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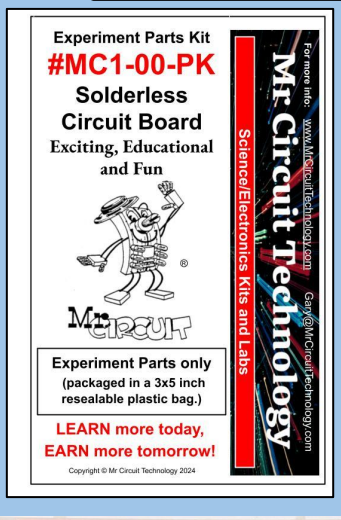
Mr Circuit Technology

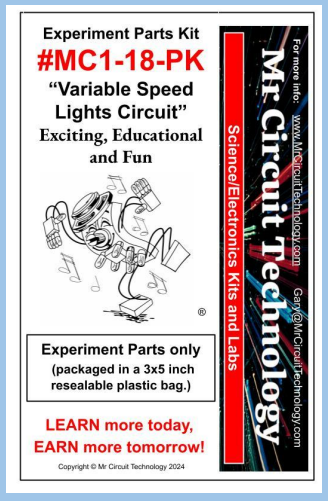
Science/Electronics Experiment Kits and Labs

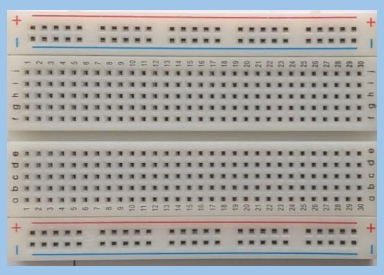
Exp. 18 - "VARIABLE SPEED LIGHTS CIRCUIT"

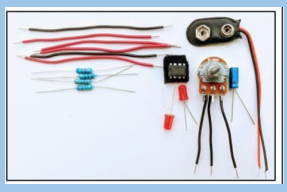


LESSON PLAN

Table of Contents







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 #MC1-18-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

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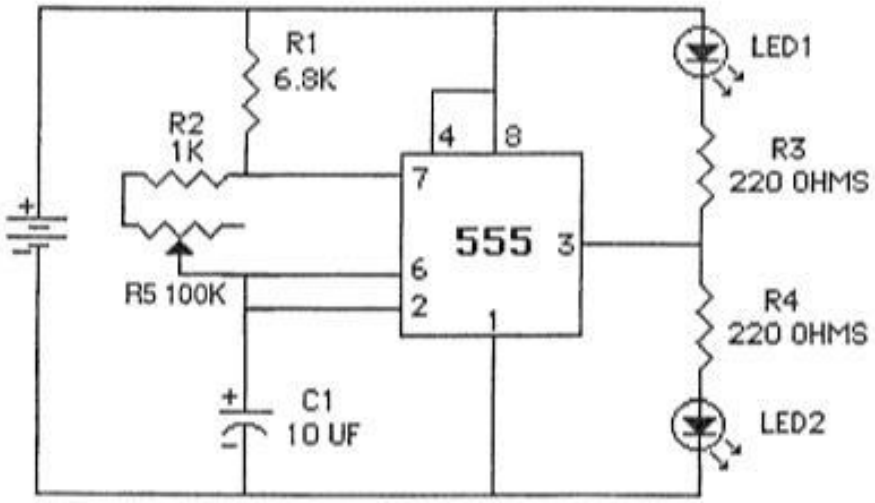
EXPLANATION OF EXPERIMENT part 1 of 2

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



This interesting circuit was invented by engineers who needed a circuit that would make lights **blink alternately** at a variable rate like disco lights.

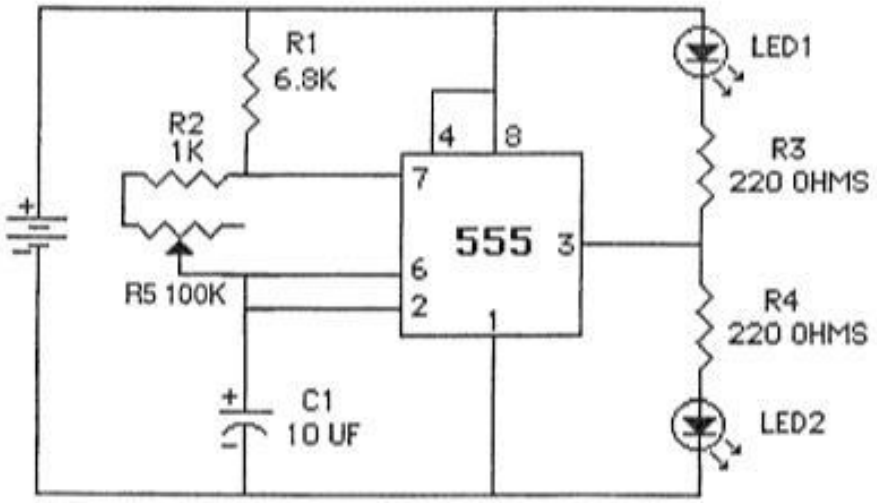
This circuit has two LEDs that turn on and off alternately which makes an interesting light display.

You can use this circuit for a variety of purposes including burglar alarms, etc.

(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 SPEED LIGHTS** circuit that you will build.



The 555 IC in this circuit is working as a **CLOCK** which means the 555 is putting out clock pulses. The **speed can be adjusted** by rotating the shaft of the potentiometer.

The two LEDs are connected with **opposite polarity** to Pin 3. When Pin 3 is positive, electrons will leave the battery and flow through LED2 to Pin 3. When Pin 3 is negative, electrons will leave Pin 3 and go through LED1 and flow to the positive terminal of the battery.

Note: When the Anode of an LED is connected the Positive and the Cathode is connected to the negative, then the LED is Forward-Biased and the LED will light up. If the LED is Reverse-Biased, it will not light up.

(Continue to Page 3)

MC1-18-R-3

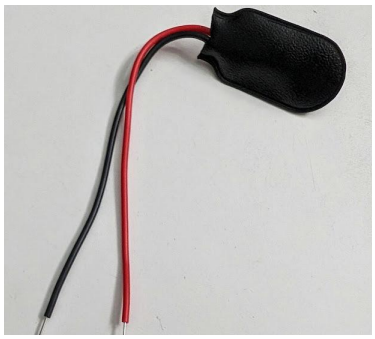
PURPOSE OF THIS EXPERIMENT

*** To build a VARIABLE SPEED LIGHTS circuit using a 555 Integrated circuit.

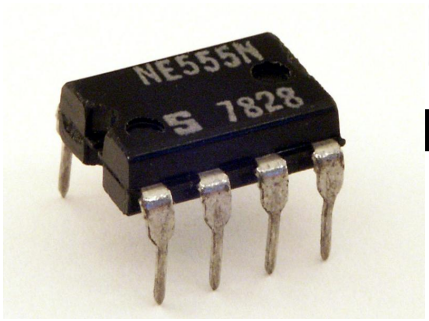
PARTS NEEDED FOR EXPERIMENT

In this experiment, you will use the following:

9-Volt Snap

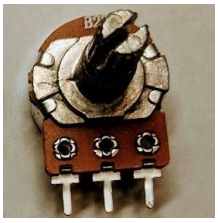


555 IC



2 LEDs

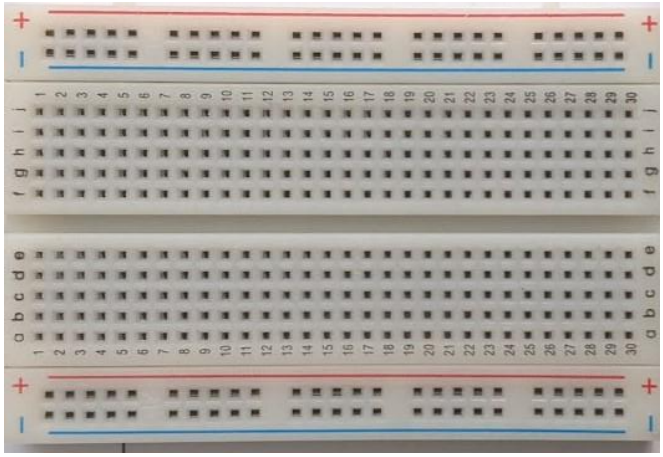
Potentiometer



4 fixed Resistors

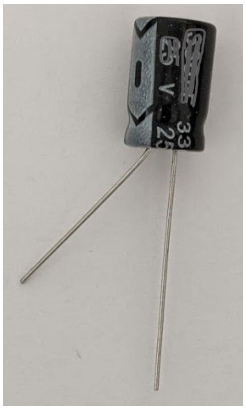
6 Jumper Wires

Solderless Circuit Board



9-V Battery

Radial Capacitor

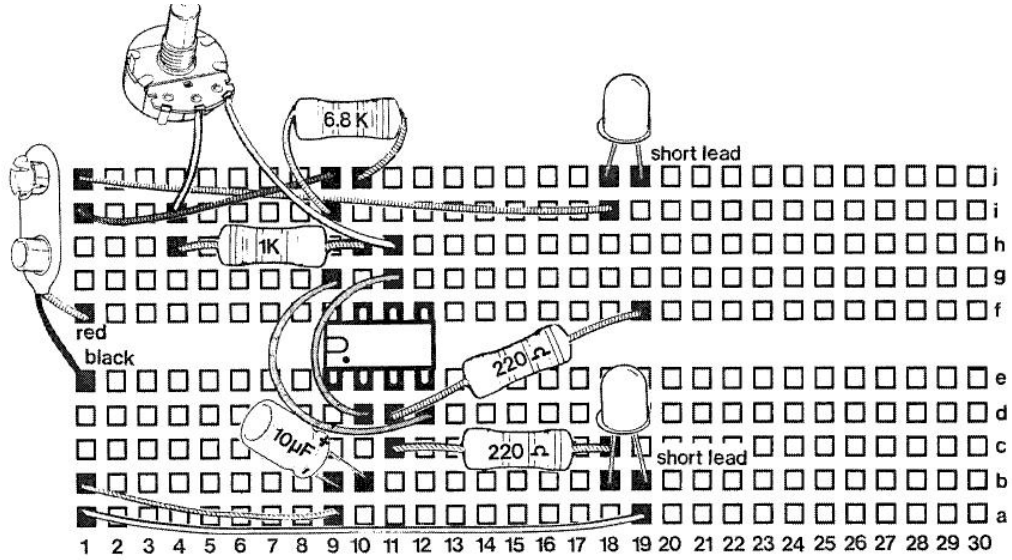


(Continue to Page 4)

DO THE EXPERIMENT (part 1 of 2)

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

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

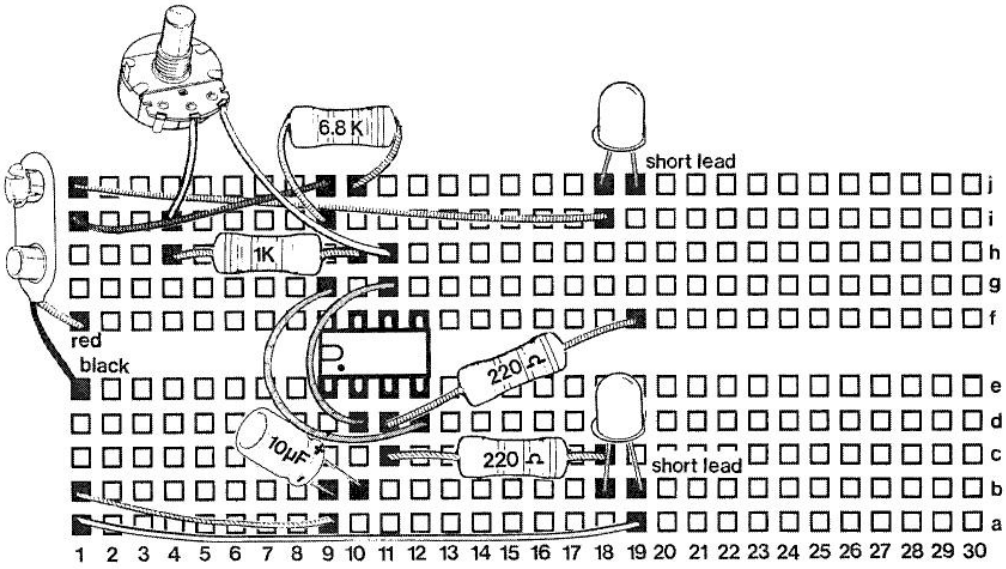


Step 2 - Install all the parts on the SCB as shown above.

- ❑ Install an LED with the Short Lead in hole 19j and the Long Lead in hole 18j
- ❑ Install an LED with the Short Lead in hole 19b and the Long Lead in hole 18b
- ❑ Install the 220 Ohm resistor (red, red, brown, gold) in holes 11c to 18c
- ❑ Install the 220 Ohm resistor (red, red, brown, gold) in holes 11d to 19f
- ❑ Install the 6800 (6.8k) Ohm resistor (blue, gray, red, gold) in holes 9i to 10j
- ❑ Install the 555 Timer IC with Pin 1 in hole 9e as shown in pictorial
- ❑ Install the 10uF Electrolytic Capacitor - Long lead in hole 10b, Short lead in 9b
- ❑ Install the Potentiometer, middle lead in 4i, edge in 11h
- ❑ Install Jumper Wire #1 in holes 1a to 19a
- ❑ Install Jumper Wire #2 in holes 1b to 9a
- ❑ Install Jumper Wire #3 in holes 1i to 9j
- ❑ Install Jumper Wire #4 in holes 1j to 18i
- ❑ Install Jumper Wire #5 in holes 9g to 12d
- ❑ Install Jumper Wire #6 in holes 10d to 11g
- ❑ 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. The LEDs should blink on and off and you can vary the rate of blinking by twisting the shaft of the potentiometer.

CONCLUSION

You should have observed that you can build a
VARIABLE SPEED LIGHTS circuit
with a
555 Integrated Circuit.

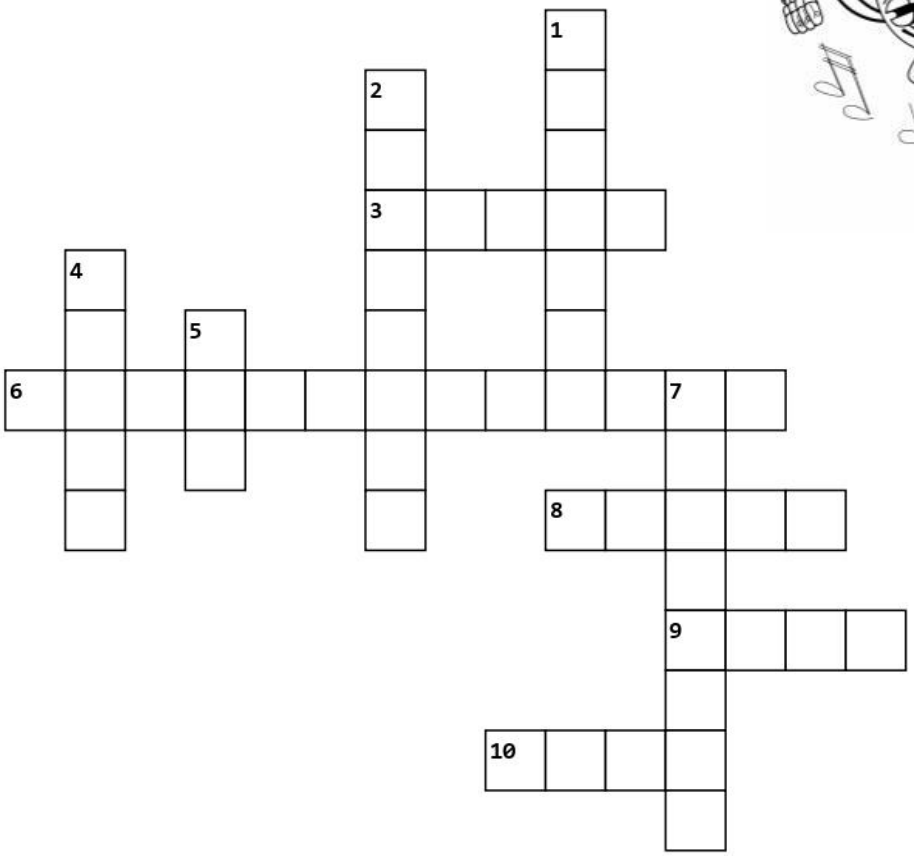
(End of Experiment 11)

Mr. CIRCUIT®

MC1-18-CW

CROSSWORD

Exp. 18 - "VARIABLE SPEED LIGHTS CIRCUIT"



Across

3. This circuit produces an interesting _____ light display.

6. We use a _____ to adjust the blinking rate.

8. The 555 Integrated Circuit has _____ pins.

9. How many volts does it take to power this circuit?

10. What is the color of the first band on the 6.8k Ohm resistor?

Down

1. The short lead on an LED is the _____ lead of the LED.

2. The LEDs in this circuit are connected in opposite _____ .

4. The 555 Integrated Circuit puts out _____ pulses.

5. What is the color of the first band on the 220 Ohm resistor?

7. The person who designed this circuit is called an _____ .

Mr. CIRCUIT®

MC1-18-WS

WORD SEARCH

Exp. 18 - "VARIABLE SPEED LIGHTS CIRCUIT"

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

1. The 555 is working as a variable speed _____ in this circuit.

2. This component is used to vary the speed of the blinking LEDs.

3. The long lead on an LED is the _____ lead.

4. The short lead on an LED is the _____ lead.

5. It take this amount of volts to run this circuit.

6. The 555 Integrated circuit puts out clock _____ .

7. The _____ of the battery is connected to Pin 1 of the 555 Integrated Circuit.

8. The _____ of the battery is connected to Pins 4 and 8 of the 555 Integrated Circuit.

9. There are two 220 Ohm resistors connected to Pin _____ of the 555 IC.

10. The LEDs in this circuit blink _____ .

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

QUIZ for Exp 18 or STEM KIT #18 in the Mr Circuit Electronics Training Lab 1

This Quiz covers the training learned by completing

"Build a Variable Speed Lights Circuit" Experiment 18

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 _____ working as a clock.

A. an NPN Transistor
B. a PNP Transistor
C. a 555 Timer IC
D. a Potentiometer

A B C D

#2 You can adjust the speed of the blinking lights by using _____ .

A. the Diode
B. the LED
C. the Potentiometer
D. the transistor

A B C D

#3 The two LEDs in this circuit are installed in _____ polarity.

A. the same
B. amplifying
C. dual
D. opposite

A B C D

#4 What is the value of the capacitor connected to Pin 2 of the 555 Timer IC in this circuit?

A. 1000uF
B. 330uF
C. 33uF
D. 10uF

A B C D

#5 If we reverse the polarity of the battery snap on the circuit, what will happen?

A. it will work just fine
B. the LED will burn out
C. you might destroy the 555 Timer IC
D. the LED will self-destruct

A B C D

#6 LED 1 is connect to pin 3 of the 555 Timer IC through _____ .

A. a 220 Ohm resistor
B. a 10uF capacitor
C. a 6.8k Ohm resistor
D. a 1k Ohm resistor

A B C D

#7 When this circuit is working, the LEDs will _____ .

A. remain on
B. remain off permanently
C. blink on and off alternately
D. get hot and self-destruct

A B C D

#8 When an LED is _____ it means that the Anode is positive and the Cathode is negative.

A. reverse-biased
B. will not turn on
C. forward biased
D. will change from Red to Green

A B C D

#9 When an LED is _____ it means that the Anode is negative and the Cathode is positive.

A. will change from Red to Green
B. forward-biased
C. will not turn on
D. reverse-biased

A B C D

#10 A Potentiometer is also known as _____ .

A. variable transistor
B. fixed capacitor
C. a variable resistor
D. fixed resistor

(Form SQ18)

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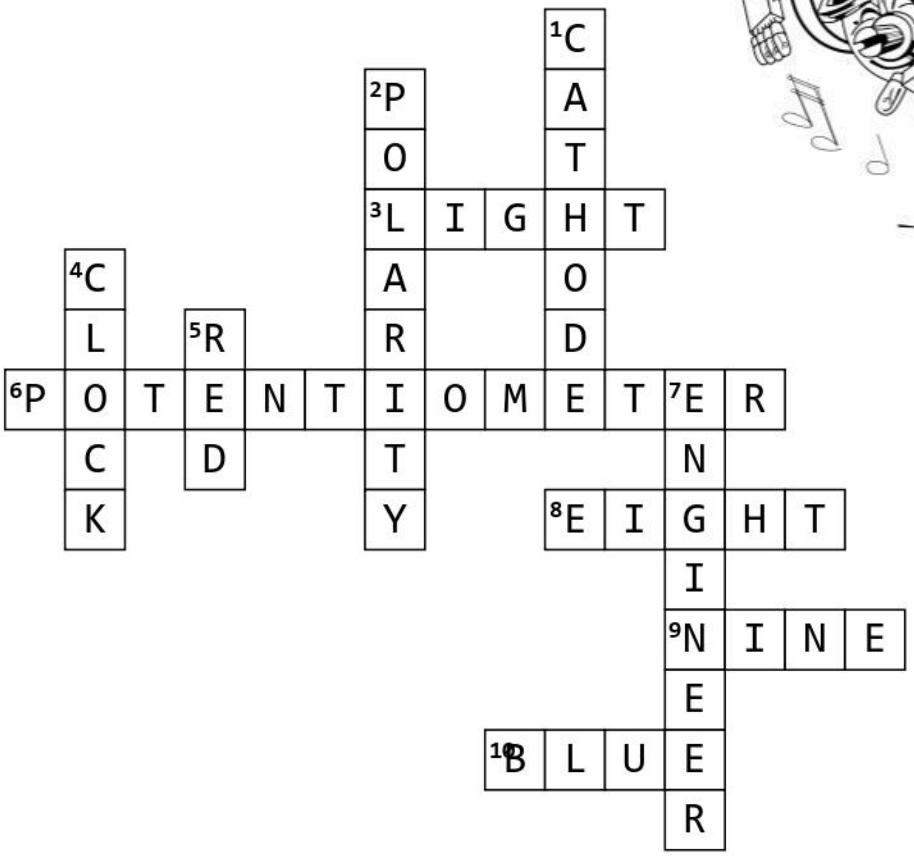
Score	

ANSWERS FOR CROSSWORD

Exp. 18 - "VARIABLE SPEED LIGHTS CIRCUIT"



Across

3. This circuit produces an interesting _____ light display.

6. We use a _____ to adjust the blinking rate.

8. The 555 Integrated Circuit has _____ pins.

9. How many volts does it take to power this circuit?

10. What is the color of the first band on the 6.8k Ohm resistor?

Down

1. The short lead on an LED is the _____ lead of the LED.

2. The LEDs in this circuit are connected in opposite _____ .

4. The 555 Integrated Circuit puts out _____ pulses.

5. What is the color of the first band on the 220 Ohm resistor?

7. The person who designed this circuit is called an _____ .

ANSWERS FOR WORD SEARCH

Exp. 18 - "VARIABLE SPEED LIGHTS CIRCUIT"

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

1. The 555 is working as a variable speed _____ in this circuit.

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7. The _____ of the battery is connected to Pin 1 of the 555 Integrated Circuit.

8. The _____ of the battery is connected to Pins 4 and 8 of the 555 Integrated Circuit.

9. There are two 220 Ohm resistors connected to Pin _____ of the 555 IC.

10. The LEDs in this circuit blink _____ .

QUICK-CHECK ANSWER KEY for Experiment 18 QUIZ
for Mr Circuit Electronics Training ("Variable Speed Lights")

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 _____ working as a clock.

A. an NPN Transistor
B. a PNP Transistor
C. a 555 Timer IC
D. a Potentiometer

A B C **(D)**

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A. the Diode
B. the LED
C. the Potentiometer
D. the transistor

A B C **(D)**

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A. the same
B. amplifying
C. dual
D. opposite

A B C **(D)**

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A. 1000uF
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A B **(C)** D

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B. the LED will burn out
C. you might destroy the 555 Timer IC
D. the LED will self-destruct

(A) B C D

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B. will not turn on
C. forward biased
D. will change from Red to Green

A B C **(D)**

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A. will change from Red to Green
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C. will not turn on
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A B **(C)** D

#10 A Potentiometer is also known as _____ .

A. variable transistor
B. fixed capacitor
C. a variable resistor
D. fixed resistor

(Form SQAK18)

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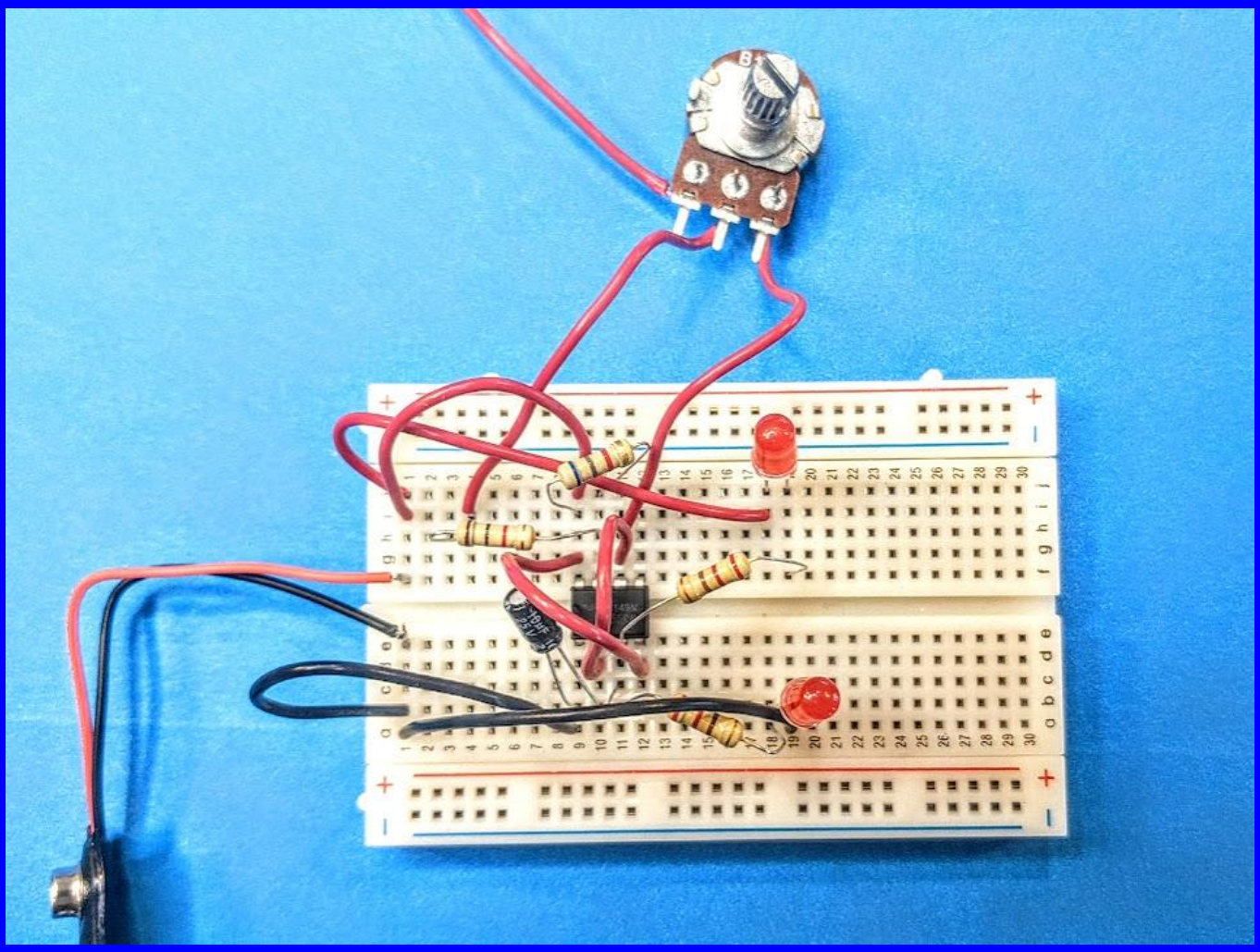
VARIABLE SPEED LIGHTS



BASIC ELECTRONICS LAB 1

"VARIABLE SPEED LIGHTS CIRCUIT"

(Poster MC1-18-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
MC1-10-PK	Parts Kit for "How a Transistor Oscillator Works	$3.95
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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
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MC1-24-PK	Parts Kit for "Moisture Detector circuit	$2.95
MC1-25-PK	Parts Kit for "Code Oscillator circuit	$4.95
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MC1-SET-PK	**Complete Set of All Series 1 Parts Kits (31 total)**	**$120.00**