This will be a quick and dirty implementation of a TC and DS1820 interface for the roaster using an Arduino. It will also use the ZC and trigger the Triacs for the heater and the fan.

# Temperature measurements

Works well now, got the DS 1820 and the MCP3424 to provide good temperature measurements. Use the TypeK.h version of the conversion lib and found out that there are no pointers (in contrast to thermocouple.h). Now it works. DS1820 is a small library with no chitchat.

A diagram of a device

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# Triac

We will try the TriacDimmer lib for the AVR

<https://github.com/AJMansfield/TriacDimmer/blob/master/src/TriacDimmer.cpp>

| \_BV(ICES1) //positive edge 🡪 needs to be taken out as our ZC gives a neg pulse

I then built a little ZC emulation using Timer2 that produces exactly the ZC signal we get from the circuit.

![A device with a screen showing a graph

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The connector seems to be connected like this (no really the unconnected pin is connected to D12), ground is correct, fan to d13 mit R150, heat to d14 mit R150, ZC to D35 (4K7 pullup). The wire to D12 is new, not sure what it does ???; HEAT and FAN are EXCHANGED!!

A diagram of a circuit

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Anyway the ZC signal looks good:

A screenshot of a computer screen

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For 5V a 10K pullup seems ok.

The TRIAC resistors should be higher. IF for the LED should be between ~20mA, using pulses > 100us no correction is needed (we use 200us)

Rled = (5-1.2)/.020 = 190 make it 220 (gets us 17mA). Now we also have to think how to adapt the TriacDimmer library to emulate what we did before:

#define ZC\_LEAD 500 // zero cross signal is about 1000us and leads the actual crossing by approx 500us

#define TRIAC\_PULSE\_WIDTH 2000 // reasonable, but fan might require more

I think these were us, the scope showed that the ZC signal is actually more like 1200us long, but let’s see. OK so here is how we did it on the ESP32: From the ZC falling edge start a period of ZC\_LEAD (500us) + a value from a lookup table ()

OK now testing: using a pulse width of 400 (about 200us) we can start with 25% (fan moves slowly, less does not work) up to 65% more does not work (fan chokes). I guess I took the TC4 lookup table (they use a prescaler of 8 -> each tick = 0.5us)

Uuuhlala I just saw: only the FAN is done by a dimmer like algo, the heater is done using ICC (Bresenham) within the ZC ISR. We might be able to do the same.

OK, fixed it we have now incorporated an ICC type algo into the input capture ISR. This will now output on pin PD7

Sketch for drawing …

A close-up of a circuit board

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Final circuit

A drawing of a circuit board

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