

Circuit Board

by Marcus Baker-Wells

Submission date: 19-Jan-2024 10:56AM (UTC+0000)

Submission ID: 222610690

File name: 42754_Marcus_Baker-Wells_Circuit_Board_546483_1312690247.docx (1.04M)

Word count: 1533

Character count: 6887

Fundamentals of Electrical and Electronic Systems

ACDA4018

Circuit build

By Marcus Baker-Wells

2213115 – student number
Level 4 OME HNC

Table of Contents

Contents

Abstract	2
Circuit Description	2
Schematic Circuit	3
Circuit Board.....	6
Conclusion	8
Table of Figures.....	8

Abstract



In this report the topic of making a circuit on Proteus and on a breadboard will be discussed and the outcome of the circuit made is shown below in different pictures. Also, the calculations needed for the circuit will be made correctly with the right voltage, Amp  resistance.

Circuit Description



The circuit itself was based around an integrated circuit: 555 timer. The 555-timer had 8 pins which had to be connected to a board/circuit. The circuit also consisted of multiple resistors, LED's (Light emitting diodes) and capacitors. It also has one 9-volt battery and 1 ground  the ground lets any unwanted voltage be disposed off safely.

There are four separate resistors, the four different variables they are at 1K ohms, 10K ohms AND TWO 100 Ohm 5 gives an equivalent resistance of 47.39, this can be done by doing:

$$R_{eq} = R1 + R2 + R3 + R4$$

The LEDs are of two colours: green and red. These are used to show the different timings which are done by the main component which is the 555 timer. This also shows the different skills/functions the circuit works. The 555 timer is an integrated circuit which has 8 separate pins. Pin 1 is the ground pin, which grounds the integrated circuit. Grounding is another way of saying earthing which gives the timer a way to discharge unwanted voltage in a safe way. Pin 2 is the trigger which initiates the circuit and created a 1 (within the 555 timer there is an integrated circuit with logic gates within it, these are running off of 1 and 0s) which would 'trigger' the system into working. Pin 3 is an output pin which would mean you would have components like LEDs, displays and timers. Pin 4 is a reset pin; this resets the inside flip-flop system. Pin 5 allows an external controller to control the voltage within the 555 timer. Pin 6 is the threshold pin, this means that when the voltage pin goes above 2/3 of the voltage the flip flop is reset. Pin 7 discharges the internal capacitor, when it gets told to. Pin 8 acts as a supply voltage pin and takes in/connects to the positive supply voltage.

Within the circuit there is also 2 capacitors, one at 100µF and the other is 100nF. The capacitors are used to store voltage and to then be released at different times when needed. Capacitors and resistors work oppositely in that way by having a resistor restrict the voltage and a capacitor to store and discharge. The operation of the circuit is to have the 555 timer to control the on and off of the green, red LEDs.

Schematic Circuit

The schematic for the circuit is as shown below in figure 1:

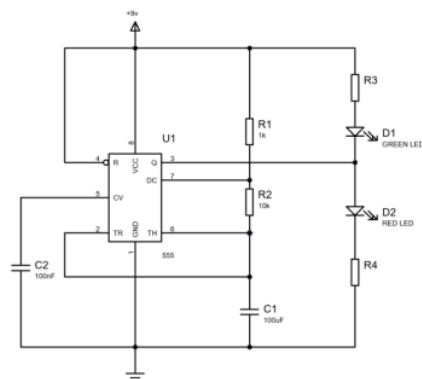


Figure 1, Schematic for Circuit

In figure 1, there is multiple lines which equal to the wires which would be used in the simulation and the real circuit made from breadboards. The big block in the middle of the circuit is the 555 timer, the resistors are the vertical rectangles and the capacitors are the horizontal lines labelled C1 and C2. The ground is the upside triangle lines at the bottom of the circuit attached by the single wire. The 9V battery is the single triangle at the top of the circuit. Each of the pins on the 555 timer is being used as intended. Each pin is labelled on the circuit so you know which wire goes where when making the circuit in real time or in Proteus.

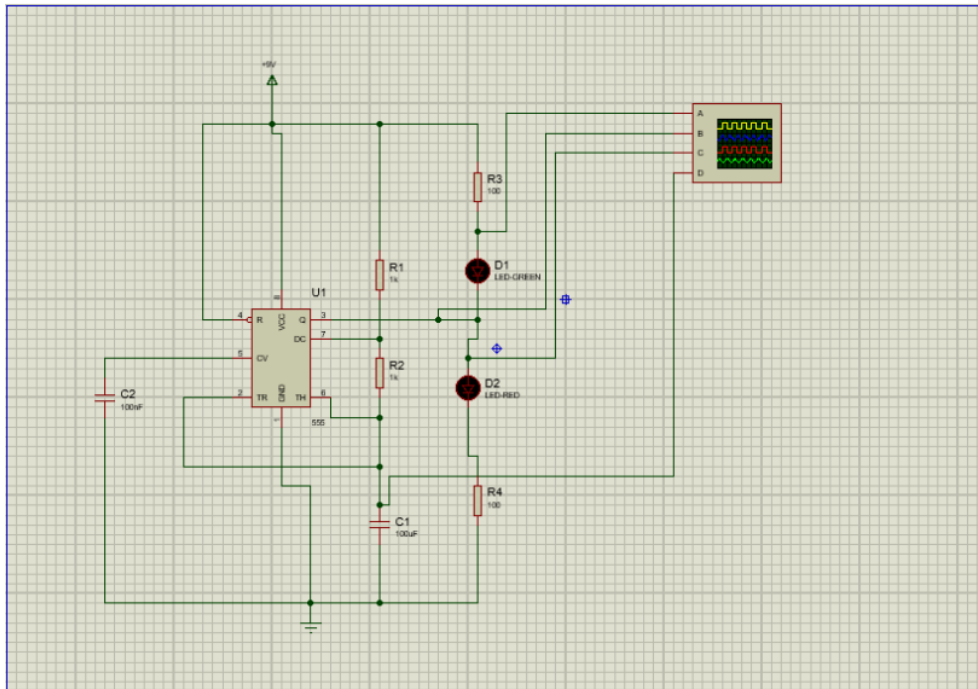


Figure 2, Proteus made Circuit.

The above is a circuit that was made in Proteus a software which was used to simulate the circuit running correctly. In the simulation all the components are the same as in the initial work instructions except for the Oscilloscope which is used to measure the wavelength of the periodic voltage, this is typically in a sine wave. This are also used to convert the DC (direct current) to AC (Alternating Current). However, you can also get a read out from these and it can be shown as shown in figure 3.

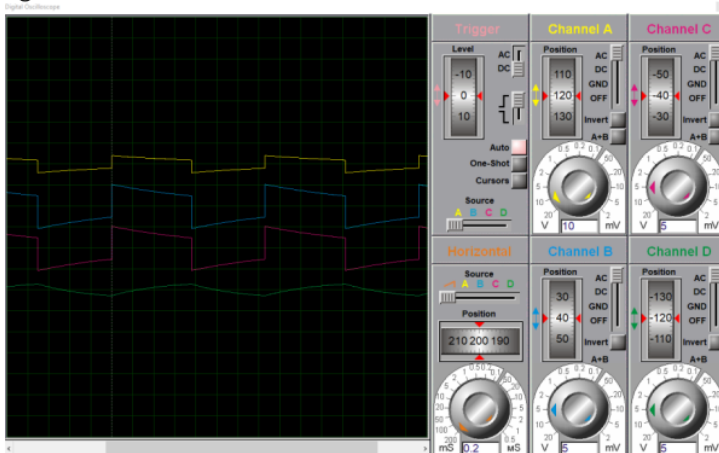


Figure 3, Oscilloscope read out.

This shows the turning off and on of the 555 timer. When the graph dips it means the timer is off and when it is on the graph shows the line is on. This was connected through the computers when run in proteus, but with the real circuit the oscilloscope is attached by crocodile clips to the positive column in the breadboard.

Design Calculations

The calculations for this circuit are as follows:

The resistance of R3 and R4:

$$R = \frac{V}{I} \quad R = \text{resistance} \quad V = \text{Voltage} \quad I = \text{Current}$$

$$V = 9V \quad I = 426.51 \quad R = 47.39$$

$$I = 9 \times 47.39 = 426.51$$

The resistance for R3 and R4 would be :

$$R_{eq} = 1/r1 + 1/r2 + 1/r3 + 1/r4$$

This would equal out to R3 being 100 Ohms and R4 being 100 Ohms.

The on and off times for the circuit are shown via the graph below. When the graph is showing a dip in the line it is showing that the switch is off. When the line is above it shows the graph is on, now with this it visibly shows the timer turning off and on continuously.

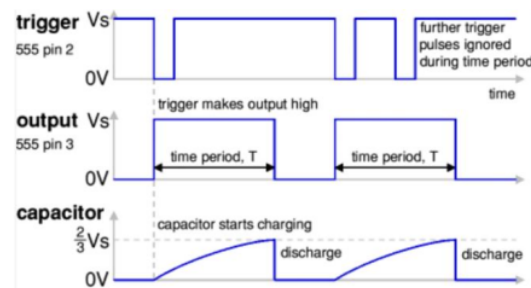


Figure 4, On and off table.

Figure 4 shows the trigger output whilst also making the period of the on and the off of the trigger. In figure 3 the same on and off, of the graph is shown, and to calculate the on and off time periods you can do:

$$\begin{aligned} \text{Time1} - \text{Time2} &= \text{ON/OFF Time} \\ 2.23s - 1.47s &= 0.76s \text{ (ON)} \\ 1.47 - 0.75 &= 0.72s \text{ (OFF)} \\ 0.76 + 0.705 &= 1.46s \text{ (Full time)} \end{aligned}$$

This above shows the on-time period.

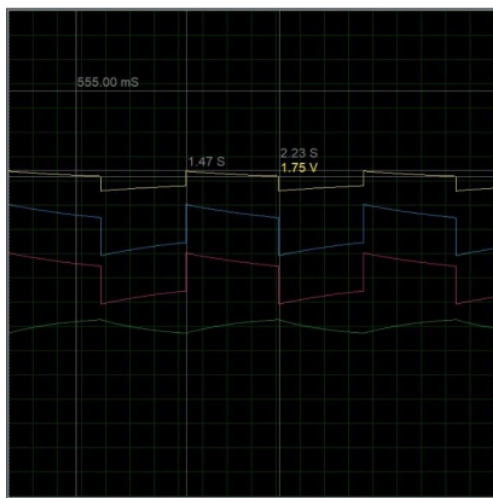


Figure 5, On and Off time graph

The next calculation for the circuit is frequency .Frequency can be worked out by doing:

$$f = \frac{1}{T}$$

From the graph the ideal value needed would be 0.76 seconds, this would give the calculation of:

$$f = \frac{1}{1.46s} = 0.68 \text{ Hz}$$

Circuit Board

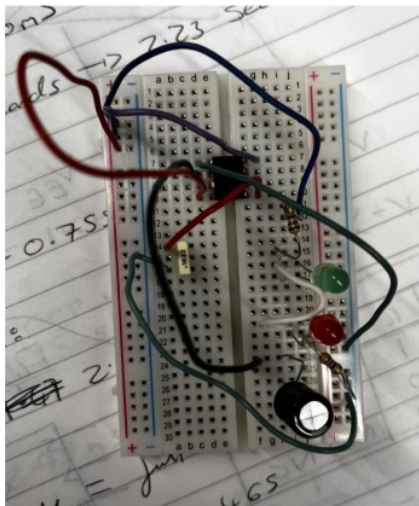


Figure 6, Bread Board Circuit.

Pictured above in figure 6 is the breadboard which is used to simulate the circuit in real time. All the components in the breadboard are what is used in the Proteus circuit. In the bottom right corner of the breadboard is the capacitor and the red and green LEDs, these are connected to the 555 timer and each pin is going to its correct negative pin for the components. On the left side you have the other capacitor. Also, on the left side you have the positive lead to power the whole breadboard. A key thing to note with breadboards is that you need to connect the row with a positive lead to power the row.

The above is a working circuit. The below in figure 7 shows the circuit working with the green LED on. In figure 8 is the circuit showing the red LED on. This shows the difference of the on and off timings, this is because when it is 'on' the red light will show and when it is 'off' then it will show the red light.

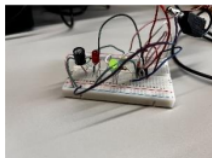


Figure 7, Green light on.

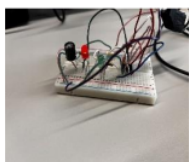


Figure 8, Red light on.



Figure 9, DC readings.

In figure 9, it shows the specific readings which were used to set the circuit voltage (9V), Amperage (0.1A). The 9V is a specified detail which was needed for the circuit to run as it did in the Proteus simulation. The live wire was connected to this machine by a single wire entering the positive side of the breadboard and that related to a crocodile clip to the machine (single red wire in figure 9). Below is a picture of how it was connected.

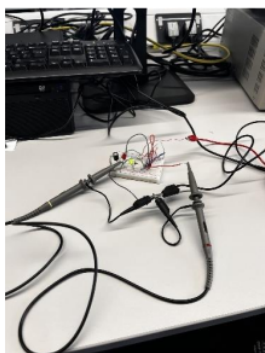


Figure 10, Connected Breadboard

The above shows the circuit connected to leads which would give off a signal and relate that to a wavelength graph, which is shown below.

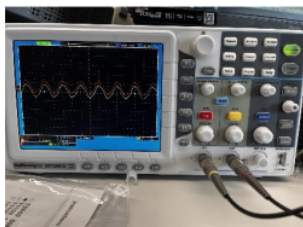


Figure 11, Wavelength graph

Conclusion

The circuit was created and had all requirements met for the working circuit, calculations and evidence of a working circuit in the permitted lesson time. Overall, the circuit was working and able to give off the appropriate readings and correct timings for the LEDs to work. The Proteus circuit was a good start to help visualise and have a good opportunity to fine tune the circuit, however when putting it into a bread board it would create a struggle due to the different capacitors being at a different sizes and not being able to easily read the values, the same with the resistors.



Table of Figures

Figure 1, Schematic for Circuit	3
Figure 2, Proteus made Circuit.	4
Figure 3, Oscilloscope read out.	4
Figure 4, On and off table.....	5
Figure 5, On and Off time graph	6
Figure 6, Bread Board Circuit.	6
Figure 7, Green light on.....	7
Figure 8, Red light on.	7
Figure 9, DC readings	7
Figure 10, Connected Breadboard	8
Figure 11, Wavelength graph	8

Circuit Board

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

60/100

PAGE 1

PAGE 2



Comment 1

It is better to start Abstract form a fresh page



Comment 2

Highlight the main results, findings, or outcomes of the study. Focus on key data points or discoveries.



Comment 3

It is better to number each heading



Comment 4

The font, font size, line spacing, spacing between paragraphs, spacing between heading and paragraph should be uniform throughout the document.



Comment 5

This calculation is not correct



Comment 6

The
font, font size, line spacing, spacing between paragraphs, spacing between
heading and paragraph should be uniform throughout the document.



Comment 7

IT is better to have simulated output graphs showing the values.



Comment 8

Line
spacing between heading and para, between lines, between paragraphs should be
uniform.



Comment 9

It would have been better if the outputs were recorded in a tabulation.



Comment 10

It would have been better if references were included.

MARCUS BAKER-WELLS**60****ENGAGEMENT WITH LITERATURE**

Marks for engagement with literature skills will be gained through the use of information collected from appropriate reference material embedded in mainly the circuit description, but also in the testing sections of your report. This reference material should be used to explain concepts and to support arguments in the discussion of your results.



No evidence of reading and/or reliance on inappropriate sources. Views and findings mostly unsupported and non-authoritative. Referencing conventions used incoherently or largely absent.

0**KNOWLEDGE AND UNDERSTANDING**

Marks for knowledge and understanding skills will be given for the accuracy of your description of the concepts and principles of the circuit and how this relates to the experimental setup used.



Excellent knowledge and understanding of the basic underlying concepts and principles of electrical and Electronic systems. which is evident through the description on the experimental setups, calculations and theoretical explanation.

21**COGNITIVE AND INTELLECTUAL**

Marks for cognitive and intellectual skills will be given for the quality and validity of your interpretation of the experimental results gathered.



Good evaluation of the underlying concepts and principles of the electrical and Electronic systems. Can interpret data with minor errors. Ability to use evidence to support the argument. Mostly valid arguments and logical judgements is evident from the description.

16

PRACTICAL SKILLS

Marks for practical skills will be given for your use of the available tools, models and techniques to explain your results and their relationship to the theory of the concepts.



Good application of a range of basic methods, materials, tools and/or techniques in circuit design. Very good consideration of the context of the application. Very good evidence of different approaches to problem-solving in Electrical and Electronic circuits and proposes appropriate solutions.

21

TRANSFERABLE SKILLS FOR LIFE

Marks for transferable skills for life and professional practice will be given for the structure, coherence, presentation and overall quality of your report.



The report demonstrates a basic level of structure and coherence. Presentation is somewhat clear, but improvements are needed for a higher overall

2

quality. Work on refining the organization and enhancing the report's flow.