Window Shade Test Report

##
Overall Summary: Window Shades are functional
Tested by: Hernan Tovar, Padmanabh Kaushik. Nicholas Sorak.
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##

Mechanical Design Requirements

Test T1: Interaction with Motor

- **Equipment**: Motor, relays, power supply, and wall outlet.
- **Method**: Apply a line voltage source switching via protoboard with relays attached, using 12 volts to switch on and off.
- **Pass/Fail Criteria**: Motor rotates once the voltage applied to the relays is high.

Test T2: Breaker Component

- **Test Equipment**: Built PCB, breaker.
- **Test Method**: Switch on/off the breaker component.
- **Acceptance Criteria**: Disables power to the motor, and motor doesn't rotate.

Cover Requirements: Wired aspects shall be secured and out of reach/away from the resident.

Test T3: Window Shades Reach

- **Test Equipment**: Motor, built PCBs, shades.
- **Test Method**: Enable the motor to spin to its maximum, adjust as necessary.
- **Acceptance Criteria**: The shades reach to the bottom of the window.

Test T4: Accommodation of PCBs

- **Test Method**: Insert the PCBs into their designated 3d printed compartments. Check for proper fit, alignment, and secure positioning.
- **Acceptance Criteria**: The PCBs should fit securely within their housing, with no movement or obstruction.
- **Test Equipment**: 3D Fusion, ruler.

Cover Requirements: Wired aspects shall be secured and out of reach/away from the resident.

Electrical functionality

Test T5: Voltage Convertor Voltage Regulation

- **Test Equipment**: Digital multimeter or oscilloscope.
- **Test Method**:
    - Measure the output voltage from the LM 2596 buck converter under both idle and active states.
    - Repeat the test under different load conditions(turning the system on or off).
- **Acceptance Criteria**: The voltage supplied to the microcontroller output side should not exceed 5.1 V.

Test T6: Relay Circuit Current Limitation

- **Test Equipment**: Digital multimeter
- **Test Method**:
    - Power the GPIO pins from the Pico W and measure the current flowing through the circuit under standard and maximum operating conditions.
    - Measure the current in voltage across the drain and source from each transistor and calculate the current.
- **Acceptance Criteria**: The coil current in the Relays should be ≤ 25 mA and ≤ 33.3 mA, for the DSP2A-DC12V and the G5LE-1 DC12, respectively in all tested conditions.

Test T7: GPIO Input Voltage Limitation to Microcontroller

- **Test Equipment**: Digital multimeter or oscilloscope.
- **Test Method**:
    - Measure the voltage at the GPIO input pin on the microcontroller in both idle and active states.
    - Test under various input signal conditions to ensure stability.
- **Acceptance Criteria**: The voltage at the GPIO input should not exceed 3.8 V.

Wi-Fi Integration Functionality:

Test T8: Microcontroller Readings

- **Test Equipment**: Computer and Oscilloscope.
- **Test Method**:
    - Verify if the name of the device appears on the console of the Hub.
    - Monitor one of the GPIO pins on the microcontroller while the up cover option from the Home Assistant is pressed.
    - Program the microcontroller to turn on the built-in LED if the button is pressed.
- **Acceptance Criteria**: The microcontroller should register a logic high or logic low signal depending on when the up or down, and stop is pressed.

Cover Requirements: Smart Window Shades shall be connected with the Smart Hub wirelessly.

System level integration (involves 5 buttons):

Setup:

- Attached the motor and tube with shades to the ceiling.
- Wired and connected both of the PCBs to power and each other.

Test T9: Control from HA website.

- **Test Equipment**: Computer
- **Test Method**: Use the Home Assistant website to control the shades
    - Press either up or down arrows and the stop buttons.
- **Acceptance Criteria**: Window shades respond accordingly and further verified with audio feedback from the relay.

Test T10: Control from SMD interface.

- **Test Equipment**: Smart Mobile Device
- **Test Method**: Use the user interface on the SMD to control the shades.
    - Press the arrows, up or down and stop.
- **Acceptance Criteria**: Window shades respond accordingly and further verified with audio feedback from the relay.

Test T11: Control from SALE-Remote buttons.

- **Test Equipment**: Kick Buttons

- **Test Method**: Navigate the user interface on the SMD by using the kick buttons to control the shades.
    - Press the respective kick buttons; up, down or stop.
- **Acceptance Criteria**: Window shades respond accordingly and further verified with audio feedback from the relay.

T9-T11_Cover Requirements:

- The resident shall be able to raise/lower the Smart Window Shades by interfacing with the Smart Mobile Device.
- Simple controls; with a push/touch shall open or close.

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

##**End of report**##