

SALE-R Test Report

Overall Summary: Kick Buttons are fully functional
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- **Mechanical Design Requirements**

- **Test T1: Interaction with Optical Switch Surface (T1)**
 - i. **Method:** Visually inspect and measure the clearance between the metal strap and the surface of the optical switch in all button positions using a caliper or other precision measuring tool.
 - ii. **Acceptance Criteria:** There should be a minimum clearance of 1 mm between the metal strap and the optical switch surface in both pressed states.
 - iii. **Observation from Test:** The clearance was 2mm between the strap and the optical switch, for buttons in the compressed state.
 - iv. **Pass/Fail:** Pass
- **Test T2: Laser Interruption upon Button Press (T2)**
 - i. **Method:** Press the button and observe the optical switch output using a voltmeter to confirm that the laser is interrupted by the metal strap.
 - ii. **Acceptance Criteria:** The laser should be fully interrupted once the button is pressed.
 - iii. **Observation from Test:** The laser is fully interrupted when the button is pressed, as voltage goes down to 0V.
 - iv. **Pass/Fail:** Pass
- **Test T3: Laser Continuity in Equilibrium Position (T3)**
 - i. **Method:** Place the button in its equilibrium position and monitor the optical switch output using a voltmeter.
 - ii. **Acceptance Criteria:** The laser should remain uninterrupted in the unpressed state.
 - iii. **Observation from Test:** The voltage does not change across the optical switch circuit when the button is not pressed.
 - iv. **Pass/Fail:** Pass
- **Test T4: Button Return to Equilibrium Position (T4)**

- i. **Method:** Manually press the button multiple times and observe whether it reliably returns to its original position. Use a caliper if needed to confirm alignment.
 - ii. **Acceptance Criteria:** The button must return to its equilibrium position after every press.
 - iii. **Observation from Test:** The button returns to its original position.
 - iv. **Pass/Fail:** Pass
- **Test T5: LED Circuitry Accommodation (T5)**
 - i. **Method:** Insert the LED driving circuitry into its designated compartment and check for secure fit and unobstructed placement.
 - ii. **Acceptance Criteria:** The circuitry must fit securely within the button housing with no movement or interference.
 - iii. **Observation from Test:** The LED board fits properly within the button. Each LED circuit has dimensions of 2cm x 3cm.
 - iv. **Pass/Fail:** Pass
- **Electrical Functionality**
 - **Test T6: Optical Switch Voltage Regulation (T6)**
 - i. **Method:** Use a multimeter or oscilloscope to measure voltage supplied by the Buck Convertor regulator to the optical switch in both idle and active states, under various load conditions.
 - ii. **Acceptance Criteria:** Voltage must not exceed 5.5 V.
 - iii. **Observation from Test:** The output voltage was 5.2 V.
 - iv. **Pass/Fail:** Pass
 - **Test T7: LED Driver Circuit Current Limitation (T7)**
 - i. **Method:** Power the LED circuit and measure current across the 300-ohm source resistor using a multimeter. Test under standard and maximum base current conditions.
 - ii. **Acceptance Criteria:** Current must remain ≤ 40 mA in all tested conditions.
 - iii. **Observation from Test:** The maximum observed current per button was 38mA..
 - iv. **Pass/Fail:** Pass
 - **Test T8: GPIO Input Voltage Limitation to Microcontroller (T8)**
 - i. **Method:** Measure voltage at the GPIO input pin during idle and active states using a multimeter or oscilloscope.
 - ii. **Acceptance Criteria:** Voltage must not exceed 3.8 V.
 - iii. **Observation from Test:** The voltage at GPIO was 3.29 V.
 - iv. **Pass/Fail:** Pass
- **Individual Button Functionality**
 - **Test T9: Microcontroller Readings (T9)**
 - i. **Method:** Monitor GPIO pin on the microcontroller while pressing the button. The onboard LED should be programmed to turn on when a high signal is received.

- ii. **Acceptance Criteria:** The microcontroller must detect a logic high when the button is pressed.
 - iii. **Observation from Test:** The microcontroller detects logic high when button is pressed.
 - iv. **Pass/Fail:** Pass
- **Test T10:** LED Illumination on Button Press (T10)
 - i. **Method:** Press the button and visually verify that the button's LED lights up and remains on while pressed.
 - ii. **Acceptance Criteria:** LEDs must illuminate immediately when the button is pressed.
 - iii. **Observation from Test:** LED lights up immediately when button is pressed.
 - iv. **Pass/Fail:** Pass
- **Test T11:** Bluetooth Message Transmission on Button Press (T11)
 - i. **Method:** Pair the microcontroller with a tablet or computer. Monitor the receiving application or terminal to confirm transmission of "buttonName_Pressed" and default "buttonName_!Pressed" messages.
 - ii. **Acceptance Criteria:** An "buttonName_Pressed" message must be sent when the button is pressed. "buttonName_!Pressed" must be sent when no button is pressed.
 - iii. **Observation from Test:** The button press messages were transmitted properly, and were verified by displaying them on smart Mobile Device.
 - iv. **Pass/Fail:** Pass
- **System Level Integration (involves 5 buttons)**
 - **Setup:**
 - i. Power the button system (5 buttons and the circuitry) using a 12 V supply
 - ii. Place the 5 buttons on a custom mount/footrest that is comfortable to use when a person is in a wheelchair.
 - **Test T12:** Button State Detection and String Composition (T12)
 - i. **Test Method:** Use a USB connection to print serial output from the microcontroller while pressing each button individually and in combinations; confirm that the generated string accurately reflects the state of each button.
 - ii. **Acceptance Criteria:** The generated string accurately reflects the current state of each button in the format "ON_1 OFF_2..." etc.
 - iii. **Observation from Test:** The generated string accurately reflected the current state of each button in the format "ON_1 OFF_2..." etc.
 - iv. **Pass/Fail:** Pass
 - **Test T13:** Bluetooth Transmission of Button States (T13)
 - i. **Test Method:** Pair a tablet or computer with the microcontroller via Bluetooth, then press buttons individually and in combinations while monitoring the received string in a logging application; verify that each transmission matches the current button states and test for consistency under rapid presses.

- ii. **Acceptance Criteria:** The tablet consistently receives the correct button state string for every combination of presses, in the specified format (e.g., Left pressed, Right pressed, etc.).
 - iii. **Observation from Test:** The button presses were detected in tight format. For instance Left pressed when the left button was pressed and vice versa..
 - iv. **Pass/Fail:** Pass
- **Test T14:** Stability and Responsiveness Testing (T14)
 - i. **Test Method:** Use logging software to monitor transmitted strings while rapidly pressing buttons in different sequences, including simultaneous inputs; observe whether the system consistently updates the string without missing or misreporting button states.
 - ii. **Acceptance Criteria:** The system should not miss any button press events or provide incorrect button states
 - iii. **Observation from Test:** The system detects buttons pressed properly, even when they are pressed pretty fast. This is valid as long as button presses are within 0.25 sec, which is the sampling time programmed in the controller.
 - iv. **Pass/Fail:** Pass

Test Result Summary

Test No.	Pass/Fail
T1	Pass
T2	Pass
T3	Pass
T4	Pass
T5	Pass
T6	Pass
T7	Pass
T8	Pass
T9	Pass
T10	Pass
T11	Pass
T12	Pass
T13	Pass
T14	Pass

#####End of Report#####