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EE102-03

11.10.2023

Lab 3: Combinational Logic Circuit

1. Purpose

The experiment's primary goal is to design and construct a combinational logic circuit using a breadboard, logic gates with the aid of a datasheet. In addition, a 4-bit counter and led are used in this experiment.

2. Methodology

In the first step of the experiment, a 4-bit counter 74HC163 is used. This IC component needs a 5V voltage provided to the MR, CEP, CET, PE, and VCC pins in order to function, and the needed signal must be applied to the CP pin. These techniques are used to capture two signals from Q0 and Q1 pins. Signal generator is used to have a 5 volts peak to peak voltage and 1 Hz square wave signal.

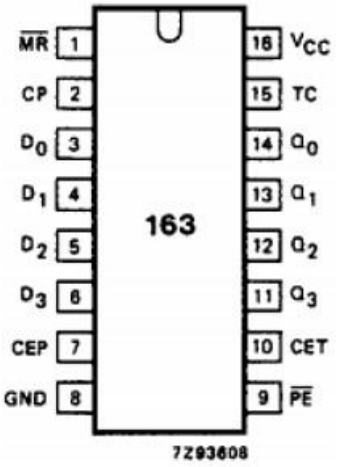

Image 1: Counter, 74HC163

In the second step of the experiment, an AND gate SN74HC08N is used. This AND gate has 4 inputs but in this experiment only 2 variable are used. Other than inputs, this AND gate has a VSS and a GND places.

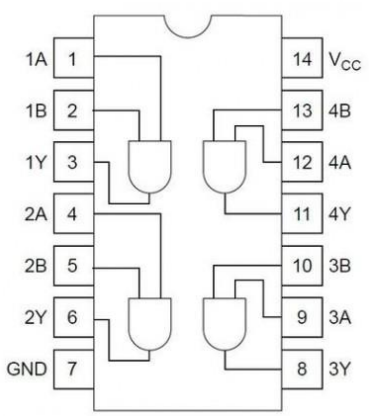

Image 2: AND gate, SN74HC08N

The clock input of the counter has received a square wave signal with a peak-to-peak voltage of 5 V and a frequency of 1 KHz from the signal generator. Two variables are included in the inputs: Q0 and Q1. The word OUT is produced as the output. Here is the truth table for the variables and the output.

Table 1: Truth Table

Q0	Q1	OUT
0	0	0
0	1	0
1	0	0
1	1	1

3. Results:

Q0 and Q1 pins are used in the counter as there were only two inputs. To see the inputs and determine whether the counter was functioning, two green LEDs and two resistors were attached. I used resistors in order to stop the LEDs from being burned out. Then, the 1A and 1B of the AND gate were connected to these inputs. And the results were accomplished from pin 1Y. 1Y pin of the AND gate is connected with another green LED and a 1 kOhm resistor to see if the result is succesfull or not. When the green light is on it showns the result is 1 and when it is off the result is 0.

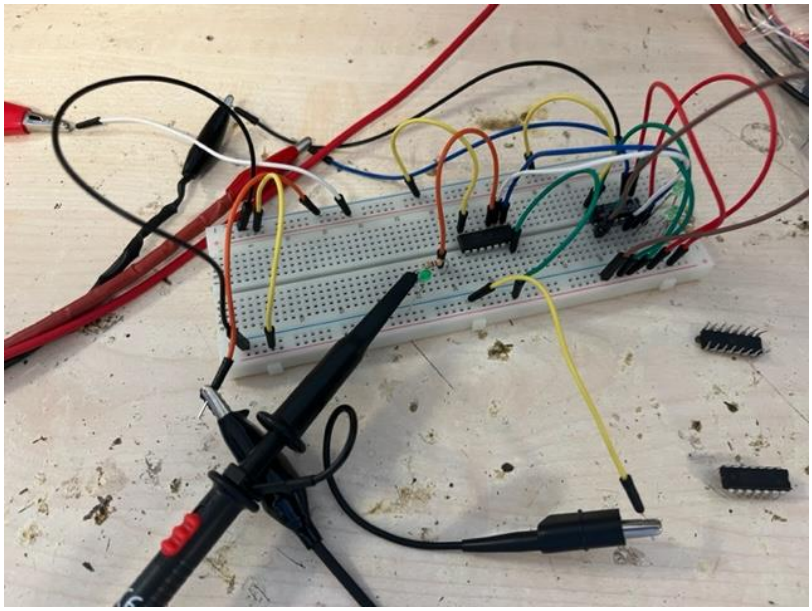

Image 3: Breadboard when Q1:0 , Q2:0 ,OUT:0

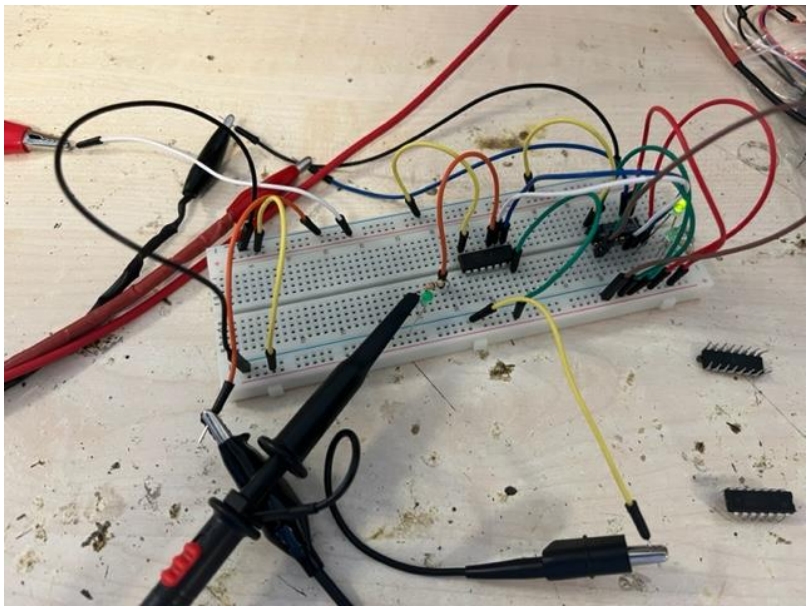

Image 4: Breadboard when Q1:1 , Q2:0 ,OUT:0

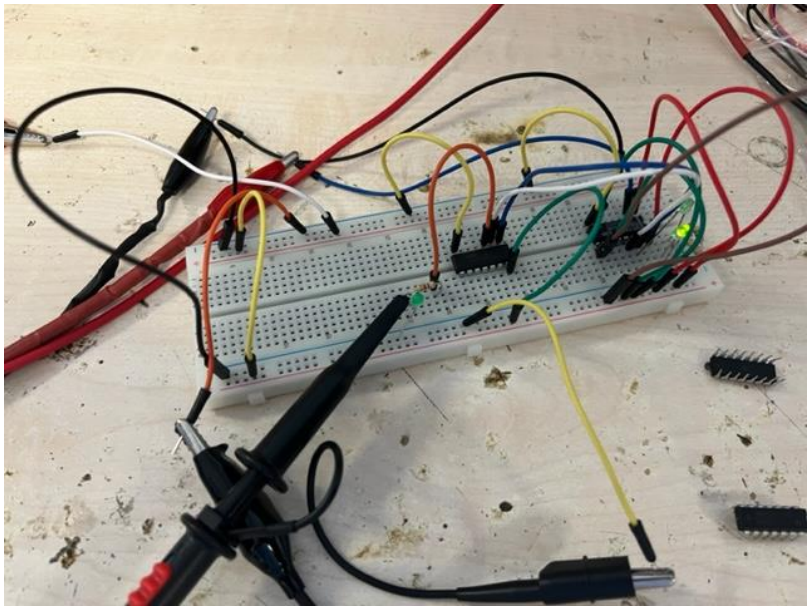

Image 5: Breadboard when Q1:0 , Q2:1 ,OUT:0

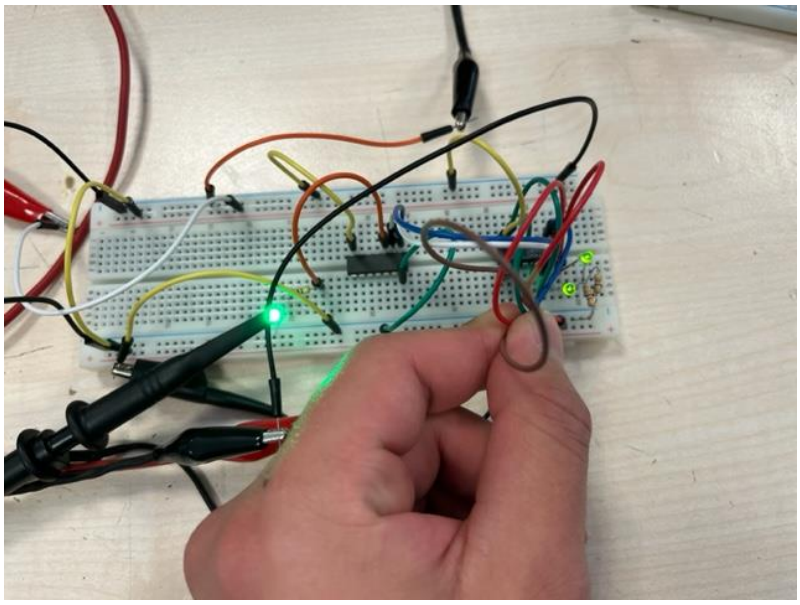

Image 6: Breadboard when Q1:1 , Q2:1 ,OUT:1

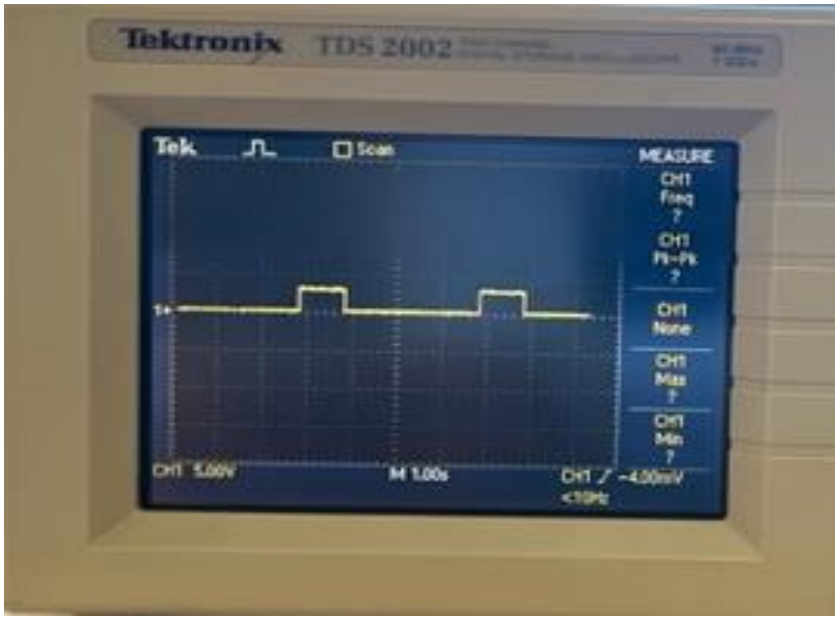

Image 7: Waveform on the display of oscilloscope

4. Conclusion:

A broad introduction to logic gates was provided through the experiment. This experiment's goal was to create a truth table and simulate it on a breadboard. The results were verified using waveforms. A 4-bit counter was used to construct the waveform. The experiment had a number of malfunctioning parts, thus the procedure needed to be fixed at several points. No substantial mistakes were found during the experiment.