

Team Number: C School & Team Name: _____

Student Names: _____

CHECK-IN

Construction & Competition Parameters:

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|---|---|-------------|---|
| T | F | 3.a. | Device is built using a microcontroller or microcontroller board, a display, LED lights, and a participant-built sensor/probe. The sensor produces a voltage which varies according to the temperature of the water. WiFi/Internet connection is not used at any time during competition. |
| T | F | 3.b. | The sensor is constructed from either an NTC/PTC thermistor or a legal analog output temperature device. The sensor is not constructed using preassembled sensors/probes that are already in a waterproof housing. The sensor and wires/cables, together, are ≥ 30.0 cm in length, small enough to fit through an opening of 5.0 cm, and the end is immersible up to 15.0 cm in water. |
| T | F | 3.e. | The Device has a digital readout that clearly displays the temperature in degrees Celsius and the potential in Volts. Team does not use a laptop on the written exam. |
| T | F | 3.f. | The Device is able to indicate the specific temperature zone using three separate LEDs—one red, one green, and one blue. If RGB LEDs are used, they are wired for only one color. |
| T | F | 3.g. | Teams do not use electrical outlets at any time during the competition. If the Device is not powered by a connected laptop or calculator, the Device is powered by commercially available batteries. Multiple batteries (connected in series or parallel) have expected voltage output across any two points ≤ 12 V. |
| T | F | 3.h. | Device is clearly labeled with the team's name and team number. |
| T | F | 5.Part I.a. | Once participants enter the event area, they do not leave or receive outside assistance, materials, or communication. |

1. T F DEVICE MEETS ALL CONSTRUCTION & COMPETITION PARAMETERS ABOVE

DESIGN LOG (MAX 4 POINTS EACH)

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| <u> 2. </u> | 4.b.i. | A top-down photograph of the Device with labels identifying all the components and detailing their functions. This section should also include a brief summary explaining how the Device was constructed and the Sensor waterproofed. |
| <u> 3. </u> | 4.b.ii. | A data table with at least 10 trials showing the sensor voltage reading versus the corresponding temperature values in $^{\circ}\text{C}$. |
| <u> 4. </u> | 4.b.iii. | Scatter-plot graph of this data with temperature on the Y-axis and voltage on the X-axis. |
| <u> 5. </u> | 4.b.iv. | Function graph of mathematical model supported by the data overlaid on a scatter-plot of the data. |
| <u> 6. </u> | 4.b.v. | Equation of the above mathematical model used to convert measured voltage to the corresponding temperatures in $^{\circ}\text{C}$ highlighted for easy identification |
| <u> 7. </u> | 4.b.vi. | Printout of program with code highlighted showing this exact mathematical equation (or its code implementation) converting voltage to temperature $^{\circ}\text{C}$. The code implementation may be multi-step (with intermediate variables). Code in libraries, if any, need not be printed except for those containing all/part of the temperature calculation equation. |
| <u> 8. </u> | 4.b.vii. | Program with the code highlighted that will illuminate the appropriate LED(s) according to their assigned temperature ranges. |

STATION 1 STATION 2 STATION 3 STATION 4 ← DEVICE TESTING (2 MINUTES PER STATION)

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|-------------------------------|-------------------------------|---|-------------------------------|---|
| <u> 9. </u> | <u> 12. </u> | <u> 15. </u> | <u> 18. </u> | Temperature displayed by Device reported by team (in $^{\circ}\text{C}$, to the nearest 0.1°C) |
| <u> 10. </u> | <u> 13. </u> | <u> 16. </u> | <u> 19. </u> | Stable temperature displayed by Calibration Thermometer (in $^{\circ}\text{C}$, to the nearest 0.1°C) |
| <u> 11. </u> T <u> </u> F | <u> 14. </u> T <u> </u> F | <u> 17. </u> T <u> </u> F | <u> 20. </u> T <u> </u> F | Team has correct LED color |
| <u> 21. </u> | 6.b.i. | Absolute Error Multiplier (Regional = 2, State = 3, National = 4) | | |

WRITTEN TEST

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| <u> 22. </u> | 6.b.iv. | Written Test (maximum 30 points) |
| <u> 33. </u> T <u> </u> F | General Rule: The team is disqualified. (Notify the team and their coach as soon as possible.) | |