GE Electric Oven

Oven Dissection

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ME345 Section 2

I decided to disassemble the electric oven in my apartment to learn how it measured and maintained a constant temperature. My initial guess was that it was a type of analog temperature measurement, as opposed to digital measurement, due to the way the temperature knob feels when turned (Figure 1). When turned, the knob moved outward as the knob increased in temperature. Before disassembling, I first turned off the power at the breaker box and then unplugged the oven from the wall. I then removed the knob to see whether there was anything to indicate an analog version of temperature measurement. Upon removing the knob, there was a way to calibrate the oven's temperature by loosening and adjusting the fitting to which the knob attaches (Figure 2). I next turned my attention to inside the oven. I found a rod running along the back wall with a crimped end that mimicked the end of the thermistors shown in class (Figure 3). I now suspected I would encounter a system that measured output voltage upon dissembling the oven.

I pulled the oven from the wall and removed the screws holding a sheet of steel to the back of the oven. I immediately noticed that the wire coming from the rod I saw in the oven was simply a single copper wire coming from the oven compartment (Figure 4). This told me that this was not a thermistor or thermocouple system because of the single copper wire. I now concluded that the copper wire was used to carry the temperature from inside the oven up to the instrument panel instead of being used to carry electricity. The copper wire went into a box, which I name the "Temperature Box" in Figure 4. I next disassembled the "Temperature Box". Figures 5 and 6 show the two halves of the "Temperature Box". Figure 5 shows that the copper wire is attached to a metal rod. Figure 6 shows that the metal rod touches a raised contact on a spring loaded mechanism. When the oven is off, the metal rod presses against the spring loaded bar from Figure 6. Upon turning the knob to a higher temperature from Figure 1, the metal rod moves outward. This decompresses the spring loaded bar. It is now clear how the oven measures temperature.

When the oven is turned on, the metal rod from Figure 5 breaks contact with the spring loaded bar from Figure 6 and this tells the oven to begin heating. As the oven heats, the copper wire inside the oven transfers heat to the metal rod in Figure 5 and causes it to expand. Once the rod expands to the desired temperature (assuming it is calibrated correctly), it makes contact with the spring loaded bar again from Figure 6 and turns the oven off. The main advantage to this method is that it is an analog system so there is constant feedback to measure the temperature. The main disadvantage is the copper wire will dissipate some of its heat as it travels to the "Temperature Box", thus making the oven hotter than is desired. Therefore, using the calibration methods provided in Figure 2 make for a very good way to calibrate the oven to heat to the correct temperature.

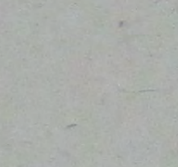
As digital display ovens are being phased in, they most likely are using a thermocouple or thermistor to measure temperature digitally. Figure 7 was obtained from the internet showing the back of a digital display oven. The two small wires leaving the oven compartment are indicative of a

thermocouple or thermistor being used. This method of temperature measurement would be more accurate and less likely to overheat since the oven temperature is being read as a voltage instead of carrying the temperature via copper wire to the instrument panel. This would prevent the oven from overheating as is possible with the analog control method. In my State College apartment, I use an analog style oven but back home we have a digital oven. I have noticed that I burn things more often here with the analog oven and rarely ever burn anything back home with the digital oven. I can now conclude that it is the digital oven being less likely to overheat that is the cause of it burning food less often.

Figure 1

OVEN TEMP

OVEN
CYCLE



MAKE HOTTER

MAKE COOLER

+20 0° -20

164D2730

TO ADJUST OVEN TEMPERATURE LOOSEN SCREWS AND ROTATE

APPROX 10° PER NOTCH

Figure 2

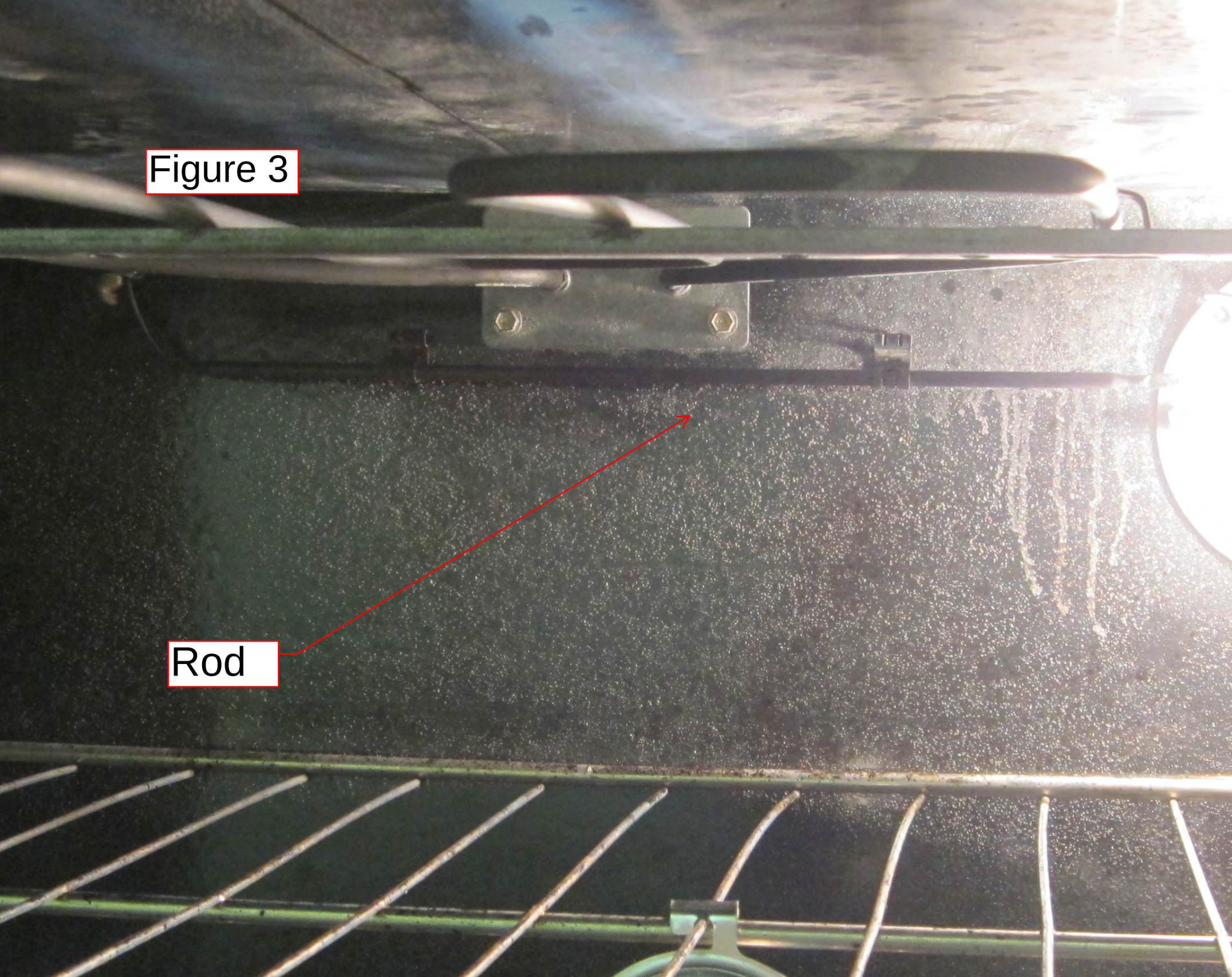


Figure 3
Rod

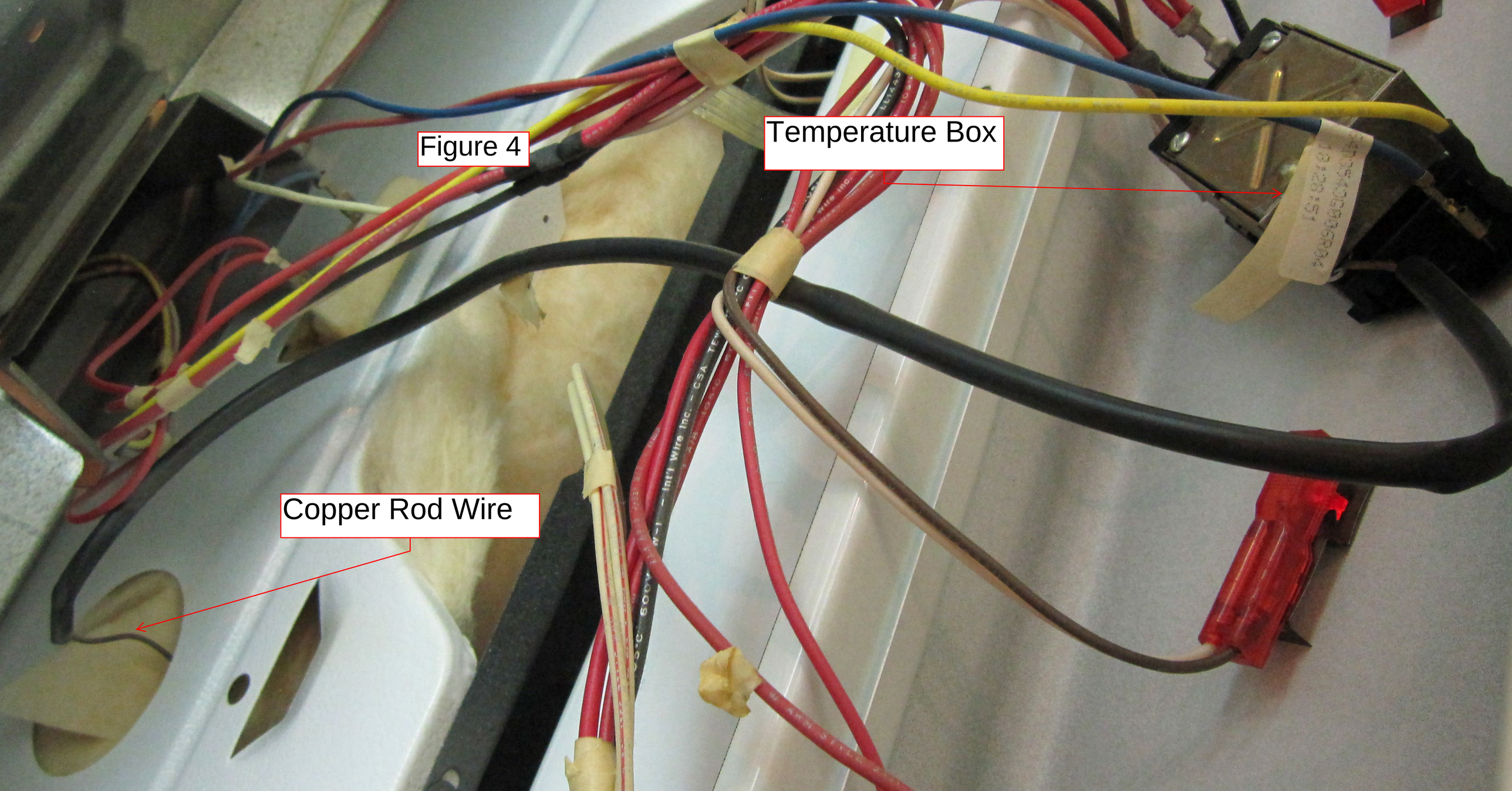


Figure 4
Temperature Box
Copper Rod Wire

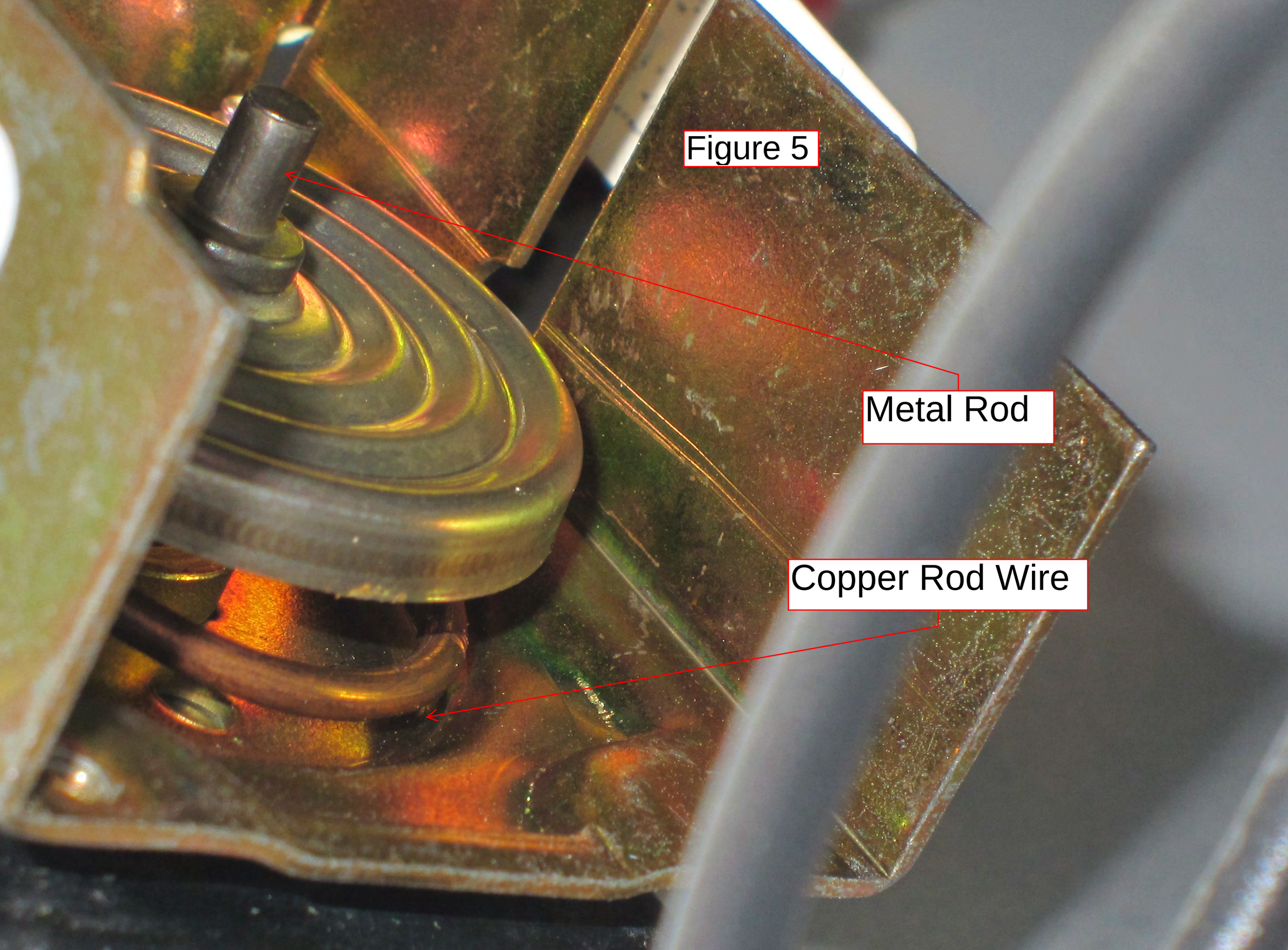
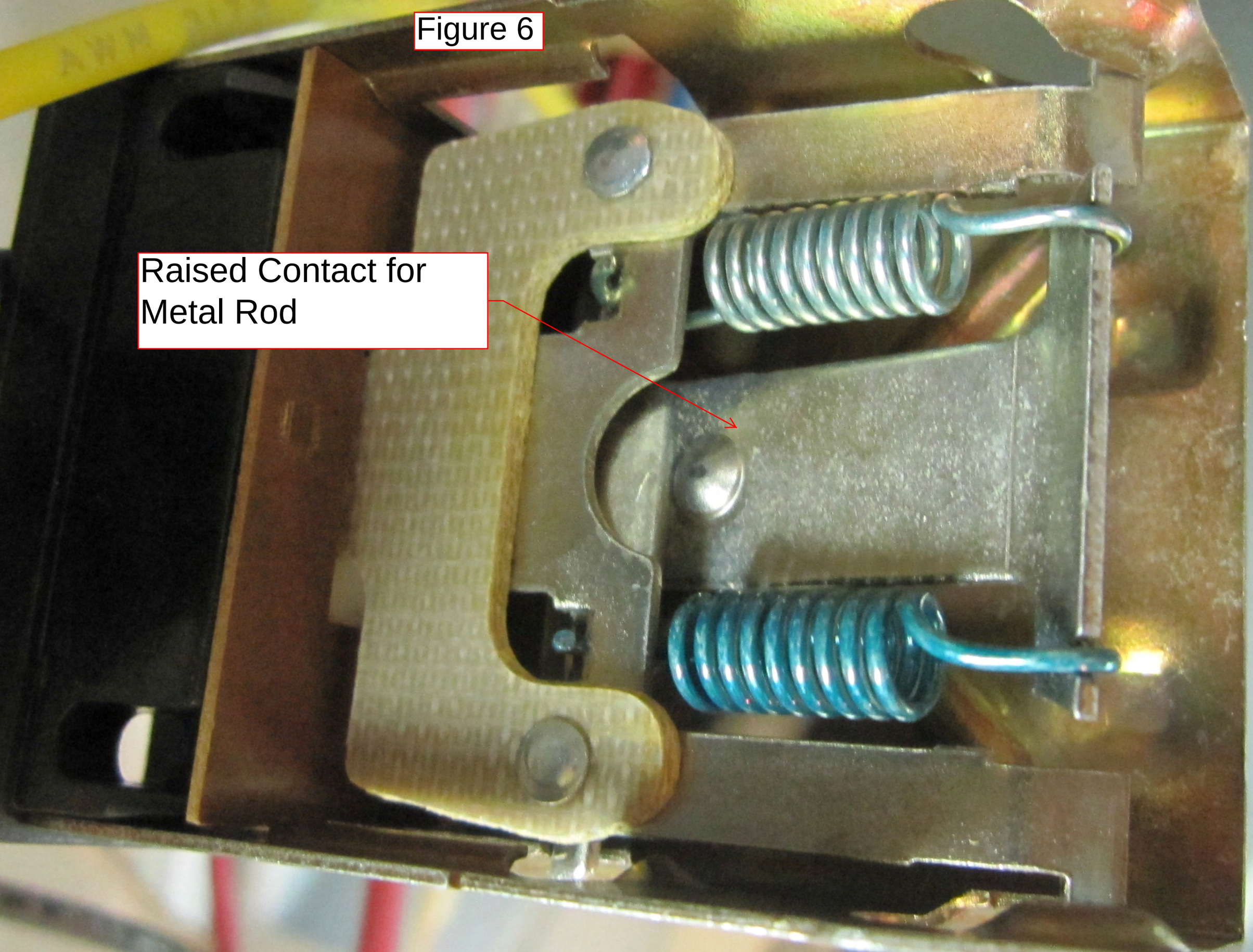


Figure 5
Metal Rod
Copper Rod Wire

Figure 6



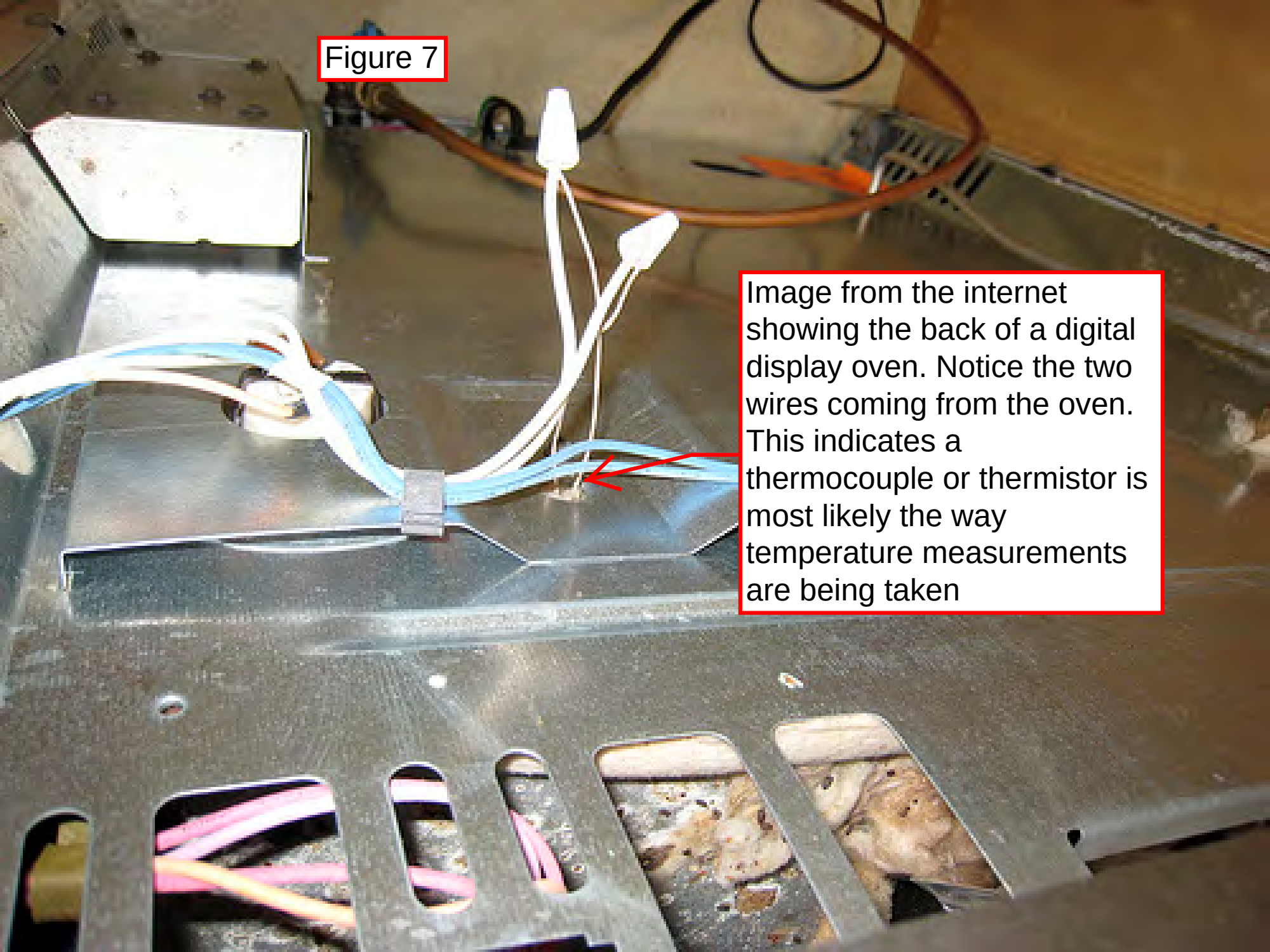


Figure 7
Image from the internet showing the back of a digital display oven. Notice the two wires coming from the oven. This indicates a thermocouple or thermistor is most likely the way temperature measurements are being taken