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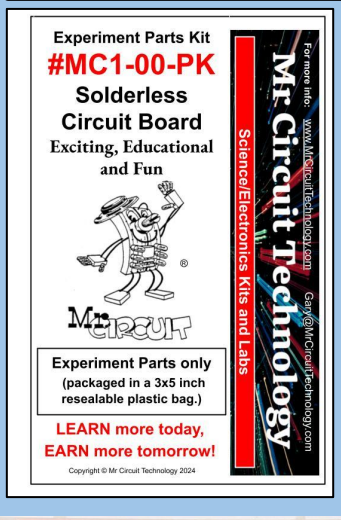
Mr Circuit Technology

Science/Electronics Experiment Kits and Labs

Exp. 23 - "VARIABLE TIMER CIRCUIT"



LESSON PLAN

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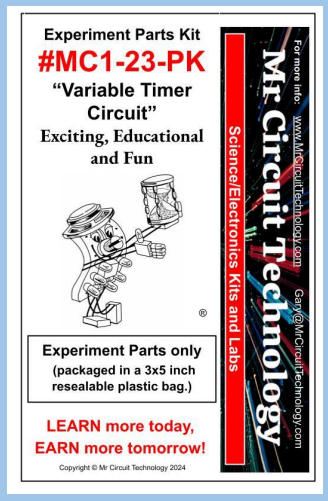
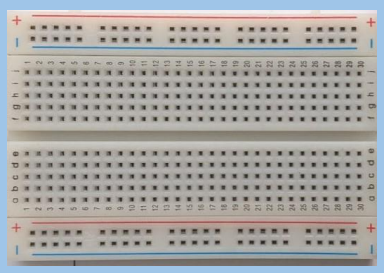
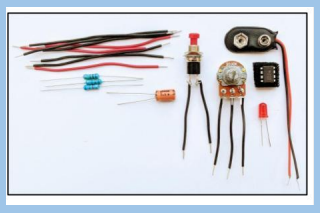






PREPARATION: You can put the Page 12 poster up on your classroom wall to announce the fact that you are going to do the Science-Electronics Experiment.

Step 1 - Make a copy of pages 1 through 8 for each student. The students can read and do these pages on their own or you can guide them.

Step 2 - Hand out Parts Kit #MC1-00-PK (that has the Solderless Circuit Board) and Parts Kit #MC1-23-PK (that has the experiment parts) with a 9-Volt battery. Give these items to each student along with the 8 pages.

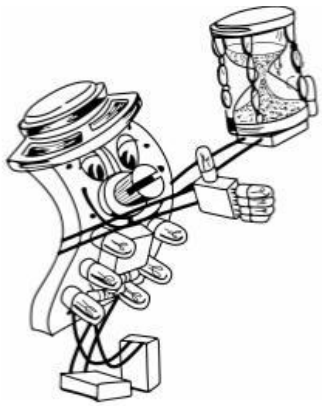
Step 3 - When your students have completed the experiment, collect all the Parts Kits and batteries for later use.

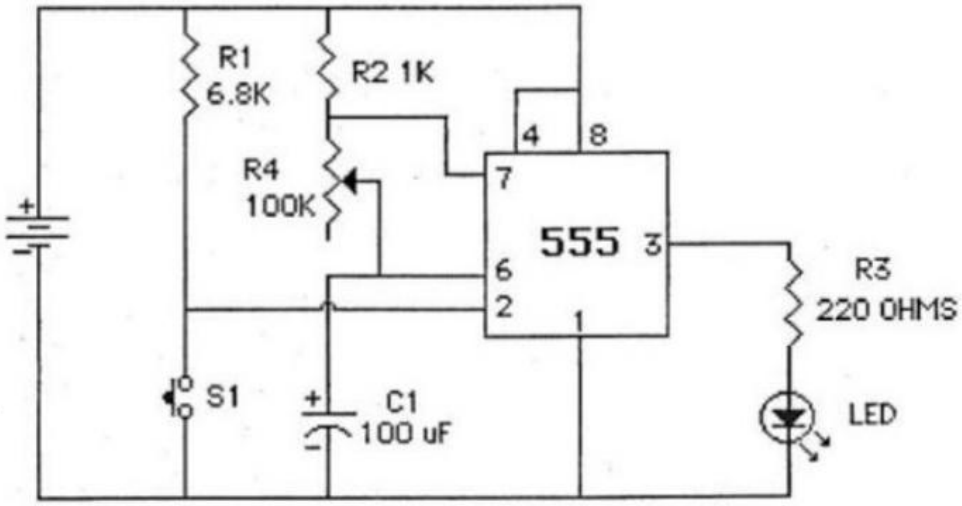
Step 4 - Collect all the Written Quizzes for grading and use the Answer Key to grade them.

For Tech Support or any questions, you can email us or call 805-295-1642

EXPLANATION OF EXPERIMENT part 1 of 2

***** You are going to build a VARIABLE TIMER circuit. Here is the SCHEMATIC DIAGRAM of the circuit you will build.**





This interesting circuit was invented by engineers who wanted a circuit that would work as a Timer.

What is a Timer? It is a circuit that when once activated or triggered will put out a pulse for a certain period of time and then stop putting out the pulse,.

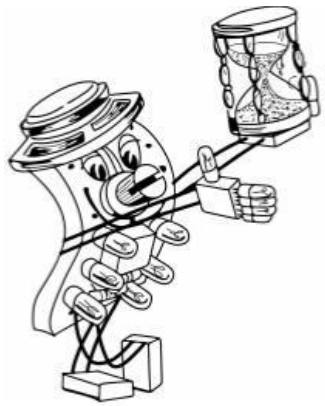
This Timer is VARIABLE because you can change the amount of time that the pulse remains HI by adjusting the potentiometer in the circuit or by changing capacitor C1 to 1000 microfarads (1000uF).

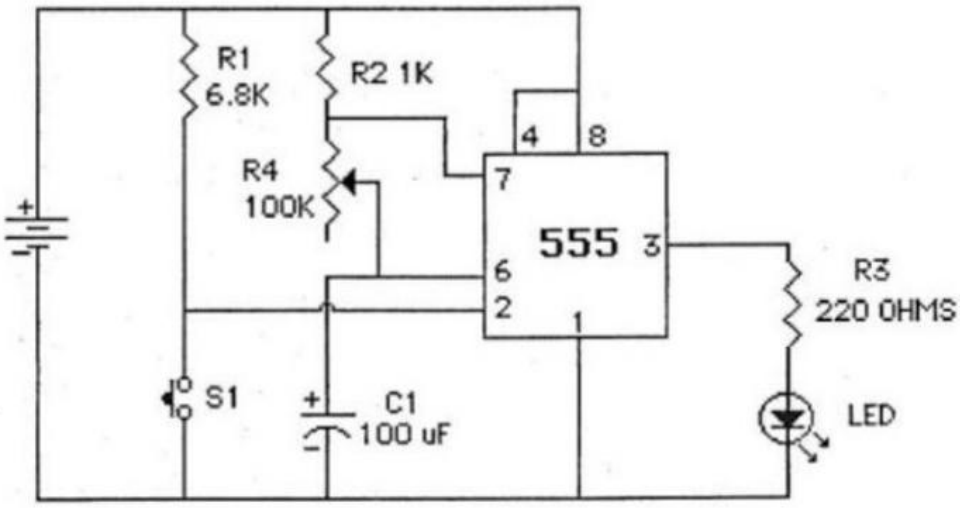
There are many times that we need such a circuit in electronics.

(Continue to Page 2)

EXPLANATION OF EXPERIMENT part 2 of 2

Let's talk about how the circuit works. Here is the schematic of the **VARIABLE TIMER** circuit that you will build.





This circuit uses a 555 Integrated Circuit as **TIMER**, also known as a **Monostable Multivibrator**.

"Monostable" refers to the idea that this circuit has only "one stable state". In this circuit, the stable state is when the LED is OFF (maintaining a LO on Pin 3 of the 555).

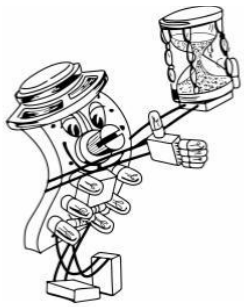
To start or **"trigger"** the timer, you press push button switch S1 which puts a momentary negative voltage on Pin 2. This will cause the output on Pin 3 to go from LO to HI and the LED will light up. The time that Pin 3 remains HI depends on the values of R2, R4, and C1.

You can reduce the time the LED remains on by rotating the potentiometer shaft clockwise.

(Continue to Page 3)

VARIABLE TIMER CIRCUIT

MC1-23-R-3



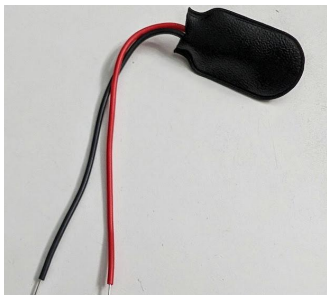
PURPOSE OF THIS EXPERIMENT

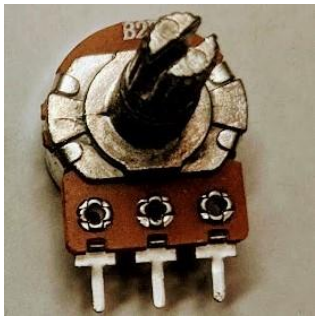
*** To build an VARIABLE TIMER using a 555 Integrated Circuit.

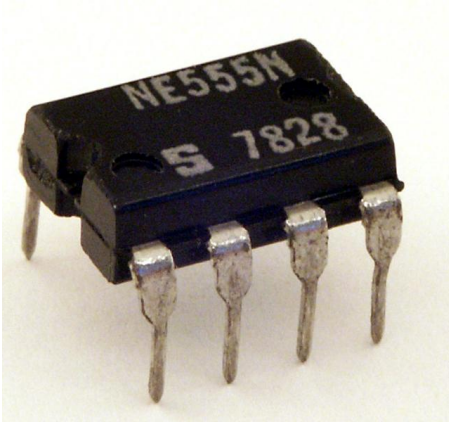
PARTS NEEDED FOR EXPERIMENT

In this experiment, you will use the following items:

a BATTERY SNAP a POTENTIOMETER 555 IC LED







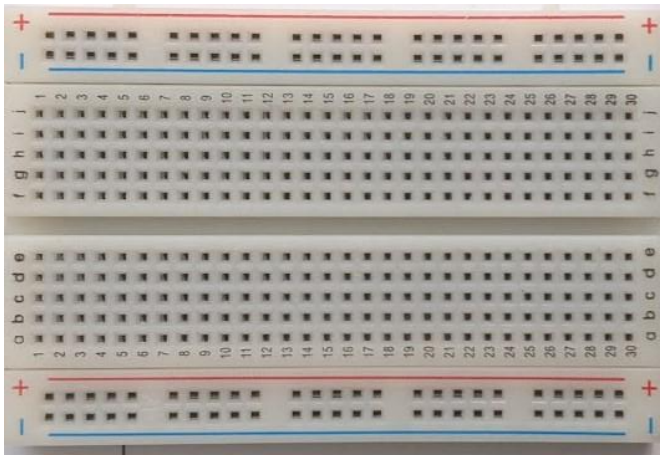
220 Ohm resistor

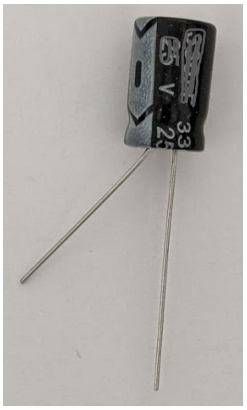
1000 Ohm resistor

6800 Ohm resistor

7 Jumper Wires

a SOLDERLESS CIRCUIT BOARD a Radial Cap P/B Sw





You will also need a good 9 Volt battery

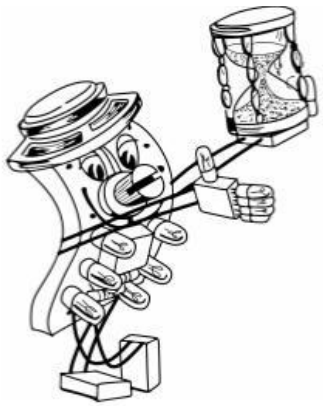
(Continue to Page 4)

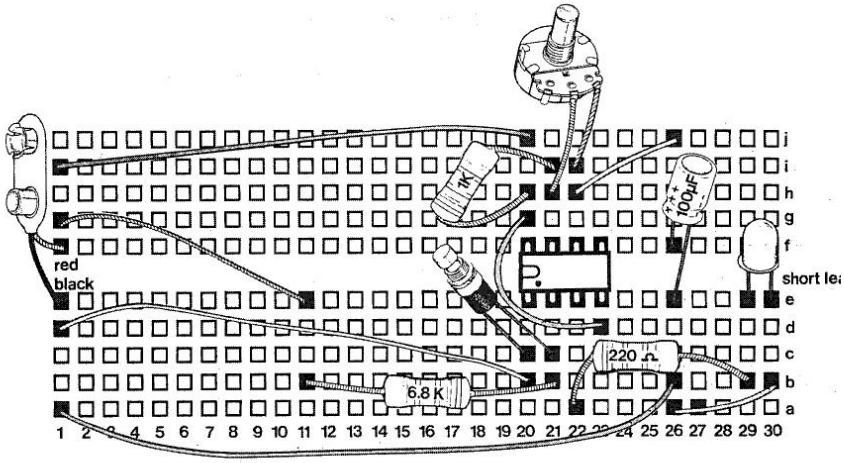
DO THE EXPERIMENT (part 1 of 2)

MC1-23-R-4

Now you are going to build the circuit on a Solderless CB.

Step 1 - Take out all the parts needed for this experiment.



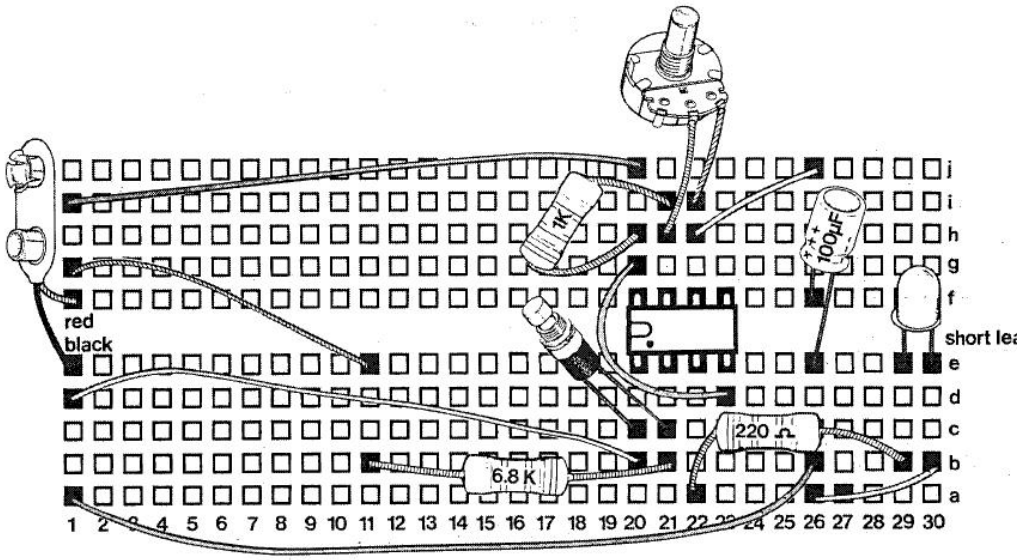


Step 2 - Install all the parts on the SCB as shown above.

- ❑ Install an LED with the Short Lead in hole 30e and the Long Lead in hole 29e
- ❑ Install the 220 Ohm resistor (red, red, brown, gold) in holes 22a to 29b
- ❑ Install the 1000 (1k) Ohm resistor (brown, black, red, gold) in holes 20h to 21i
- ❑ Install the 6800 (6.8k) Ohm resistor (blue, gray, red, gold) in holes 11b to 21b
- ❑ Install the 555 Timer IC with Pin 1 in hole 20e as shown in pictorial
- ❑ Install a 100uF Capacitor - Long lead in 26f, Short lead in 26e
- ❑ Install the Push Button Switch in holes 20c to 21c
- ❑ Install the Potentiometer, middle lead in 21h, edge in 22i
- ❑ Install Jumper Wire #1 in holes 1a to 26b
- ❑ Install Jumper Wire #2 in holes 1d to 20b
- ❑ Install Jumper Wire #3 in holes 1g to 11e
- ❑ Install Jumper Wire #4 in holes 1i to 20j
- ❑ Install Jumper Wire #5 in holes 20g to 23d
- ❑ Install Jumper Wire #6 in holes 22h to 26j
- ❑ Install Jumper Wire #7 in holes 26a to 30b
- ❑ Install the Battery Snap, Black lead in hole 1e and Red Lead in hole 1f

(Continue to Page 5)

DO THE EXPERIMENT (part 2 of 2)



Step 3 - Connect the battery to the Battery Snap. Press the Push Button Switch to start the timer. The LED will remain on for a period of time and then shut off automatically. You can adjust the time the LED remains on with the potentiometer.

CONCLUSION

You should have observed that you can build an **VARIABLE TIMER** circuit with a 555 Integrated Circuit.

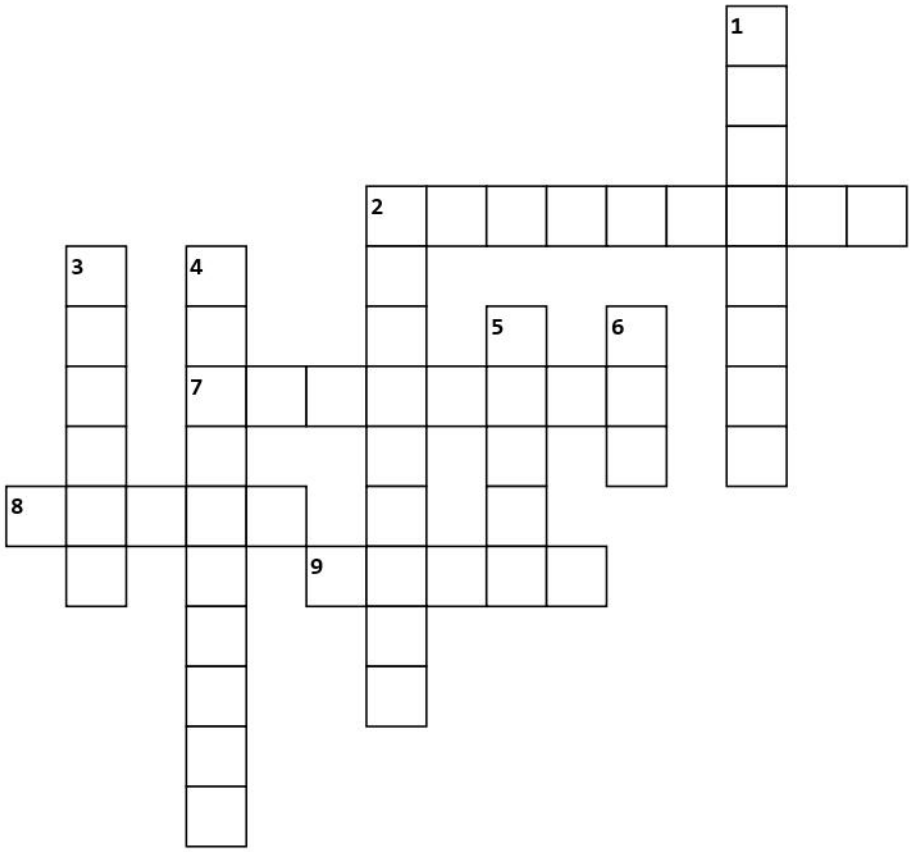
(End of Experiment 23)

Mr. CIRCUIT®

MC1-23-CW

CROSSWORD

Exp. 23 - "VARIABLE TIMER CIRCUIT"



Across

2. To reduce the time that the timer in ON, adjust the shaft of the potentiometer _____ .

7. A 'LO' output is also called a _____ voltage.

8. A timer circuit puts out a _____ for a certain period of time and then shuts off.

9. To _____ the timer, you press the push button switch.

Down

1. This timer circuit is _____ because you can adjust the time that the LED is on.

2. To increase the time the LED is on in this circuit, increase the value of _____ C1.

3. Pin 3 is called the _____ pin on the 555.

4. This circuit is also called a _____ MULTIVIBRATOR circuit.

5. The 555 in this circuit is used as a _____

6. What is the name of the device that turns on in this circuit?

Mr. CIRCUIT®

MC1-23-WS

WORD SEARCH

Exp. 23 - "VARIABLE TIMER CIRCUIT"

Y R K B F U E A U V T H R I R G F S K Y
V Q P W A U V A J X U K K L K X C O S O
F A S X B S G J D X R X W R L M P M W Y
Q U W T P X T M O N O S T A B L E P L M
F X Y A Q T Y F X H M J D B T T X A U P
M W U L W H Z G F O G U J E D S I Z P H
A H Y X C U D X B H H Q M L O M L U W Q
W R E Q L U C L O C K W I S E G P J H Q
M U L T I V I B R A T O R O G E E E P P
P O T E N T I O M E T E R B X O S P C Z
G Z R M B J X Q I M R L X T I M E R U F
R O K S F X E D R J Q X Z O V H U K V E
Q F K C U Q E L Z H O U T P U T G I W E
P H A A N M Q G B Z Z D F N J Q R I W E
L Y E L B A B E S A M Y M J M N Y I I R
E K T S W I T C H W I V O X M R H Y Y Q
W Z M Z E A Y V C X T R I G G E R U X P
Y A B R B Y M O J Z J C A Z D K X Y G Z
A Y Q I N X J S W V T J U V H B H S V U
I F R E A C T I V A T E V C K F L O Y Z

1. This circuit is a MONOSTABLE _____ circuit.

2. To start the timer, you press the normally-open Push Button _____ .

3. This circuit is a _____ timer circuit.

4. The 555 integrated circuit is working as a _____ .

5. Pin 3 is the _____ pin on the 555 Integrated Circuit.

6. R4, in this circuit, is a _____ .

7. To _____ the timer, press the push button switch.

8. To reduce the time that the LED stays on, you rotate the shaft of the potentiometer in a _____ direction.

9. _____ refers to one stable state.

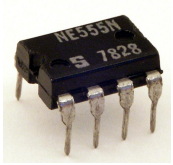
10. You can _____ the timer to start by pressing the push button switch.

(Student Name) (Period/Student Number) (Date)

QUIZ for Exp 23 or STEM KIT #23
in the Mr Circuit Electronics Training Lab 1

(Page 8)

This Quiz covers the training learned by completing



"Build a Variable Timer Circuit" Experiment 23

Circle the letter for your answer to each question and then hand this quiz in to your teacher.

A
B
C
D

#1 This circuit uses a 555 Timer IC as a _____ .

A. a clock
B. variable capacitor
C. a timer
D. variable resistor

A
B
C
D

#2 What pin on the 555 Timer is connected to an LED?

A. 8
B. 3
C. 6
D. 12

A
B
C
D

#3 All the pins on the 555 Timer IC are used in this circuit except _____ .

A. Pin 5
B. Pin 1
C. Pin 8
D. Pin 4

A
B
C
D

#4 The Switch S1 is connected to Pin 2 and to _____ .

A. Pin 4
B. Pin 6
C. Pin 1
D. Pin 3

A
B
C
D

#5 What is the purpose of the Potentiometer in this circuit?

A. to vary how long the LED is ON
B. to vary the volume of the sound
C. to count the pulses
D. to vary the brightness of the LED

A
B
C
D

#6 If you want the LED to stay on longer, what would you do?

A. replace C1 with 1000uF
B. remove C1 from the circuit
C. reduce the capacitance of C1
D. short C1

A
B
C
D

#7 The positive of C1 is connected to _____ .

A. Pin 4
B. Pin 2
C. Pin 6
D. Pin 8

A
B
C
D

#8 To 'trigger' the timer to start, you _____ .

A. apply a positive voltage to Pin 1
B. remove the voltage from Pin 3
C. increase the voltage on Pin 8
D. apply a negative voltage to Pin 2

A
B
C
D

#9 The Potentiometer is connected to _____ .

A. Pins 7 and 8
B. Pins 6 and 7
C. Pins 4 and 5
D. Pins 3 and 4

A
B
C
D

#10 The amount of time the LED remains on after the timer is 'triggered' depends on the values of R2, R4, and _____ .

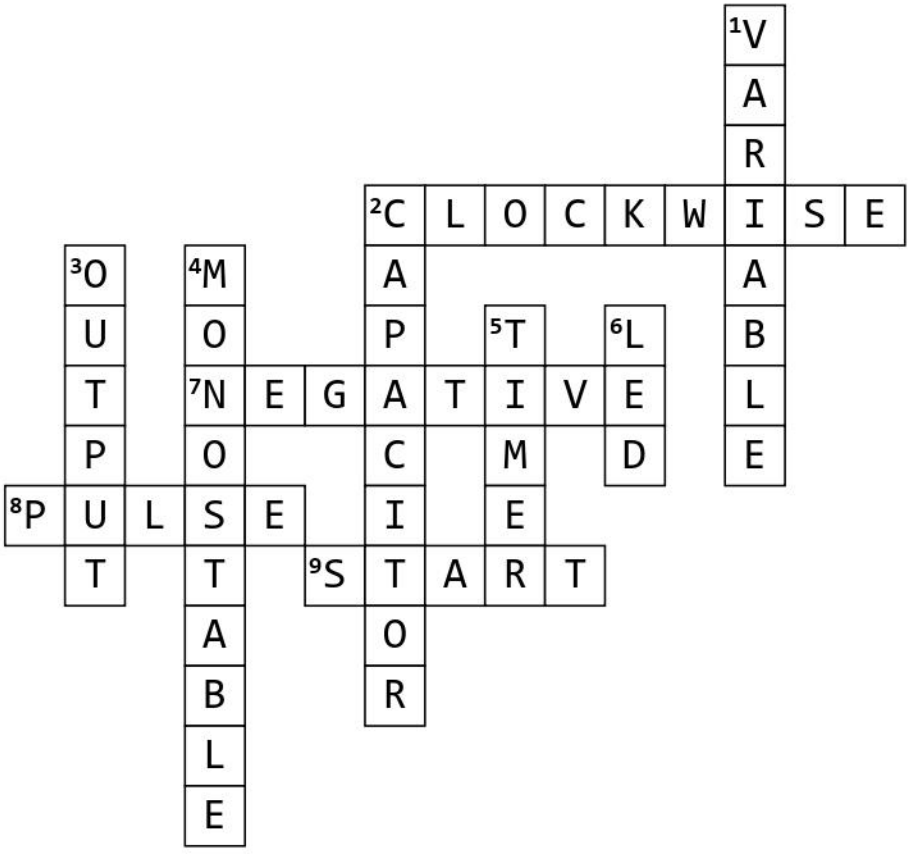
A. R3
B. C1
C. R1
D. the LED

(Form SQ23)

Score	

ANSWERS FOR CROSSWORD

Exp. 23 - "VARIABLE TIMER CIRCUIT"



Across

2. To reduce the time that the timer in ON, adjust the shaft of the potentiometer _____ .

7. A 'LO' output is also called a _____ voltage.

8. A timer circuit puts out a _____ for a certain period of time and then shuts off.

9. To _____ the timer, you press the push button switch.

Down

1. This timer circuit is _____ because you can adjust the time that the LED is on.

2. To increase the time the LED is on in this circuit, increase the value of _____ C1.

3. Pin 3 is called the _____ pin on the 555.

4. This circuit is also called a _____ MULTIVIBRATOR circuit.

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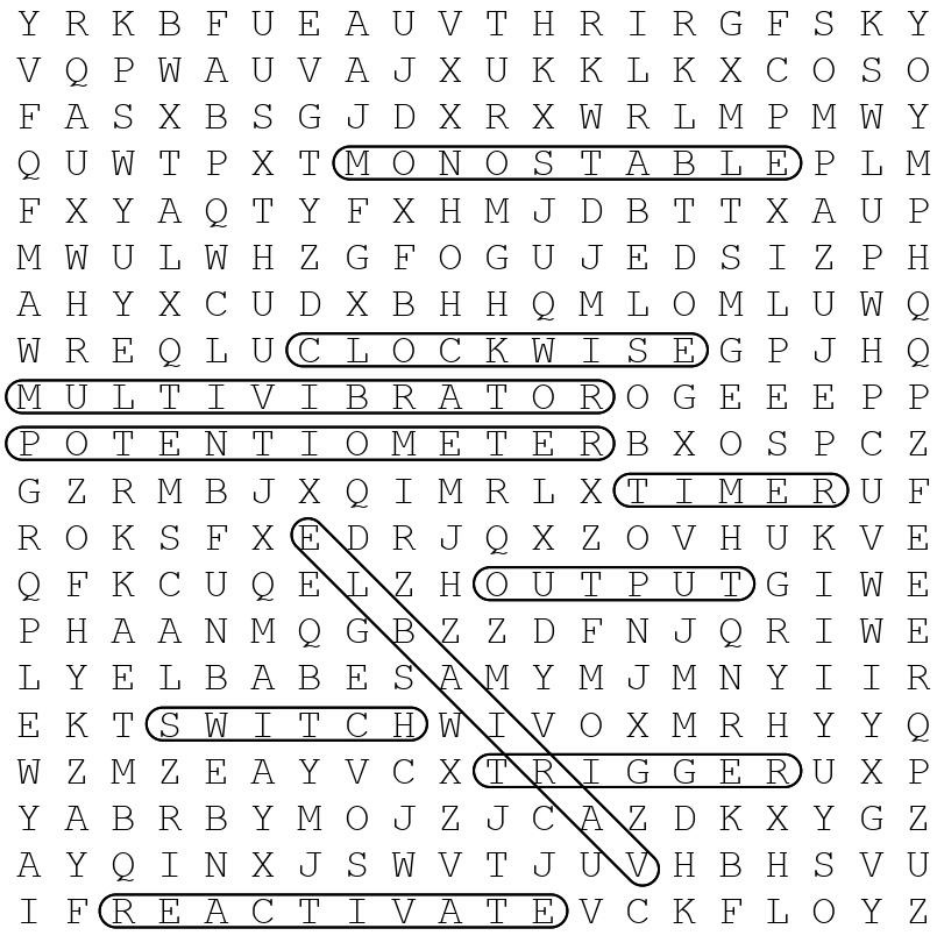
ANSWERS FOR WORD SEARCH

Exp. 23 - "VARIABLE TIMER CIRCUIT"



1. This circuit is a MONOSTABLE _____ circuit.

2. To start the timer, you press the normally-open Push Button _____ .

3. This circuit is a _____ timer circuit.

4. The 555 integrated circuit is working as a _____ .

5. Pin 3 is the _____ pin on the 555 Integrated Circuit.

6. R4, in this circuit, is a _____ .

7. To _____ the timer, press the push button switch.

8. To reduce the time that the LED stays on, you rotate the shaft of the potentiometer in a _____ direction.

9. _____ refers to one stable state.

10. You can _____ the timer to start by pressing the push button switch.

QUICK-CHECK ANSWER KEY for Experiment 23 QUIZ
for Mr Circuit Electronics Training ("Variable Timer")

Place this sheet over top of the STUDENT QUIZ (offset a little to the left and then offset to the right) to compare the answers on this sheet to the answers that the student marked. Put an 'X' for each wrong answer.

Count the right answers and record the score of right answers in your grade book.

A B **(C)** D

#1 This circuit uses a 555 Timer IC as a _____ .

A. a clock
B. variable capacitor
C. a timer
D. variable resistor

A B C **(D)**

#2 What pin on the 555 Timer is connected to an LED?

A. 8
B. 3
C. 6
D. 12

(A) B C D

#3 All the pins on the 555 Timer IC are used in this circuit except _____ .

A. Pin 5
B. Pin 1
C. Pin 8
D. Pin 4

A B **(C)** D

#4 The Switch S1 is connected to Pin 2 and to _____ .

A. Pin 4
B. Pin 6
C. Pin 1
D. Pin 3

(A) B C D

#5 What is the purpose of the Potentiometer in this circuit?

A. to vary how long the LED is ON
B. to vary the volume of the sound
C. to count the pulses
D. to vary the brightness of the LED

(A) B C D

#6 If you want the LED to stay on longer, what would you do?

A. replace C1 with 1000uF
B. remove C1 from the circuit
C. reduce the capacitance of C1
D. short C1

A B C D

#7 The positive of C1 is connected to _____ .

A. Pin 4
B. Pin 2
C. Pin 6
D. Pin 8

A B **(C)** D

#8 To 'trigger' the timer to start, you _____ .

A. apply a positive voltage to Pin 1
B. remove the voltage from Pin 3
C. increase the voltage on Pin 8
D. apply a negative voltage to Pin 2

A B C **(D)**

#9 The Potentiometer is connected to _____ .

A. Pins 7 and 8
B. Pins 6 and 7
C. Pins 4 and 5
D. Pins 3 and 4

A **(B)** C D

#10 The amount of time the LED remains on after the timer is 'triggered' depends on the values of R2, R4, and _____ .

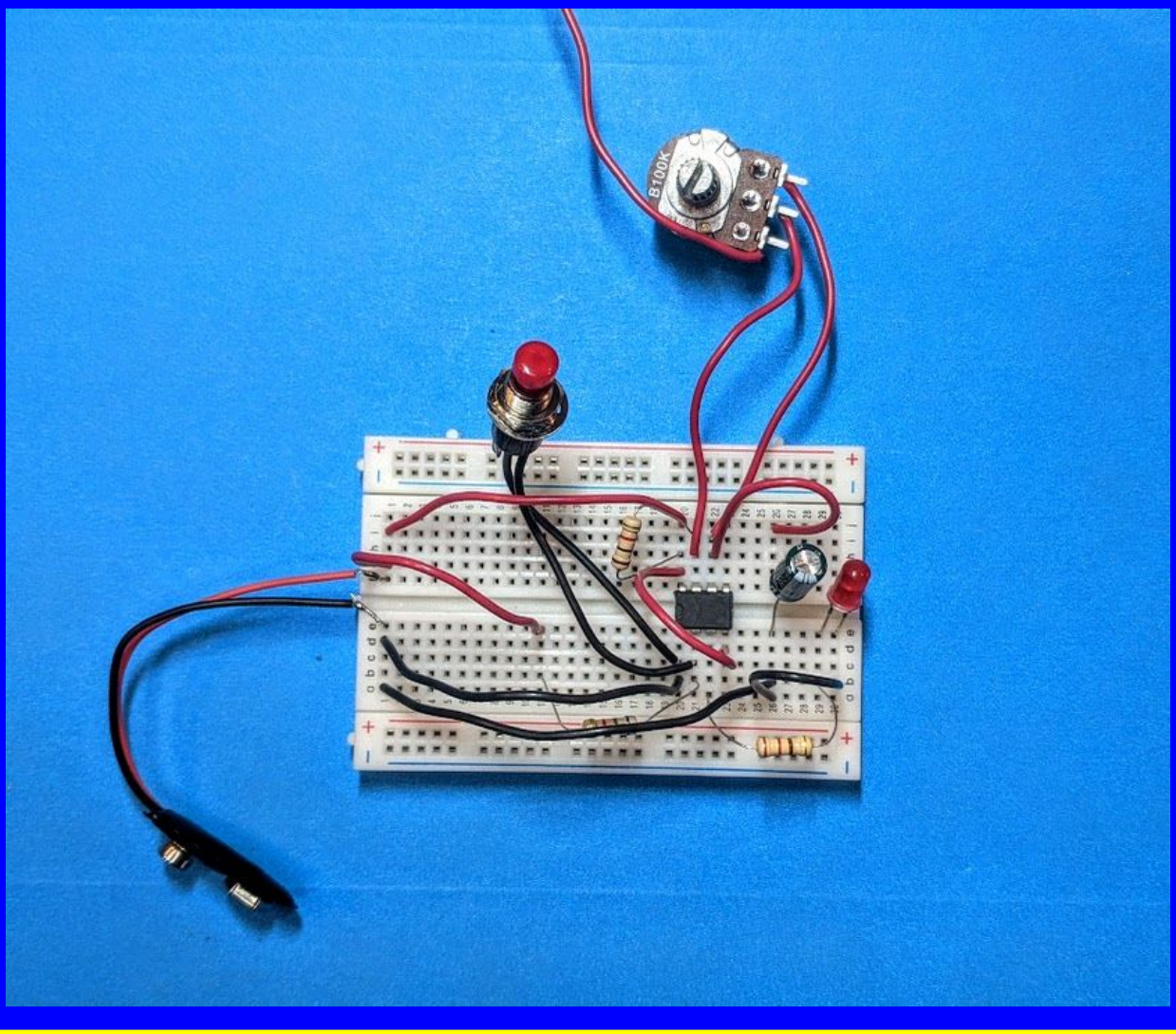
A. R3
B. C1
C. R1
D. the LED

A **(B)** C D

(Form SQAK23)

BUILD A BETTER FUTURE by UNDERSTANDING SCIENCE-ELECTRONICS

VARIABLE TIMER



BASIC ELECTRONICS LAB 1

"VARIABLE TIMER CIRCUIT"

(Poster MC1-23-P01)

For more info: www.MrCircuitTechnology.com MrCircuit23@gmail.com

Mr Circuit Technology

PRICE LIST

PRICE LIST

PARTS KIT Number	Mr Circuit Series 1 PARTS KITS FOR "LESSON PLANS"	Price Each
MC1-00-PK	Solderless Circuit Board to build kits	$3.95
MC1-01-PK	Parts Kit for "How a Resistor Works	$1.95
MC1-02-PK	Parts Kit for "How a Potentiometer Works	$2.95
MC1-03-PK	Parts Kit for "How a Photocell Works	$1.95
MC1-04-PK	Parts Kit for "How a Capacitor Works	$2.95
MC1-05-PK	Parts Kit for "How a Speaker Works	$2.95
MC1-06-PK	Parts Kit for "How a Diode Works	$1.95
MC1-07-PK	Parts Kit for "How an SCR Works	$3.95
MC1-08-PK	Parts Kit for "How an NPN Transistor Works	$2.95
MC1-09-PK	Parts Kit for "How a PNP Transistor Works	$2.95
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MC1-13-PK	Parts Kit for "Solar-Activated Night Light circuit	$3.95
MC1-14-PK	Parts Kit for "0 TO 9V DC Power Supply circuit	$2.95
MC1-15-PK	Parts Kit for "Electronic Metronome circuit	$4.95
MC1-16-PK	Parts Kit for "Electronic Motorcycle circuit	$3.95
MC1-17-PK	Parts Kit for "Railroad Lights circuit	$2.95
MC1-18-PK	Parts Kit for "Variable Speed Lights circuit	$3.95
MC1-19-PK	Parts Kit for "Continuity Tester circuit	$4.95
MC1-20-PK	Parts Kit for "Audio Generator circuit	$5.95
MC1-21-PK	Parts Kit for "Electronic Police Siren circuit	$4.95
MC1-22-PK	Parts Kit for "Solar-Activated Wake-Up Alarm circuit	$3.95
MC1-23-PK	Parts Kit for "Variable Timer circuit	$3.95
MC1-24-PK	Parts Kit for "Moisture Detector circuit	$2.95
MC1-25-PK	Parts Kit for "Code Oscillator circuit	$4.95
MC1-26-PK	Parts Kit for "Audible Water Detector circuit	$4.95
MC1-27-PK	Parts Kit for "English Police Siren circuit	$4.95
MC1-28-PK	Parts Kit for "Electronic Canary circuit	$7.95
MC1-29-PK	Parts Kit for "fantasy Space Machine Gun circuit	$5.95
MC1-30-PK	Parts Kit for "Ultrasonic Pest Repeller circuit	$5.95
MC1-SET-PK	**Complete Set of All Series 1 Parts Kits (31 total)**	**$120.00**