

Electronics & RF technology hands- on training

The training was done at the University
Centre

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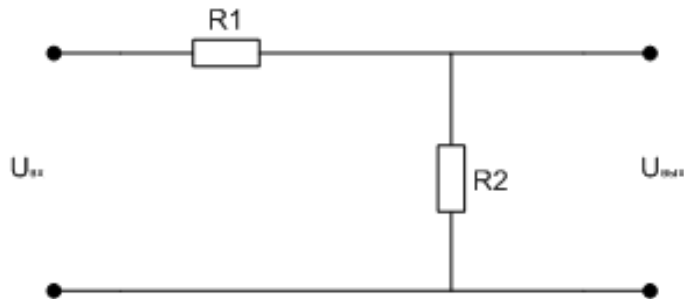
Voltage divider

- In assembling the scheme, voltage divider was assemble first, Voltage divider is also known as Potential divider, is a passive linear circuit that produces an output voltage V_{out} , that is a fraction of its input voltage V_{in} .
- This is the formular to calculate voltage divider:

$$R_{total} = R_1 + R_2, \text{ then } U_{out} = U_{in} R_2 / R_{total}$$

U_{out} – voltage output from divider

U_{in} – voltage input from divider



STEP MOTOR CONTROL UNIT

Step motor control unit is a device used to control step motor.

Step motor can move magnetic field sensor to control magnetic field.

STEP MOTOR CONTROL UNIT

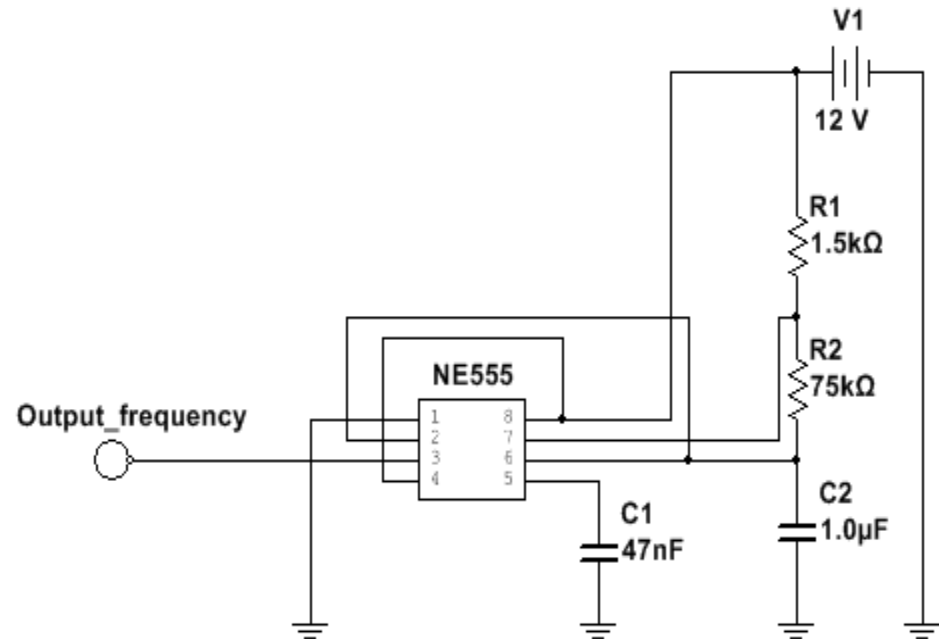
Components needed in the scheme are:

- PCB Board - 1
- Resistor -17
- Polar capacitor – 3
- Uni polar capacitor – 1
- Light diode power Indicator(Yellow) – 2
- Light diode Pulses Indicator(Red) – 4
- Transistor KT315A -4
- Counter K155IE7-1
- Timer NE555 -1
- Logical micro scheme K131LA3 -2
- Conductors

- This device have up to 5 different scheme, that makes up the complete step motor control unit;
 1. Generator
 2. Frequency divider (counter K155IE7 chip)
 3. Logical part
 4. Amplification stages (transistor switches)
 5. Other elements

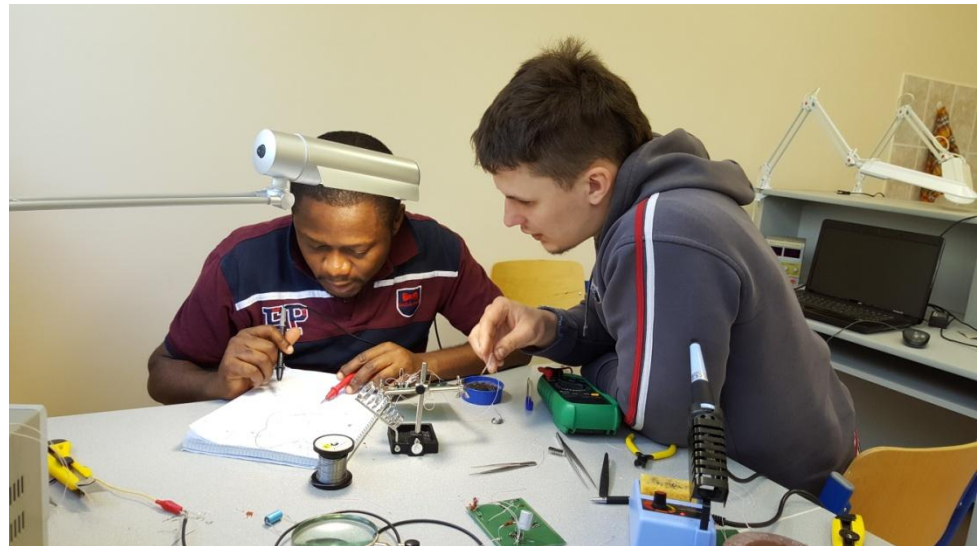
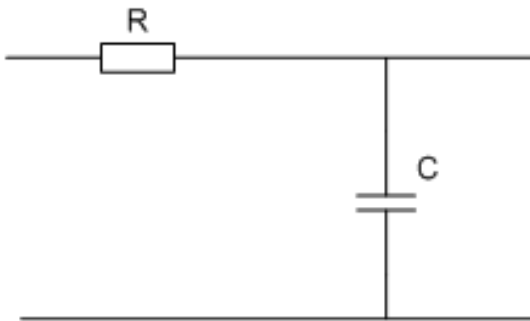
1. Generator

- a. Purpose: scheme automation, to avoid usage of the external generator. Output — meander. Frequency is set by calculation of the RC-circuit parameters.
- b. RC-circuit. Charges and discharges continuously.
- c. Second resistor is needed for scheme protection from the short circuit. It influences signal duration.
- d. Timer. Converts saw tooth signal of the RC-circuit to the meander.



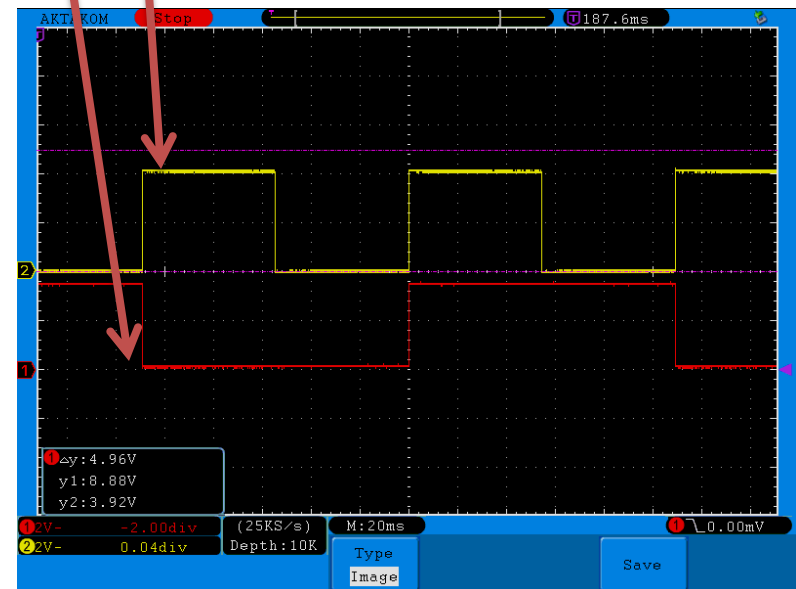
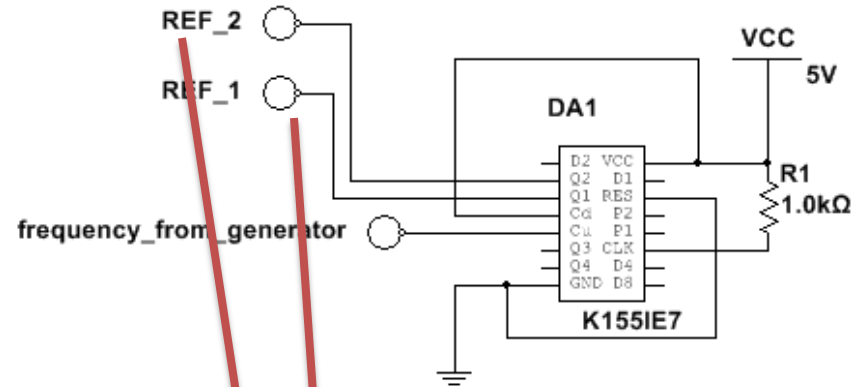
1. Generator b. RC-circuit

- I also have RC circuit, where I used this formular $\tau = R \cdot C$ to calculate for Time charge by the capacitance on 63%.
- I assemble High Pass Filter, is used to calculate the resistance of capacitance of some frequency.
- $R_t = X_c + R$ where X_c - is the resistance of capacitance of frequency.
- $U_{out}/U_{in} = 0.7 = R/R_t$.



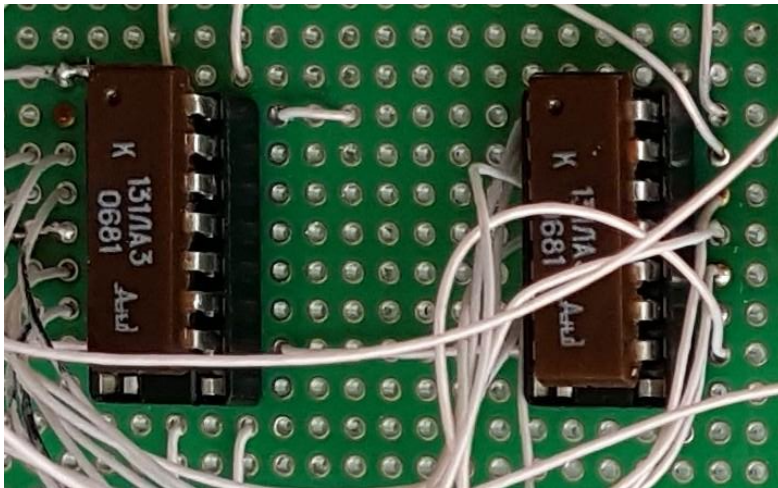
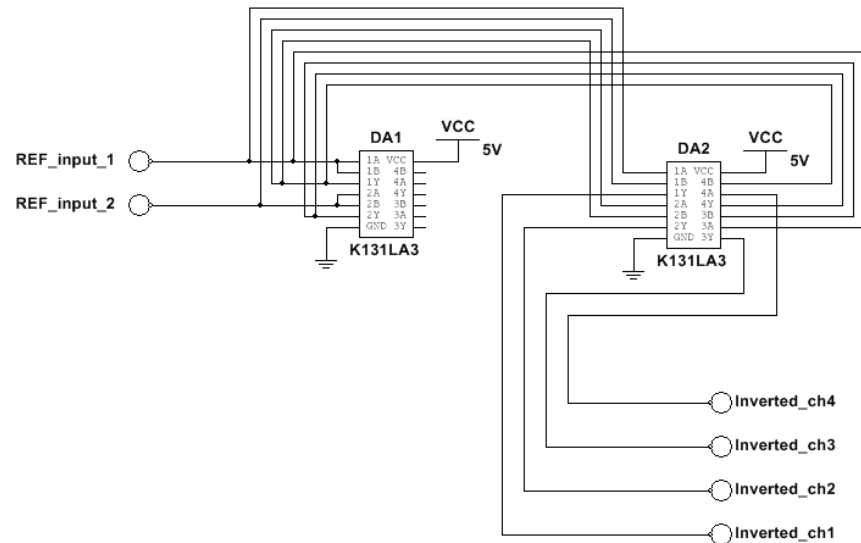
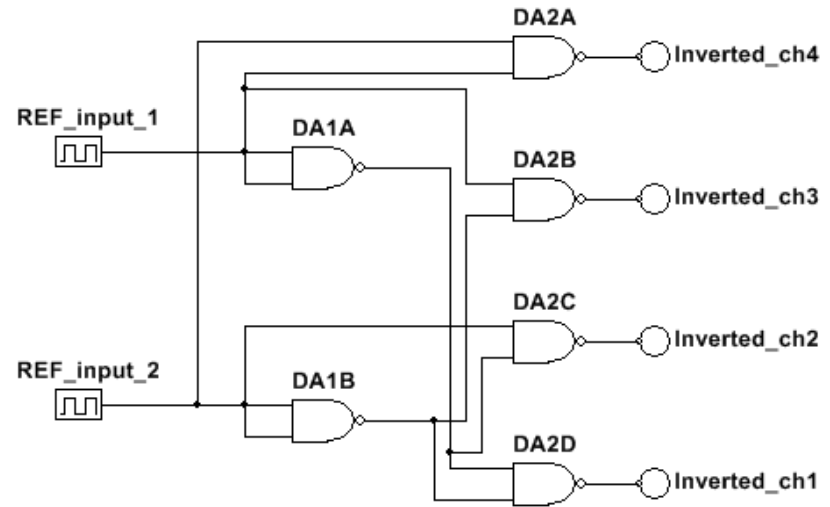
2. Frequency divider (counter K155IE7 chip)

- Forms four signals (generator signals divided by 2, 4, 8 and 16). We need two of them — by 2 and 4.
- Also converts input signal to TTL signal.
- Depending on timing and truth table the counter connection circuit was chosen (for the count mode).



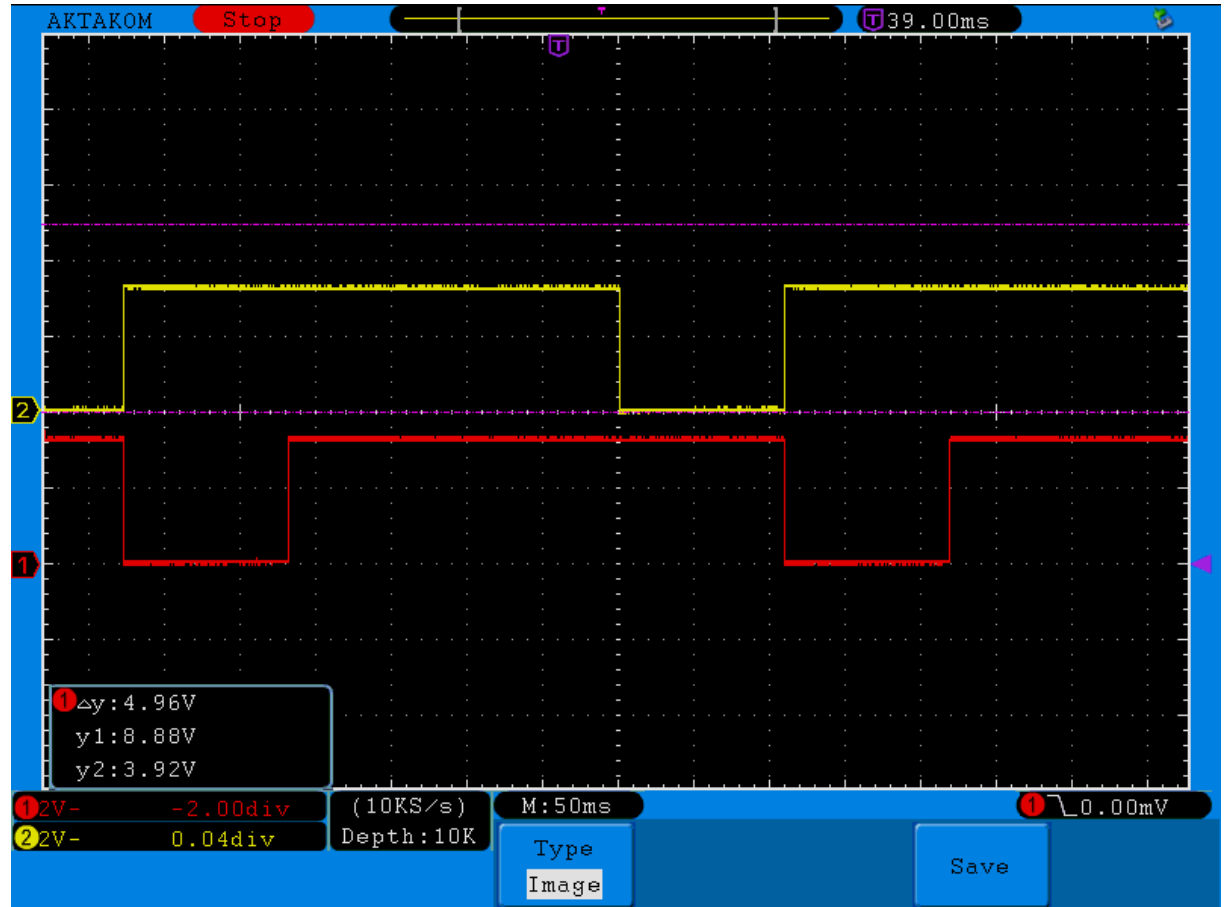
3. Logical part

- a. Forms four independent pulses shifted by a period quarter each. Such timing is needed for the step motor work.
- b. Based on 2 logical microschemes K131LA3
- c. K131LA3 consist of 4 logical elements (&+NOR)



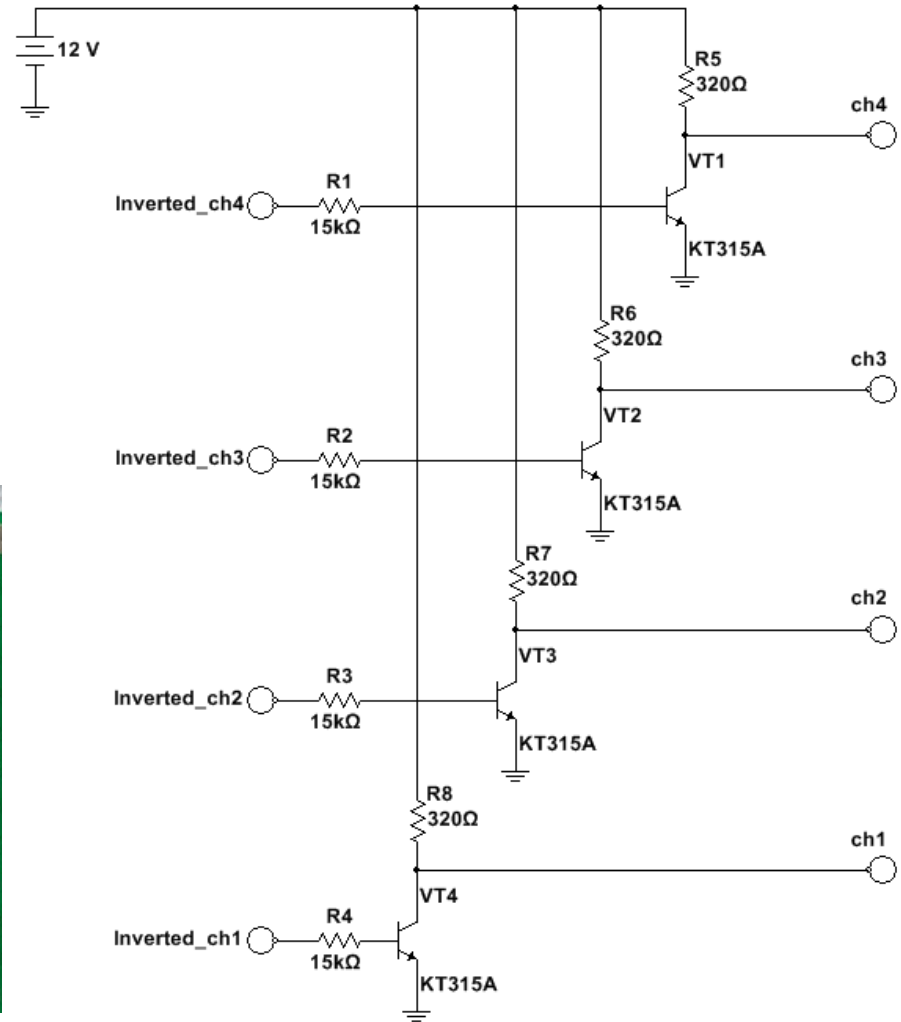
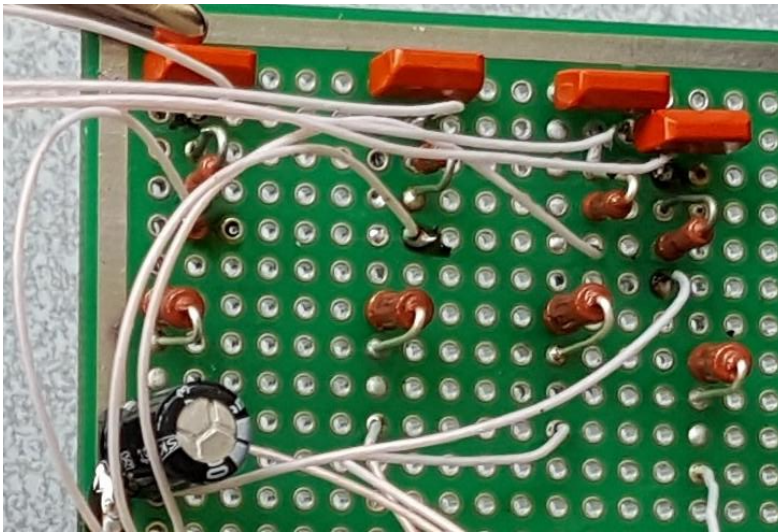
3. Logical part

Example of two independent pulses shifted by a period quarter each.



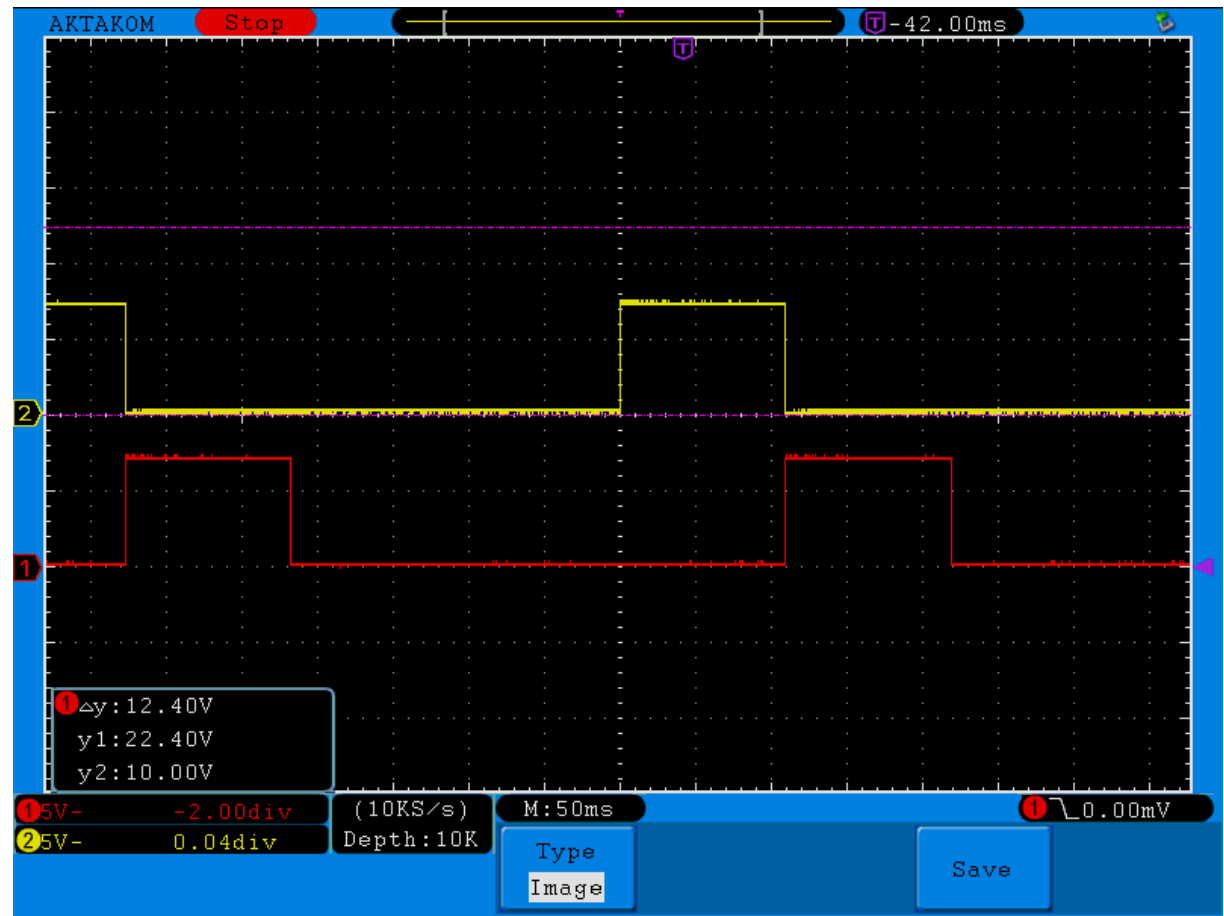
4. Amplification stages (transistor switches)

- a. Amplify to 12 V and invert output signals of the logical part.
- b. 4 transistor switches were assembled.



4. Amplification stages (transistor switches)

Example of two
output signals
after transistor
switches.

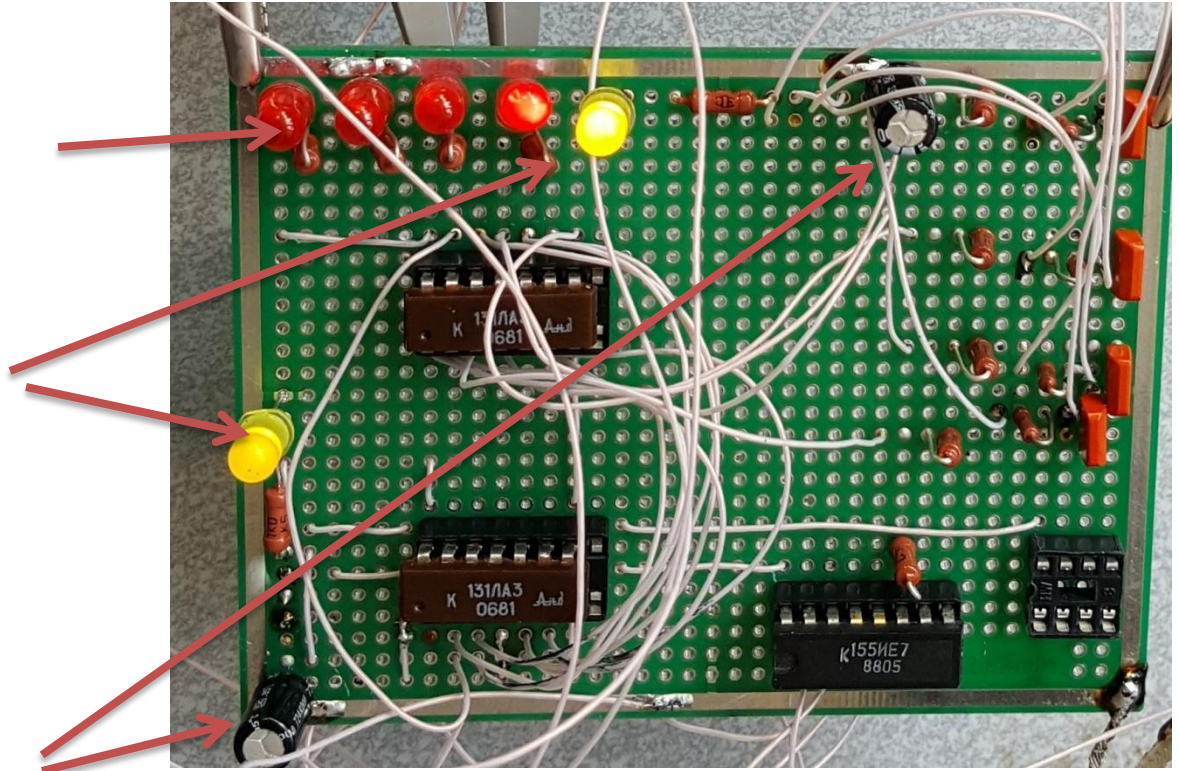


5. Other elements

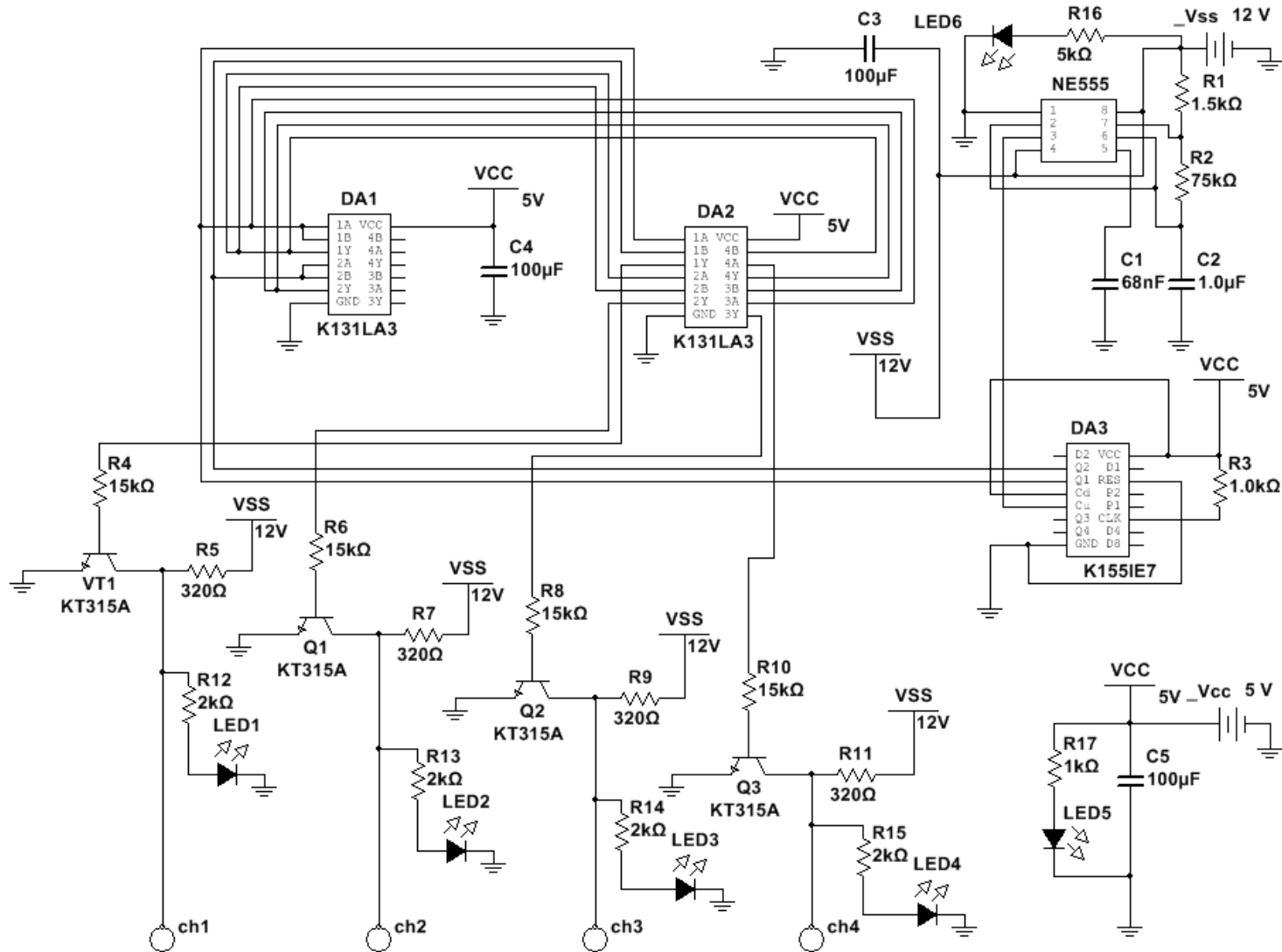
a. Indication:

- Red diodes—visualization of the signals in the circuit 4 channels
- Yellow diodes—supply (one for 5 V, logic supply, and one for 12 V, step motor supply).

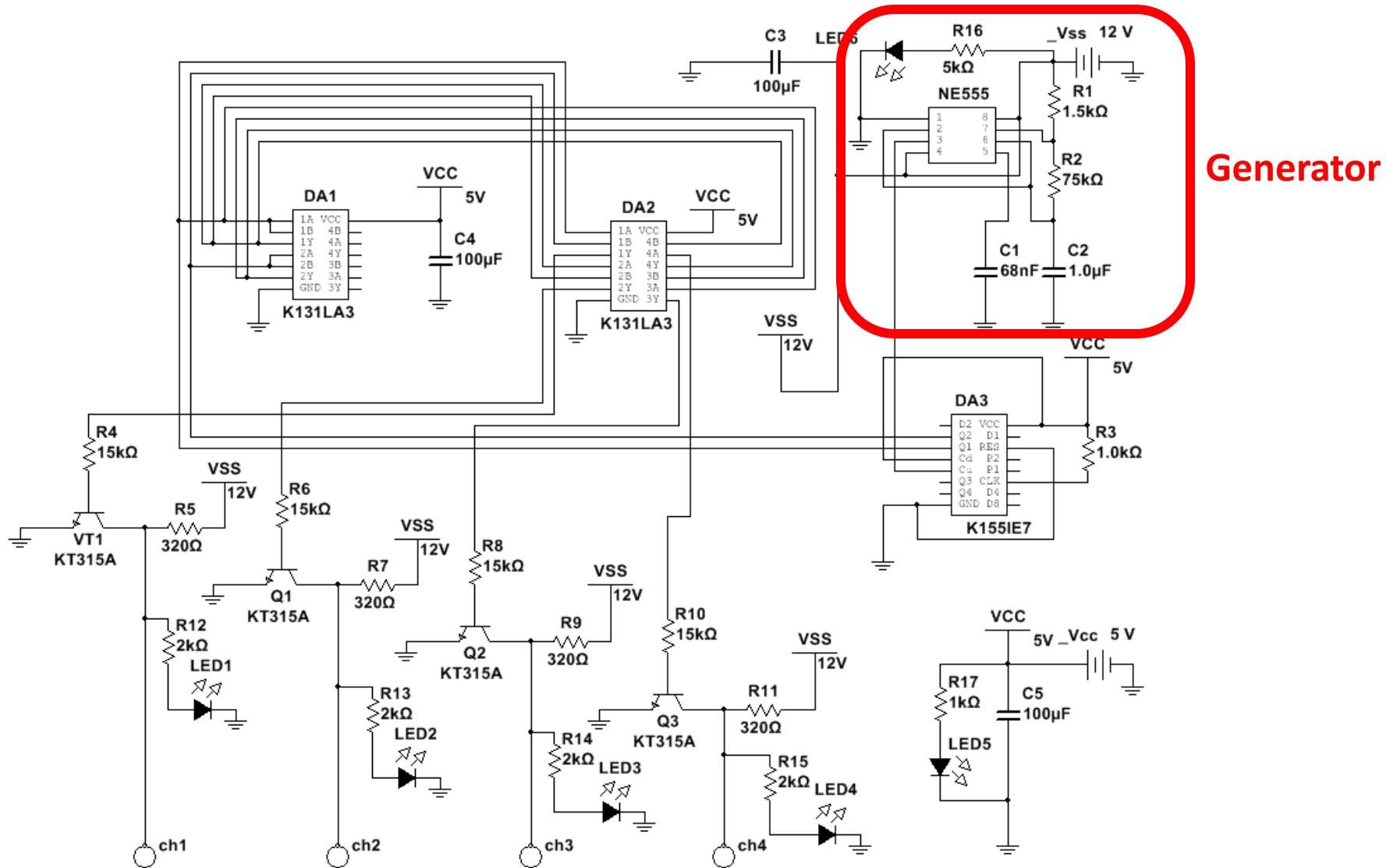
- ## b. Single-element LPF (capacitors) for smoothing the power supply pulsations.



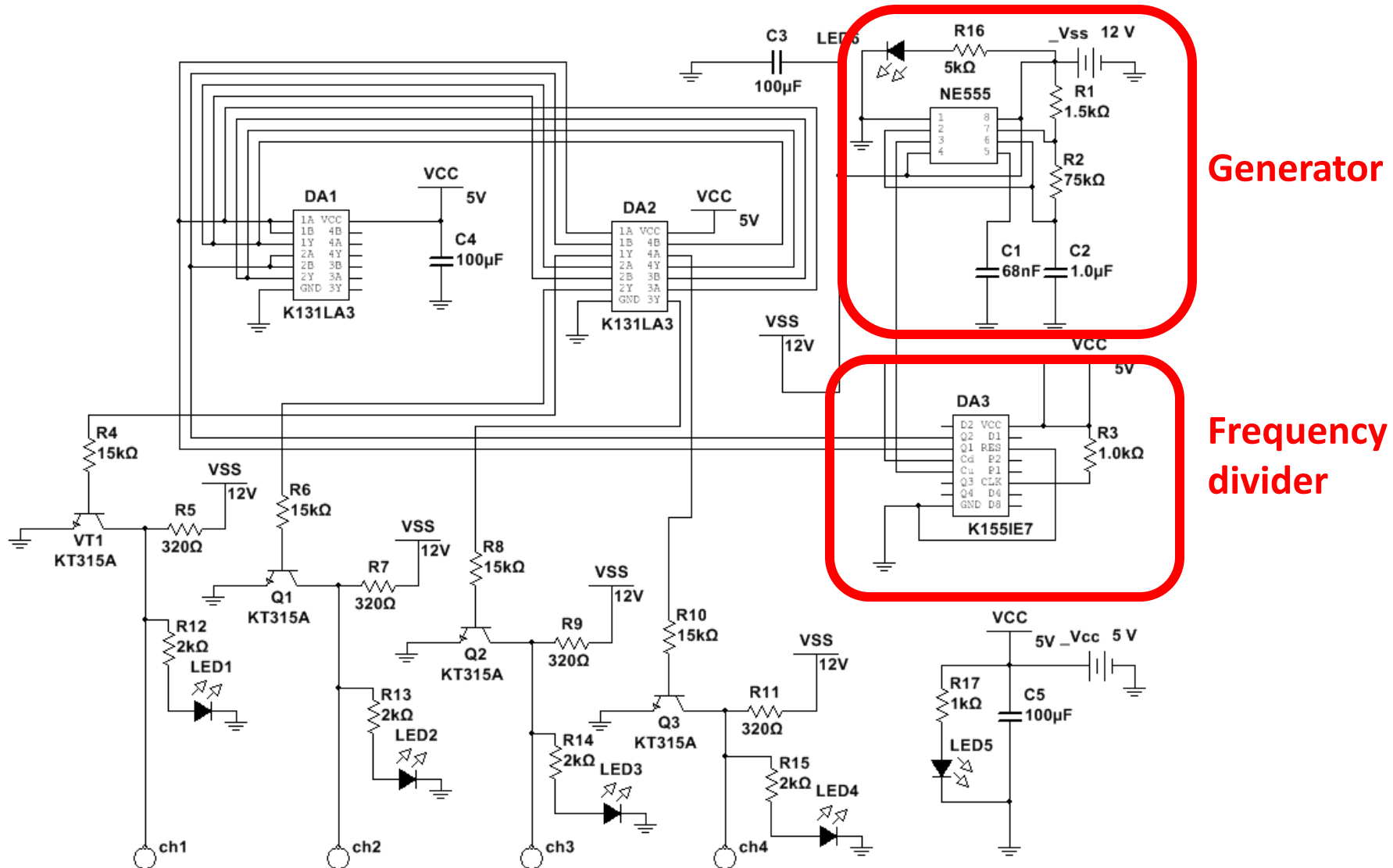
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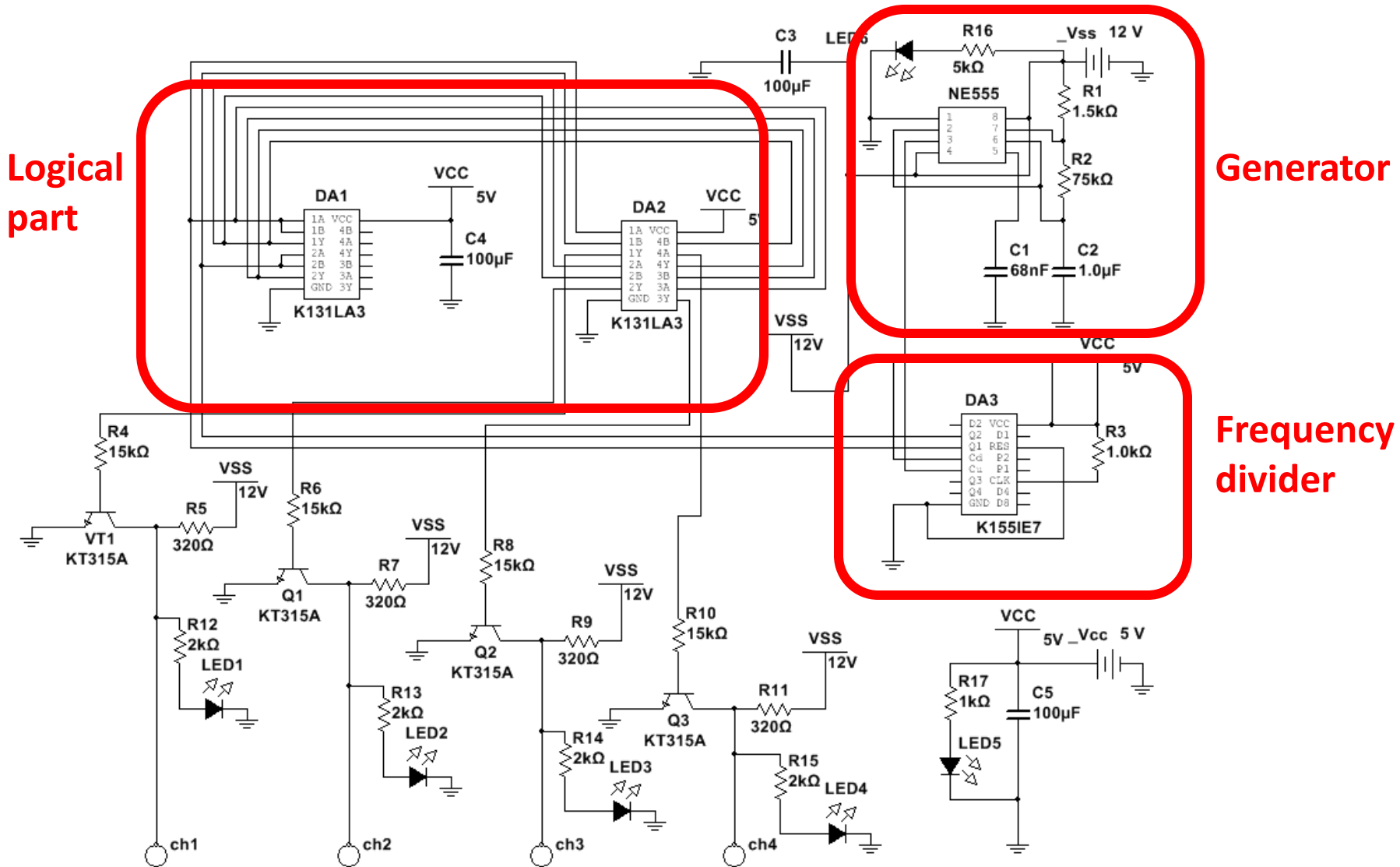
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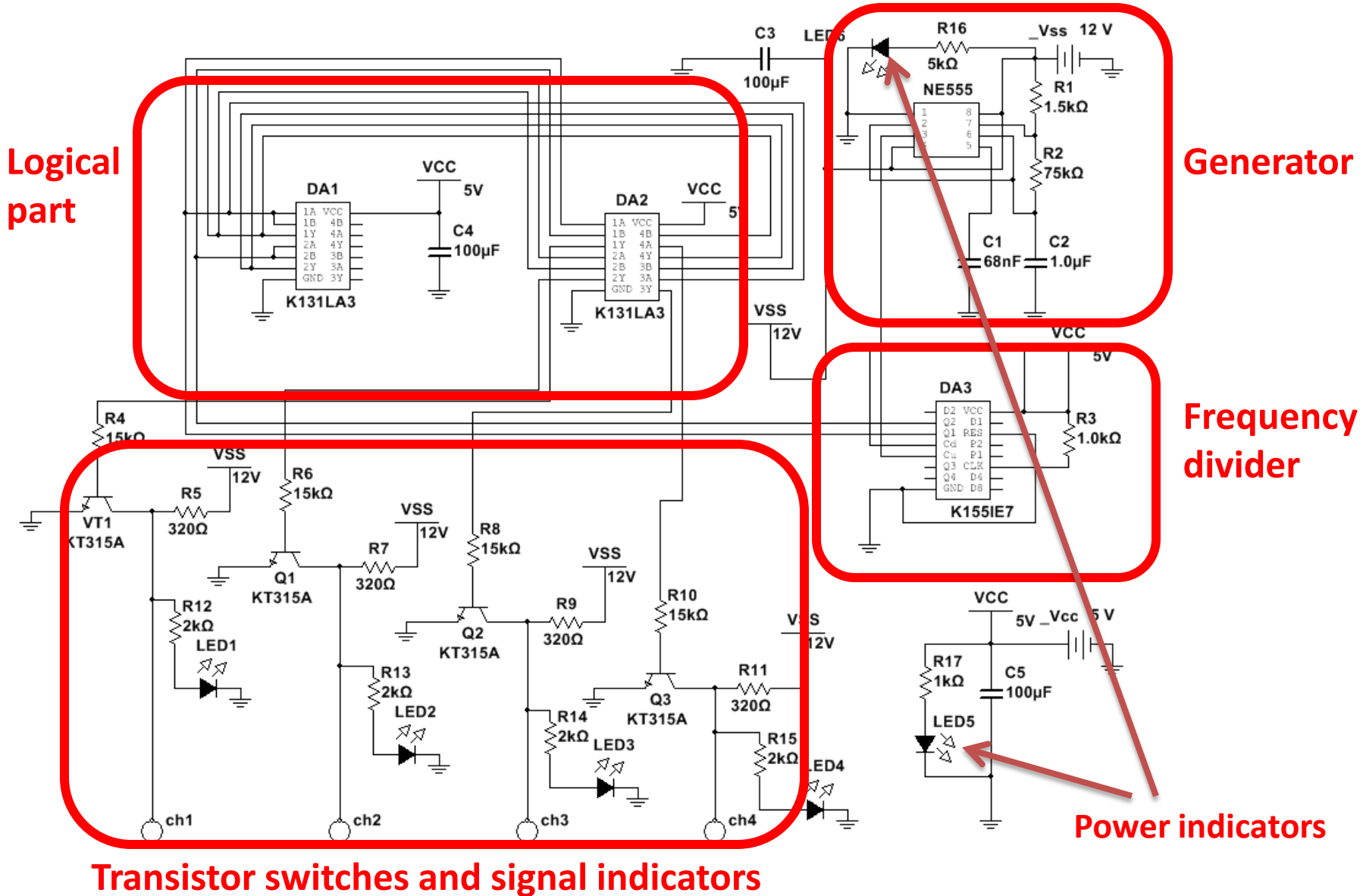
STEP MOTOR CONTROL UNIT



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STEP MOTOR CONTROL UNIT



Logical part

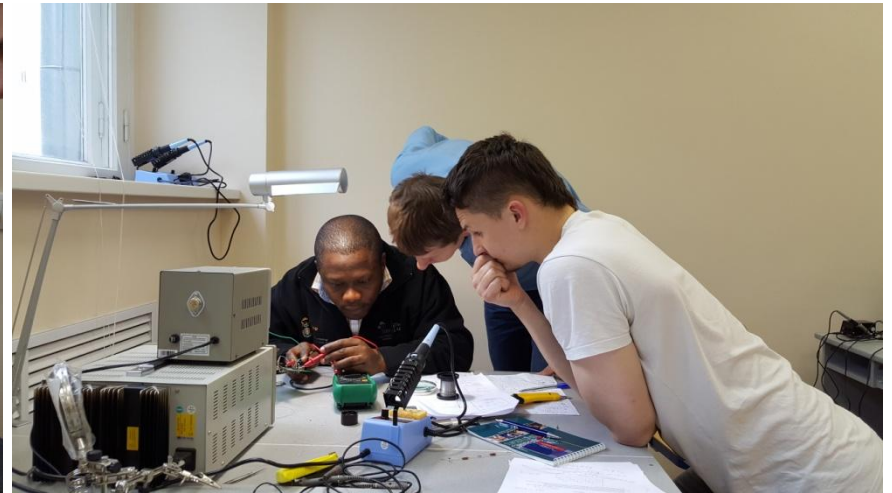
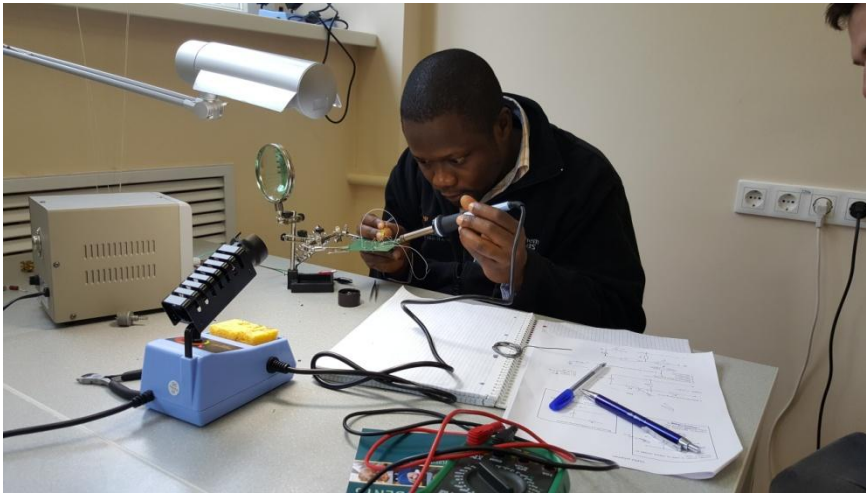
Generator

Frequency divider

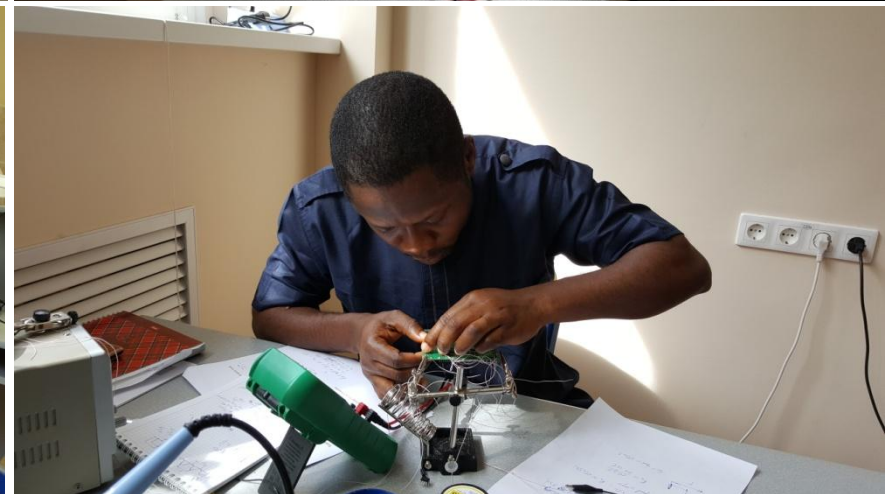
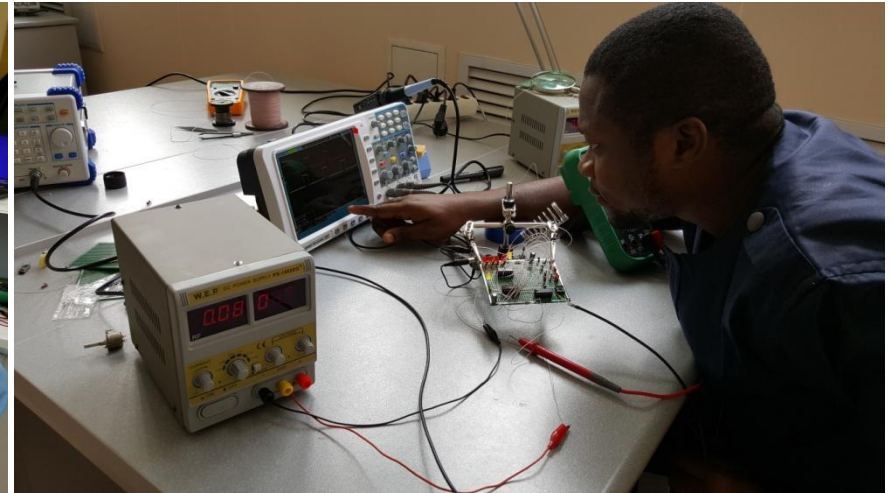
Power indicators

Transistor switches and signal indicators

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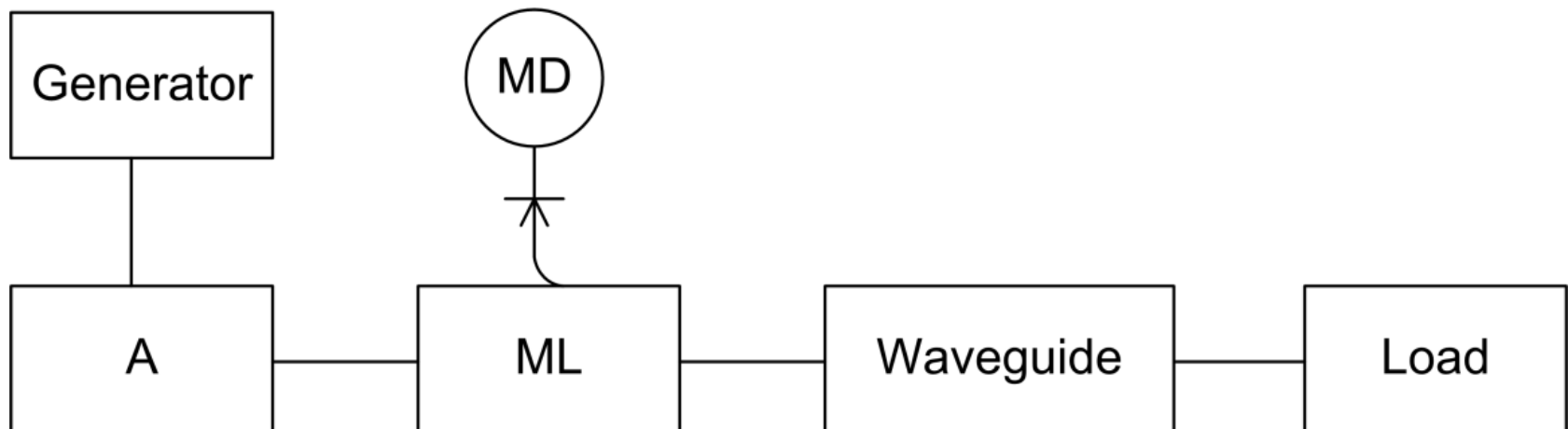


CONCLUSION

- I've got experience in assembling scheme by using soldering iron, solders and all other component use for assembling scheme.
- I recognized basic electronic components: resistor, capacitor, diode, transistor, some integrate circuits.
- I've got experience in working with basic electronics devices such as power supply, multi meter, oscilloscope, signal generator.
- I assembled several common scheme: voltage divider, RC filter, transistor switch and signal convertor.
- Using my acquired skilled, I assembled the Step Motor Control Unit device.

RADIO FREQUENCY

- INTRODUCTION
- Radio frequency generators are usually used as power sources and then power is amplified in klystrons. RF power is used in resonance particle accelerators.



RF IN THE ACCELERATOR TECHNOLOGY

- The equipments in the radio frequency laboratory was shown to me and usage of each equipment.
- RF equipments are ;
- RF Signal generator SRS SG384
- Selective micro voltmeter B6-9 (MD)
- Measuring line
- Short circuiting plug
- Matched load
- Waveguide

Radio frequency



Conclusion

- I have basic knowledge in equipments use in Radio frequency.
- I have the knowledge to identify the Radio frequency equipments.
- I have been able to use the equipments to observe and measure wave behaviour in the wave guide using different loads.

THANK YOU.