Time : 19:15

Topic Soldering

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Resistors

R_1 - orange orange red gold

R_2 - blue silver black gold

R_3 - red red brown gold

Identifying Values

						(Ω)
R_1 -	3	3	00	±	5%	3300 ± 5%
R_2 -	6	8		±	5%	68 ± 5%
R_3 -	2	2	0	±	5%	220 ± 5%

	200	2k	20k	200k	2M (Ω)
R_1	OL	.OL	3.25	03.2	.OL
R_2	67.8	0.067	0.06	00.0	0.000
R_3	OL.	0.215	0.21	0.2	0.000

The best values are the ones with the highest precision

Specifying best measurement

	Identified values (Ω)
R_1 - $3.25 \times 10^3\ \Omega = 3250\Omega$	3300 ± 165
R_2 - $67.8\ \Omega = 67.8\Omega$	68 ± 3.4
R_3 - $0.215 \times 10^3\ \Omega = 215\Omega$	220 ± 11

R_1 $3250 = 3300 - 50$ $50 < 165$

R_2 $67.8 = 68 - 0.2$ $0.2 < 3.4$

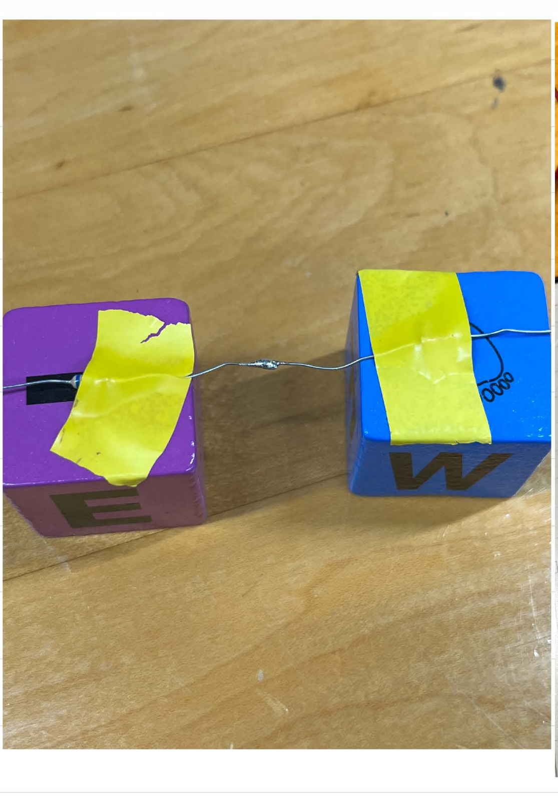
R_3 $215 = 220 - 5$ $5 < 11$

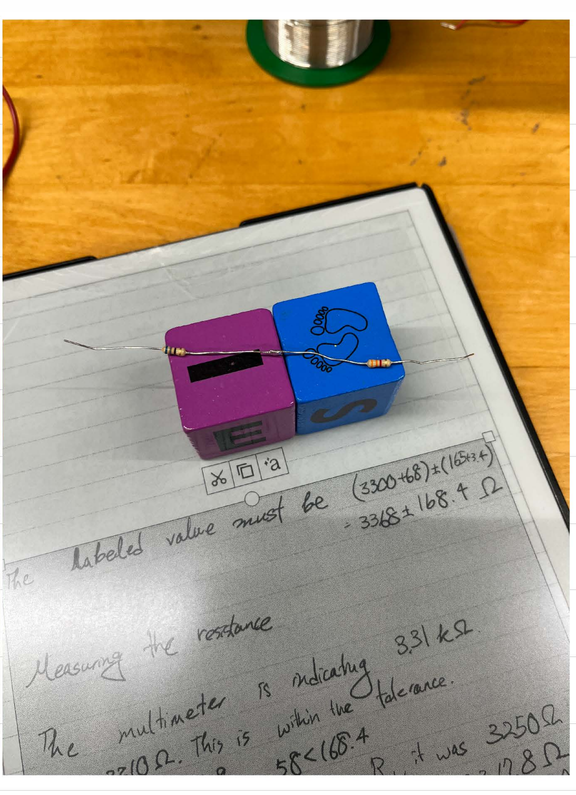
∴ The measurements are within the labeled value.

Difference between uncertainty and tolerance

Tolerance is a property of the resistor itself intrinsically. It defines the range of variation from the labeled value.
Uncertainty on the other hand, is a property of the measurement process, defining the precision in the measured value.
The tolerance is about the resister's manufacturing limits, while uncertainty is about the accuracy of measuring the value.

I soldered R_1 and R_2 together.

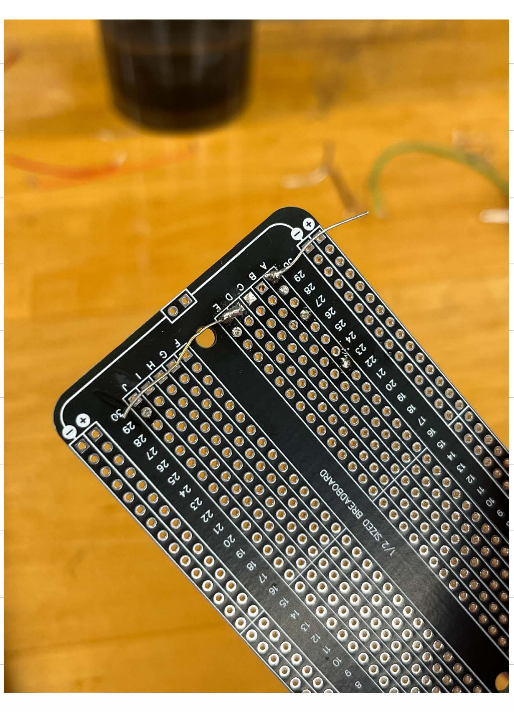




The labeled value must be $(3300+68) \pm (165+3.4)$
$= 3368 \pm 168.4\ \Omega$

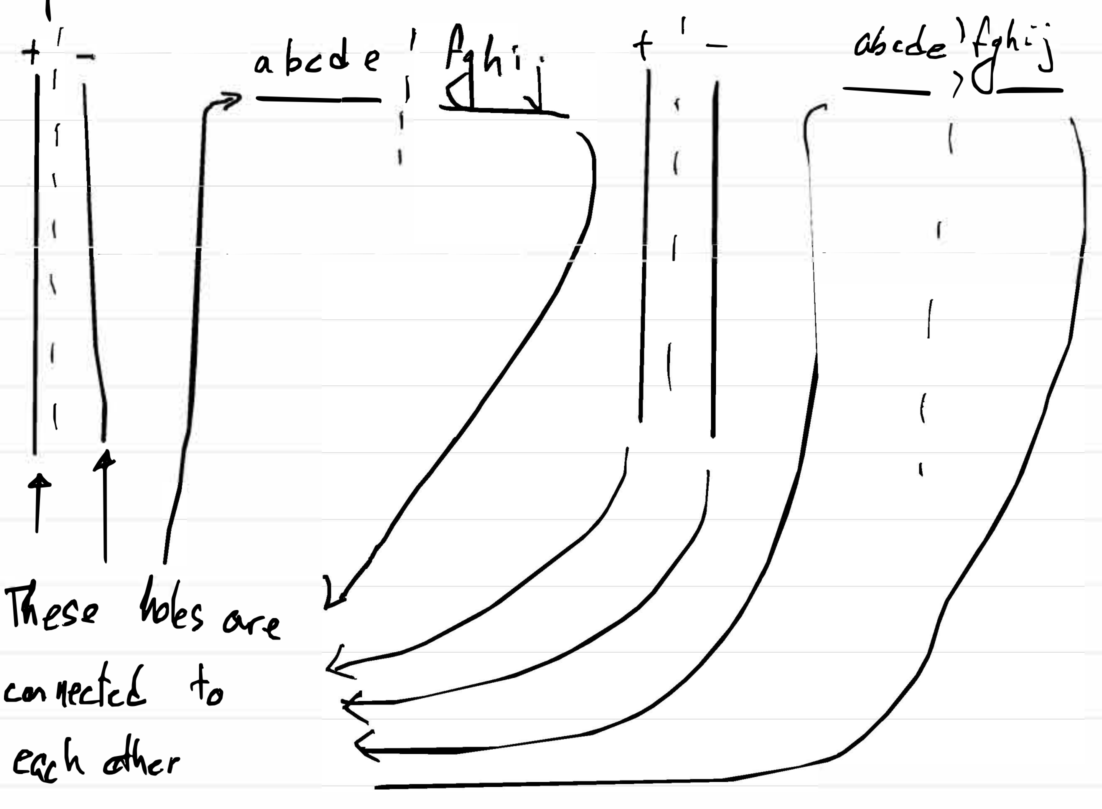
Measuring the resistance

The multimeter is indicating 3.31 kΩ.
This is 3310 Ω. This is within the tolerance.
$3368 - 3310 = 58$, $58 < 168.4$
Also, when I first measured R_1, it was 3250Ω and R_2 was 67.8Ω. $3250 + 67.8 = 3317.8\ \Omega$. This aligns with the $R_1 + R_2$ that I soldered. Therefore, the value is consistent with its expectations

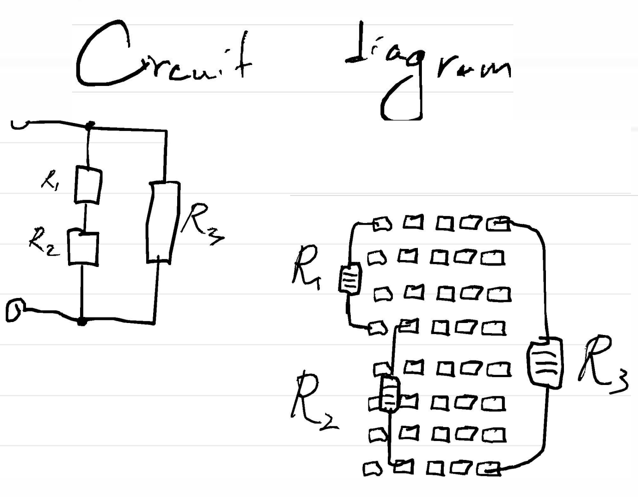


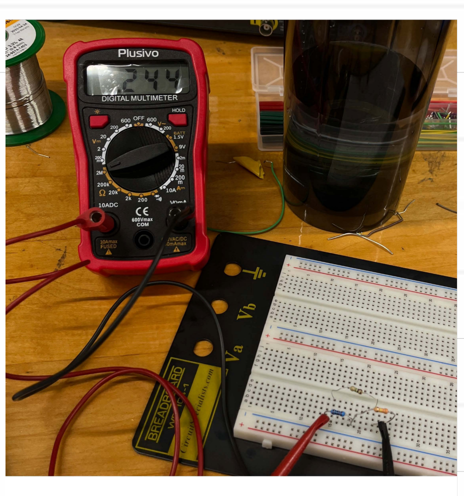
I believe that I put too much solder on each joint, because there is a big blob on each side. Next time, I will be careful on the quantity.

Bread board



Circuit diagram





I have renewed my R_1, R_2, and R_3

R_1: $0.990 \times 10^3\ \Omega$

R_2: $0.326 \times 10^6\ \Omega$

R_3: $0.960 \times 10^6\ \Omega$

Total resistance measured: $0.244 \times 10^6\ \Omega$

Now let me do the math

$$\frac{1}{R_{total}} = \left\{\left(\frac{1}{R_1 + R_2}\right) + \frac{1}{R_3}\right\}$$

$$\frac{1}{R_{tot}} = \frac{1}{990 + 243000} + \frac{1}{244000}$$

$$\frac{1}{R_{tot}} = 4.09986 \times 10^{-6}$$

$$R_{tot} = 243910\ \Omega = 0.244 \times 10^6\ \Omega$$

Since the resolution of the bread board isn't ideal, I can't really tell the resistance of the bread board. If I had 3 resisters of resistance lower than 100 Ω each, I would have confirmed whether the breadboard has resistance or not. I assume that the bread board has a resistance but is negligible, since all materials have at least some kind of resistance in room temperature, yet it didn't seem to affect my total resistance too much, which is my conclusion. The breadboard has a very small resistance.