

## Mad Scientist Mug Monitor Notes

### Parts List

- Arduino Nano
- LM35DZ temperature sensor
- 10 k $\Omega$  linear potentiometer
- 50 k $\Omega$  log potentiometer (I used a 220 k $\Omega$  dual potentiometer with the two potentiometers paralleled, as it's what I had in stock).
- LED (I used a 5 mm LED with inbuilt flasher IC and 5V input voltage, a standard LED and series resistor could be used)
- 128 x 32 pixel I2C OLED display
- 5 V magnetic buzzer
- 9 V PP3 battery drawer
- DPST slide switch
- Case, hardware, Velcro strap, wire etc.

### Wiring

- Reset switch (momentary pushbutton) between RESET and ground.
- LM35DZ temperature sensor (10 mV output per °C on centre pin) to input A0, power pin to +5 V, 0 V pin to ground.
- Setpoint potentiometer (10 k $\Omega$  linear) track wired between AREF and ground. Wiper wired to input A1. When wiper grounded, setpoint is lowest. When wiper connected to AREF setpoint is highest.
- Volume potentiometer (50 k $\Omega$  log) track wired between AREF and ground. Wiper wired to input A0. When wiper grounded, volume is lowest. When wiper connected to AREF volume is highest.
- Connect AREF and 3.3 V pins (NB: in this configuration it is essential that the command `analogReference(EXTERNAL)`; is issued before any `analogRead` commands, or the 3.3 V and 5 V lines will be connected by the Arduino's circuitry!)
- LED indicating alarm connected between digital output 12 and ground.
- Alarm buzzer connected between digital output D11 and ground.
- 64 x 32 pixel I2C OLED display wired to pin A4 (SDA), A5 (SCL), +5 V and ground.
- Battery box and on-off switch connected between VIN and ground.

### Instructions

- Wire the Arduino Nano and components as described above.
- Turn both potentiometers fully anticlockwise
- Either install a PP3 battery and switch the power switch on, or connect a USB power source.
- Strap the temperature sensor to a mug containing hot water with the Velcro strap.
- The display should indicate the current temperature of the drink ("Now °C") and the selected "Setpoint °C" (about 20°C).
- Turn the setpoint knob up so it is slightly lower than the current temperature.
- When the temperature falls below the setpoint, the LED and buzzer will turn on. The buzzer stops after 30 s.
- If the setpoint is reduced by at least 5°C and is also lower than the current temperature, the alarm is reset. Alternatively, press the reset button to reset the alarm.

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