**Test Plan**

**Requirement:** Box should be enclosed and physically robust.

**Test:**

1. Turn box upside down
2. Check to see if any circuits, switches or connectors came undone.

|  |  |  |
| --- | --- | --- |
| **Did any thing come undone?** | **Spec?** | **Did it pass the test?** |
|  | No |  |

**Requirement:** Box should have terminating cable connectors, securely mounted to the box. Can be easily disconnected and connected.

**Test:**

1. Disconnect and connect the cable connections.

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| --- | --- | --- |
| **Were the cables easy to disconnect and connect?** | **Spec?** | **Did it pass the test?** |
|  | Yes |  |

**Requirement:** Box should be able to withstand a drop to the floor.

**Test:**

1. Drop box to the floor.
2. Check to see if any connectors or cables break

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| --- | --- | --- |
| **Did anything come undone or break?** | **Spec?** | **Did it pass the test?** |
|  | No |  |

**Requirement:** When the switch is turned to off position, no temperatures should be displayed on the box or the Internet.

**Test:**

1. Turn switch to “off” position.
2. Check to see if temperature is displayed on box and Internet.

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| --- | --- | --- |
| **Was temperature displayed when “off”?** | **Spec?** | **Did it pass the test?** |
|  | No |  |

**Requirement:** When the button is pressed the temperature of the thermometer should be displayed in degrees Celsius as a binary integer on the LED display.

**Test:**

1. Turn the switch to “on” position.
2. Press and hold the button located on the box.
3. Place temperature sensor on table (room temperature).
4. The LED display should then display the temperature in binary value. (A light on represents a one and a light off represents a zero.) (Negatives in 2’s complement)
5. Record the temperature displayed in binary.
6. Convert the binary number to decimal.
7. Compare to room temperature.

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| --- | --- | --- |
| **Was the temperature displayed when the button was pressed?** | **Spec** | **Did it pass the test?** |
|  | Yes |  |
| **What is the decimal form of the number displayed?** | **Spec** | **Did it pass the test?** |
|  | 22+-4 |  |

**Requirement:** There should be a negligible delay between pressing/releasing the button and the display showing the temperature/going dark.

**Test:**

1. Turn the switch to the “on” position.
2. Press the button.
3. Release the button.

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| --- | --- | --- | --- | --- |
| **Is there a noticeable delay when turning on?** | **Spec** | **Is there a noticeable delay when turning off?** | **Spec?** | **Did it pass the test?** |
|  | No |  | No |  |

**Requirement:** An error display should be shown when the temperature sensor is not connected to the box.

**Test:**

1. Turn the switch to the on position.
2. Unplug the temperature sensor.
3. Hold the button down.
4. Check for an error display (all lights flashing on and off).

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| --- | --- | --- |
| **Was there an error display?** | **Spec** | **Did it pass the test?** |
|  | Yes |  |

**Requirement:** If the sensor has been unplugged and then plugged back in, the third box should begin normal operation without user intervention.

**Test:**

1. Turn the switch to the on position.
2. Hold the button down.
3. Unplug the sensor.
4. Plug the sensor back in.
5. Check that the temperature is still displayed normally after being plugged back in.

|  |  |  |
| --- | --- | --- |
| **Did the box display the temperature plugged back in?** | **Spec** | **Did it pass the test?** |
|  | Yes |  |

**Requirement:** The real time temperature of the temperature sensor should be displayed on the computer screen and be updated every second.

**Test:**

1. Turn the power switch on box 3 on.
2. Open the website (currently on localhost)
3. Look for the temperature displayed on the screen.
4. Click on both the “Celsius” and “Fahrenheit” buttons to check that it changes the format.
5. Move the temperature sensor from holding it in your hand to setting on a table.
6. Record how long it takes for the temperature display to change.

|  |  |  |
| --- | --- | --- |
| **When the Celsius Button was selected, did it display the temperature in Celsius?** | **Spec?** | **Did it pass the test?** |
|  | Yes |  |
| **When the Fahrenheit Button was selected, did it display the temperature in Fahrenheit?** | **Spec?** | **Did it pass the test?** |
|  | Yes |  |
| **How long did it take for the temperature display to update?** | **Spec?** | **Did it pass the test?** |
|  | 1 Sec |  |

**Requirement:** If the temperature sensor is unplugged from the third box, an “unplugged sensor” message should appear on the website instead of the real time temperature.

**Test:**

1. Turn the power switch on box 3 on.
2. Open the website.
3. Look for the temperature displayed on the screen.
4. Unplug the temperature sensor.
5. The display should have changed to a message displaying “Unplugged Sensor”.

|  |  |  |
| --- | --- | --- |
| **What did the display show?** | **Spec?** | **Did it pass the test?** |
|  | “Unplugged sensor” |  |

**Requirement:** If the third box switch is off, a “no data available” message should appear instead of the real time temperature.

**Test:**

1. Turn on the box’s power switch.
2. Open the website.
3. Look for the temperature displayed on the screen.
4. Turn the power switch off.
5. The display should have changed to a message displaying “No data available”.

|  |  |  |
| --- | --- | --- |
| **What did the display show?** | **Spec?** | **Did it pass the test?** |
|  | “No Data Available” |  |

**Requirement:** The user should be able to turn the LCD display on the third box on and off. (Computer can virtually “press the button”.) Response time less than 1 second.

**Test:**

1. Turn on the box’s power switch.
2. Open the website.
3. Run the program.
4. On the computer screen, press the “on” button.
5. LCD display should display the temperature. Record response time.
6. On the computer screen, press the “off” button.
7. LCD display should go blank. Record response time.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **When the “on” button is pressed, what does the LCD display?** | **Spec?** | **Response Time** | **Spec?** | **Did it pass the test?** |
|  | The Temperature |  | 1 sec |  |
| **When the “off” button is pressed, what does the LCD display?** | **Spec?** | **Response Time** | **Spec?** | **Did it pass the test?** |
|  | Blank |  | 1 sec |  |

**Requirement:** A graph of the last 300 seconds of data should be available on the computer screen within 10 seconds of the start of the software program.

**Test:**

1. Turn on the box’s power switch.
2. Open the website.
3. Record time between start of program and when the graph displays the temperature data.

|  |  |  |
| --- | --- | --- |
| **Does the computer screen display a graph of the last 300 seconds?** | **Spec?** | **Did it pass the test?** |
|  | Yes |  |
| **How long did it take for the computer screen to display the graph?** | **Spec?** | **Did it pass the test?** |
|  | <10s |  |

**Requirement:** The graph always displays the temperature in degrees Celsius. The upper bound of the graph corresponds to 50 degrees C and the bottom of the graph corresponds to 10 degrees C.

**Test:**

1. Turn on the box’s power switch.
2. Open the local website.
3. Look at the temperature display in degrees Celsius; compare to the data being displayed on the graph.
4. Find and record the upper bound of the graph.
5. Find and record the lower bound of the graph.

|  |  |  |
| --- | --- | --- |
| **Does the temperature display in Celsius correspond to what is being displayed on the graph?** | **Spec?** | **Did it pas the test?** |
|  | Yes |  |
| **What is the upper bound of the graph?** | **Spec?** | **Did it pas the test?** |
|  | 50 |  |
| **What is the lower bound of the graph?** | **Spec?** | **Did it pas the test?** |
|  | <10 s |  |

**Requirement:** The graph scrolls horizontally: newest values on the right and the oldest values on the left.

**Test:**

1. Turn on the box’s power switch.
2. Open the website.
3. Watch the data show up on the graph.
4. Is the new data coming from the right and old data leaving from the right?

|  |  |  |
| --- | --- | --- |
| **Is the data scrolling from right to left?** | **Spec?** | **Did it pass the test?** |
|  | Yes |  |

**Requirement:** The physical size of the graph should be scalable with the mouse.

**Test:**

1. Open the local website:
2. Using your mouse, click and drag the lower right corner of the graph to rescale.

|  |  |  |
| --- | --- | --- |
| **Was the user able to rescale the graph?** | **Spec?** | **Did it pass the test?** |
|  | Yes |  |

**Requirement:** The tic marks on the horizontal axis of the graph should be marked 300-0 (left to right) and be labeled “Seconds ago from current time”.

**Test:**

1. Open website.
2. Examine graph for horizontal tic marks and label.

|  |  |  |
| --- | --- | --- |
| **What is the range of the tic marks on the horizontal axis?** | **Spec?** | **Did it pass the test?** |
|  | 300-0 |  |
| **What is the label of the horizontal axis?** | **Spec?** | **Did it pass the test?** |
|  | “Seconds ago from current time” |  |

**Requirement:** When data can not be read, the graph should not display anything for the period of time when data is not available, but continue graphing the data when it is available again: with a “hole” on the graph where the missing data should have been.

**Test:**

1. Turn on the box’s power switch.
2. Open the website.
3. Watch the data show up on the graph.
4. Unplug the temperature sensor for 10 seconds and then plug back in.
5. Examine the graph.

|  |  |  |
| --- | --- | --- |
| **Was data displayed for the 10 seconds the temperature sensor was unplugged?** | **Spec?** | **Did it pass the test?** |
|  | No |  |
| **Did the normal real time display continue after the sensor was plugged back in?** | **Spec?** | **Did it pass the test?** |
|  | Yes |  |

**Requirement:** If the computer is on and the third box is off, the graph and real time display of the data should appear within 10 seconds of the third box being turned on.

**Test:**

1. Go to website.
2. Turn the box on.
3. Record the time taken between turning the third box on and the data on the graph being displayed.

|  |  |  |
| --- | --- | --- |
| **How long did it take for the data display to appear?** | **Spec?** | **Did it pass the test?** |
|  | <10 s |  |

**Requirement:** A text message will be sent to a specified phone number whenever the temperature exceeds a certain value or is lower than a certain value. The text messages, the max temp, the min temp and the phone number can all be altered using the computer interface.

**Test:**

1. Turn box on.
2. Go to website.
3. Set the min temperature to “10” and max temperature to “20”.
4. Enter what you wish the test message to say.
5. Enter the phone number that you wish to send the test message to.
6. Put the temperature sensor near the soldering iron to exceed max temp.
7. Put the temperature sensor in ice water go below your min temperature.

|  |  |  |
| --- | --- | --- |
| **Did the phone receive the text message when the temperature was too high?** | **Spec?** | **Did it pass the test?** |
|  |  |  |
| **Did the phone receive the text message when the temperature was too low?** | **Spec?** | **Did it pass the test?** |
|  |  |  |

**Requirement:** When someone holds the temperature sensor in their hand, the heat from their fingers should make the temperature go up after a few seconds. Holding a soldering iron close to or briefly touching the sensor should do the same, even more quickly.

**Test:**

1. Turn box on.
2. Go to website.
3. Record the temperature displayed sitting on the table.
4. Hold the temperature sensor in your hand.
5. After a few seconds, record the temperature.
6. Hold the sensor close to the soldering iron.
7. Record the temperature after a few seconds.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Temperature on the table. (Temp 1)** | **Temperature holding in hand (Temp 2)** | **Temp1-Temp 2: Positive or negative?** | **Spec?** | **Did it pass the test?** |
|  |  |  | Neg. |  |
| **Temperature on the table. (Temp 1)** | **Temperature near soldering iron. (Temp 2)** | **Temp1-Temp 2: Positive or negative?** | **Spec?** | **Did it pass the test?** |
|  |  |  | Neg. |  |

**Requirement:** In the lab, at room temperature, the output of the thermometer should be 22 degrees C, +-4 degrees C.

**Test:**

1. Turn box on.
2. Go to local website.
3. Place the temperature sensor on the table.
4. Record the temperature displayed on the website.

|  |  |  |
| --- | --- | --- |
| **Temperature displayed.** | **Spec?** | **Did it pass the test?** |
|  | 22 degrees +-4 |  |

**Requirement:** When placed in a water-ice mixture, the output of the thermometer should be 0 degrees C, +- 2 degrees C.

**Test:**

1. Turn box on.
2. Go to website.
3. Place the temperature sensor in an ice water mixture.
4. Record the temperature displayed on the website.

|  |  |  |
| --- | --- | --- |
| **Temperature displayed.** | **Spec?** | **Did it pass the test?** |
|  | 0 degrees +-2 |  |