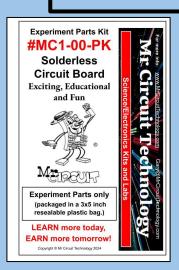
Exciting, Educational and Fun



Science/Electronics Experiment Kits and Labs

Exp. 18 - "VARIABLE SPEED LIGHTS CIRCUIT"



LESSON PLAN

Table of Contents

Page 01 - Explanation of the Experiment - part 1 of 2

Page 02 - Explanation of the Experiment - part 2 of 2

Page 03 - Purpose of the Experiment and Parts Needed

Page 04 - Do the Experiment (part 1 of 2)

Page 05 - Do the Experiment (part 2 of 2)

Page 06 - Crossword Puzzle

Page 07 - Word Search Puzzle

Page 08 - Written 10-Question Multiple Choice Quiz

Page 09 - Answers to Crossword

Page 10- Answers to Word Search

Page 11 - Answer Key to Written Quiz

Page 12 - Poster to put up on classroom wall

Page 13 - Price List for Parts Kits for your to order more. Send
Purchase Order to Gary@MrCircuitTechnology.com or order online at www.MrCircuitTechnology.com





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.

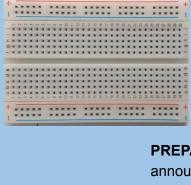
Step 2 - Hand out Parts Kit #MC1-00-PK (that has the Solderless Circuit Board) and Parts Kit #MC1-18-PK (that has the experiment parts) with a 9-Volt battery. Give these items to each student along with the 8 pages.

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



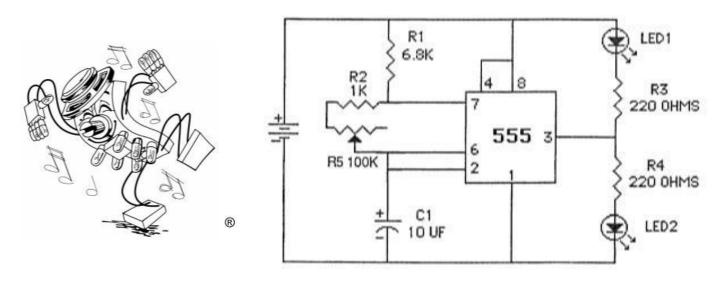




MC1-18-R-1

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.

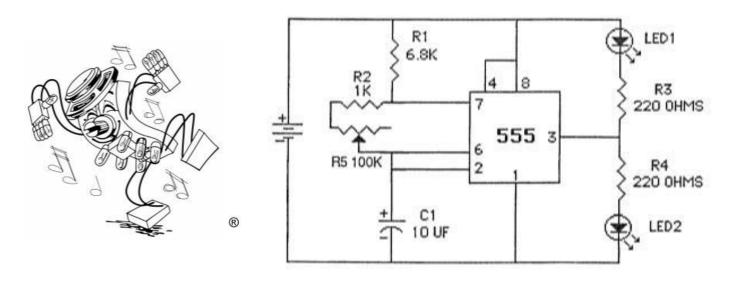
You can use this circuit for a variety of purposes including burglar alarms, etc.



MC1-18-R-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)

PURPOSE OF THIS EXPERIMENT

MC1-18-R-3

*** 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



2 LEDs



Potentiometer



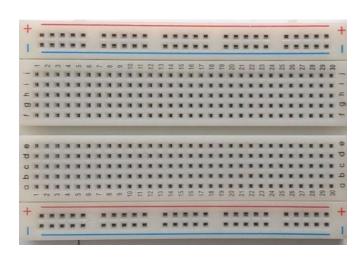
4 fixed Resistors



6 Jumper Wires



Solderless Circuit Board 9-V Battery





Radial Capacitor



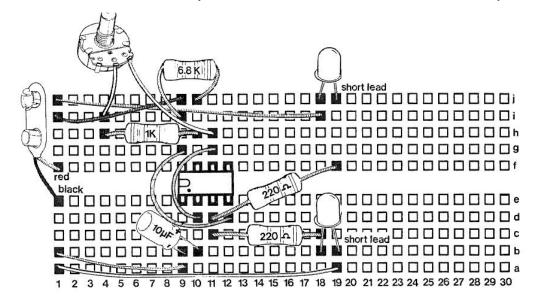
(Continue to Page 4)

DO THE EXPERIMENT (part 1 of 2)

MC1-18-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 19j and the Long Lead in hole	18j
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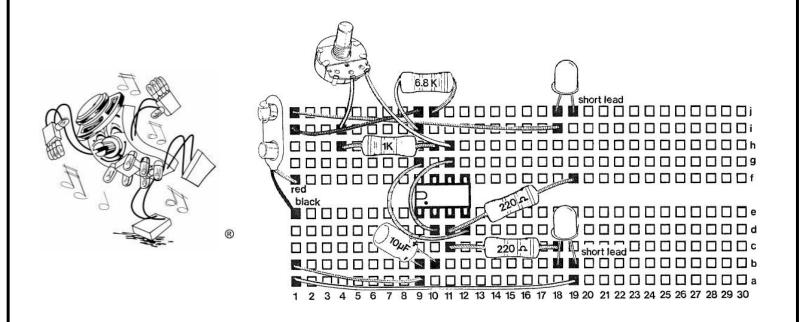
- Install an LED with the Short Lead in hole 19b and the Long Lead in hole 18b
- Install the 220 Ohm resistor (red, red, brown, gold) in holes 11c to 18c
- Install the 220 Ohm resistor (red, red, brown, gold) in holes 11d to 19f
- Install the 6800 (6.8k) Ohm resistor (blue, gray, red, gold) in holes 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)

(Page 5)

DO THE EXPERIMENT (part 2 of 2)

MC1-18-R-5



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.

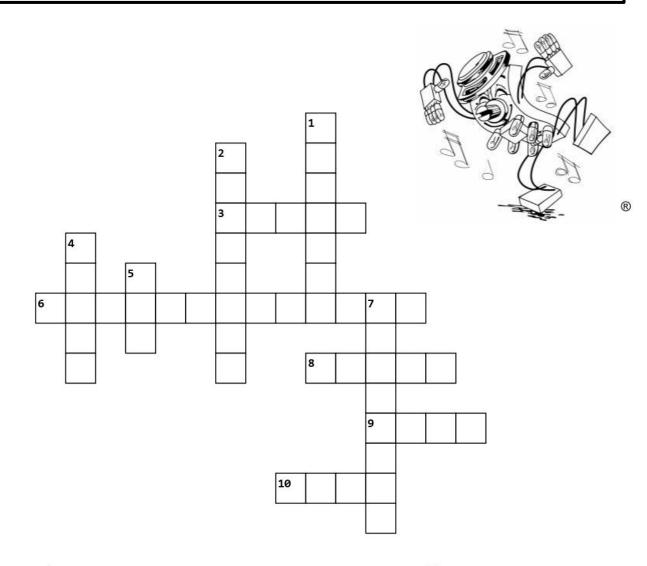
(End of Experiment 11)



CROSSWORD

(Page 6)

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 ______ .



WORD SEARCH

(Page 7)

Exp. 18 - "VARIABLE SPEED LIGHTS CIRCUIT"

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The 555 Integrated circuit puts out clock of the battery is connected to Pin 1 of the 555 integrated circuit puts out clock	Z K C F O Z L G O Q W L F W K Q X Z M R B P O T E N T I O M E T E R X E A T D R S F P O S I T I V E A J F N D E S L S T F O T M O D V E O M O B S X D F E L K E G Z I H X R D D O D M T W N E G A T I V E I K X E T R M E U F T H H O Y A J Y W T O K B D B C I Q G O U G M P Y V M O R R B D F W H K U O T V S A G R A K S K G F T X T Q J Z E W J K T W U D G S N J O F Z M Y M L N F G I X K H H E C P V K D W C J O G V V C A E F A Z U T W F I M N C F N O E U K N H X L D A Y O N U I P L I Y Q V U X B S D I J M G J V C T H R E E R N S E R X U Y L C H Y Y B V E P L Z H S J F C L A L S M K N N Z R S O I N K Q E D O H T U V G M L K Y N J L W T V V P L R . The short lead on an LED is the	Z K C F O Z L G O Q W L F W K Q X U Z M R B P O T E N T I O M E T E R F X E A T D R S F P O S I T I V E A P J F N D E S L S T F O T M O D V E L L E G Z I H X N N N D D D W N D D D W N D D D N N N D D D N D D D D D D D D D D D D D D </th <th>Z K C F O Z L G O Q W L F W K Q X U Q Z M R B P O T E N T I O M E T E R F V X E A T D R S F P O S I T I V E A P Y J F N D E S L S T F O T M O D V E L O O M O B S X D F E L K E G Z I H X N K R D D O D M T W N E G A T I V E I I K K X E T R M E U F T H H O Y A J Y N B W T O K B D B C I Q G O U G M P Y E F V M O R R B D F W H K U O T V S A V H G R A K S K G F T X T Q J Z E W J E V K T W U D G S N J O F Z M Y M L N G D F G I X K H H E C P V K D W C J O C X G V V C A E F A Z U T W F I M N C X Z F N O E U K N H X L D A Y O N U I Q P P L I Y Q V U X B S D I J M G J V R D C T H R E E R N S E R X U Y L C H A F Y Y B V E P L Z H S J F C L A L S B N M K N N Z R S O I N K Q E D O H T A C U V G M L K Y N J L W T V V P L R I U The 555 is working as a variable speed</th> <th>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 W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B C T B 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 . The 555 is working as a variable speed</th>	Z K C F O Z L G O Q W L F W K Q X U Q Z M R B P O T E N T I O M E T E R F V X E A T D R S F P O S I T I V E A P Y J F N D E S L S T F O T M O D V E L O O M O B S X D F E L K E G Z I H X N K R D D O D M T W N E G A T I V E I I K K X E T R M E U F T H H O Y A J Y N B W T O K B D B C I Q G O U G M P Y E F V M O R R B D F W H K U O T V S A V H G R A K S K G F T X T Q J Z E W J E V K T W U D G S N J O F Z M Y M L N G D F G I X K H H E C P V K D W C J O C X G V V C A E F A Z U T W F I M N C X Z F N O E U K N H X L D A Y O N U I Q P P L I Y Q V U X B S D I J M G J V R D C T H R E E R N S E R X U Y L C H A F Y Y B V E P L Z H S J F C L A L S B N M K N N Z R S O I N K Q E D O H T A C U V G M L K Y N J L W T V V P L R I U The 555 is working as a variable speed	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 W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B K T W U D G S N J O F Z M Y M L N G D J E V B C T B 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 . The 555 is working as a variable speed



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

(Page 8)

Score

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.

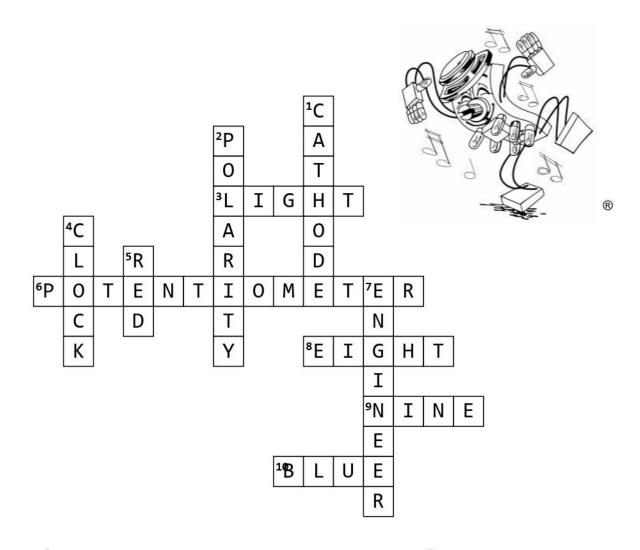
			^
A	#1 This circuit uses	#6 LED 1 is connect to pin 3 of the 555 Timer IC	A
, ,	working as a clock.	through	, ,
В			В
_	A. an NPN Transistor	A. a 220 Ohm resistor	
С	B. a PNP Transistor	B. a 10uF capacitor	С
	C. a 555 Timer IC	C. a 6.8k Ohm resistor	
D	D. a Potentiometer	D. a 1k Ohm resistor	D
	#2 Variable adjust the appeal of the blinking	#7\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
Α	#2 You can adjust the speed of the blinking	#7 When this circuit is working, the LEDs will	Α
_	lights by using	·	_
В	A the Diede	A remain on	В
_	A. the Diode	A. remain on	_
С	B. the LED	B. remain off permanently	С
D	C. the Potentiometer	C. blink on and off alternately	Ь
D	D. the transistor	D. get hot and self-destruct	D
Α	#3 The two LEDs in this circuit are installed in	#8 When an LED is it	Α
^	polarity.	means that the Anode is positive and the	^
В		Cathode is negative.	В
Ъ	A. the same	A. reverse-biased	Ъ
С	B. amplifying	B. will not turn on	С
•	C. dual	C. forward biased	•
D	D. opposite	D. will change from Red to Green	D
_			_
	## NA/Is at its the south of the source at all	#0.\\\\\-\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
Α	#4 What is the value of the capacitor connected	#9 When an LED is it	Α
_	to Pin 2 of the 555 Timer IC in this circuit?	means that the Anode is negative and the	_
В	A 4000vF	Cathode is positive.	В
_	A. 1000uF	A. will change from Red to Green	_
С	B. 330uF	B. forward-biased	С
_	C. 33uF	C. will not turn on	_
D	D. 10uF	D. reverse-biased	D
۸	#5 If we reverse the polarity of the battery snap	#10 A Potentiometer is also known as	Α
Α	on the circuit, what will happen?		$\overline{}$
В			В
ט	A. it will work just fine	A. variable transistor	ט
С	B . the LED will burn out	B. fixed capacitor	С
•	C. you might destroy the 555 Timer IC	C. a variable resistor	
D	D . the LED will self-destruct	D. fixed resistor	D
_			_
	(Form S	SQ18)	

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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

- The short lead on an LED is the lead of the LED.
 The LEDs in this circuit are connected in opposite _______.
 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 <u>alieknaleli</u> kmbkokbl	
ZKCFOZLGOQWLFWKQXUQR	
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	
JFN DESLSTFOTMODVELOK 3	2
OMOBSXDFELKEGZIHXNKA 🔎	F
RDDODMTWNEGATIVE)IIKR	NA PA
KXETRMEUFTHHOYAJYNBQ 🗿 🧖	7
W T O K B D B C I Q G O U G M P Y E F B	کے
VMORRBDFWHKUOTVSAVHE	9
GRAKSKGFTXTQJZEWJEVB	
KTWUDGSNJOFZMYMLNGDJ	
FGIX/BHHECPVKDWCJOCXX	
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/I/IYQVUXBSDIJMGJVRDS	
CTHREERNSERXUYLCHAFN	
Y Y B V E P L Z H S J F C L A L S B N O	
MKNNZRSOINKQŒDOHTAC)J	
UVGMLKYNJLWTVVPLRIUS	
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.	
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	
10. The LEDS III this chould billing.	

Mr Circuit Technology

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

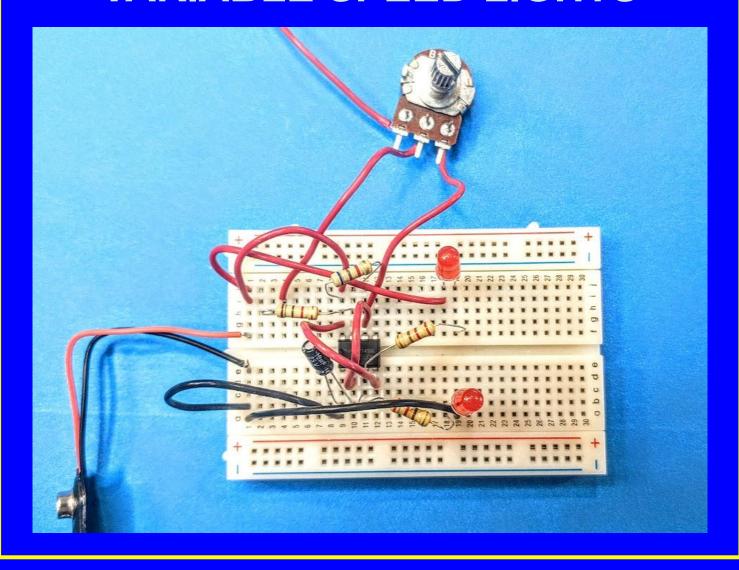
Place this sheet over top of the STUDENT QUIZ (offset a little to the left and then offset to the right) to compare the answers on this sheet to the answers that the student marked. Put an 'X' for each wrong answer.

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

in yo	our grade book.	Exploratory Hands On ELECTRONICS LAB #1101	
A	#1 This circuit uses working as a clock.	through	(A) B
B C D	 A. an NPN Transistor B. a PNP Transistor C. a 555 Timer IC D. a Potentiometer 	A. a 220 Ohm resistorB. a 10uF capacitorC. a 6.8k Ohm resistor	C D
A	#2 You can adjust the speed of the blinking lights by using	·	A
B C D	A. the DiodeB. the LEDC. the PotentiometerD. the transistor	A. remain on B. remain off permanently C. blink on and off alternately	B C D
A B C	#3 The two LEDs in this circuit are installed in polarity. A. the same B. amplifying C. dual D. opposite	means that the Anode is positive and the Cathode is negative. A. reverse-biased B. will not turn on C. forward biased	A B C D
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	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	A B C D
A B C	#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	A. variable transistor B. fixed capacitor C. a variable resistor	A B (C)
D	D. the LED will self-destruct	D. fixed resistor	D

BUILD A BETTER FUTURE by UNDERSTANDING SCIENCE-ELECTRONICS

VARIABLE SPEED LIGHTS



BASIC ELECTRONICS LAB 1

"VARIABLE SPEED LIGHTS CIRCUIT"

(Poster MC1-18-P01)

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PRICE LIST

PARTS KIT	Mr Circuit Series 1	Price
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