow again when the “battery” power supply voltage drops below 4.85v. |  |  |  |  | | |
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| Test Writer | | Nathaniel Dusciuc | | | | | | |
| Test Case Name | | Button debounce/functionality test | | | | Test ID |  | |
| Description | | Verify that all 5 button presses provide a clean steady logic 0 at their respective GPIO pins. | | | | Type | BlackBoxWhiteBox |  |
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| Tester Information | | | | | | | | |
| Name of Tester | |  | | | | Date |  | |
| Hardware Version | |  | | | | Time |  | |
| Setup | | Populate debounce circuitry and the pull-up resistors for the button. Connect a 5v power supply limited to 50mA. Turn on power by pressing the center button. | | | | | | |
| Additional Equipment | | Oscilloscope, Current limiting power supply | | | | | | |
| Step | Action | Expected Result | Pass | Fail | N/A | Comments | | |
| 1 | Connect voltage probe to GPIO pins\* and press button. | Logic steps from high to low with no voltage bounce. |  |  |  |  | | |
| 2 |  |  |  |  |  |  | | |
| 3 |  |  |  |  |  |  | | |
| 4 |  |  |  |  |  |  | | |
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\*UP = pin 39, Down = pin 40, Right = pin 41, Center = pin 42, Left = pin 43

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| Test Writer | | Nathaniel Dusciuc | | | | | | |
| Test Case Name | | Sensor module test | | | | Test ID |  | |
| Description | | Verify that the sensor module is sensing the magnetic field and outputting the correct logic levels. | | | | Type | BlackBoxWhiteBox |  |
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| Tester Information | | | | | | | | |
| Name of Tester | |  | | | | Date |  | |
| Hardware Version | |  | | | | Time |  | |
| Setup | | Connect a 5v power supply limited to 50mA to the battery input terminal. Turn on power by pressing the center button. Populate sensor header and circuitry. Connect sensor module to sensor header on main PCB. Connect voltage probe to MCU pin 29 | | | | | | |
| Additional Equipment | | Magnet, Oscilloscope, Current limiting power supply | | | | | | |
| Step | Action | Expected Result | Pass | Fail | N/A | Comments | | |
| 1 | Place neodymium magnet in front of sensor module (If no result use the other pole of the magnet). | Logic low. |  |  |  |  | | |
| 2 | Remove magnet | Logic high. |  |  |  |  | | |
| 3 |  |  |  |  |  |  | | |
| 4 |  |  |  |  |  |  | | |
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| Test Writer | | Nathaniel Dusciuc | | | | | | |
| Test Case Name | | MCU hardware test | | | | Test ID |  | |
| Description | |  | | | | Type | BlackBoxWhiteBox |  |
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|  | |
| Tester Information | | | | | | | | |
| Name of Tester | |  | | | | Date |  | |
| Hardware Version | |  | | | | Time |  | |
| Setup | | Place MCU on main PCB and all related circuitry. Connect a 5v power supply limited to 10mA to the battery input terminal. | | | | | | |
| Additional Equipment | | Oscilloscope, Current limiting power supply | | | | | | |
| Step | Action | Expected Result | Pass | Fail | N/A | Comments | | |
| 1 | Slowly increase current limit of power supply to 55mA. | The current being supplied should not exceed 50mA. |  |  |  |  | | |
| 2 | Connect voltage probe to power pins\*. | 3.3v dc without ripple or deviation. |  |  |  |  | | |
| 3 | Connect voltage probe to pin 1 | 0.6\*supply voltage (v) |  |  |  |  | | |
| 4 | Connect voltage probe to pin 5 or 6. | 8MHz signal |  |  |  |  | | |
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\*Pins 9,24,36,48