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Science/Electronics Experiment Kits and Labs


Exp. 12 - "BURGLAR ALARM CIRCUIT"

LESSON PLAN

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Experiment Parts Kit
#MC1-00-PK
 Solderless
 Circuit Board
 Exciting, Educational
 and Fun



Experiment Parts only
 (packaged in a 3x5 inch
 resealable plastic bag.)

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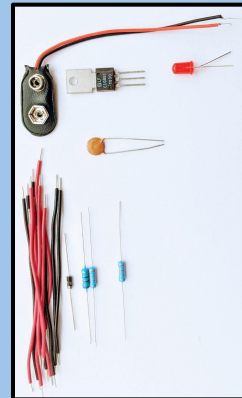
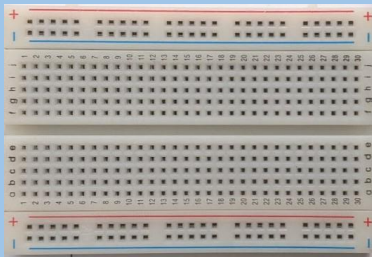
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PREPARATION: You can put the Page 12 poster up on your classroom wall to announce the fact that you are going to do the Science-Electronics Experiment.

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 #MC1-12-PK (that has the experiment parts) with a 9-Volt battery. Give these items to each student along with the 8 pages.

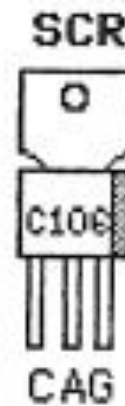
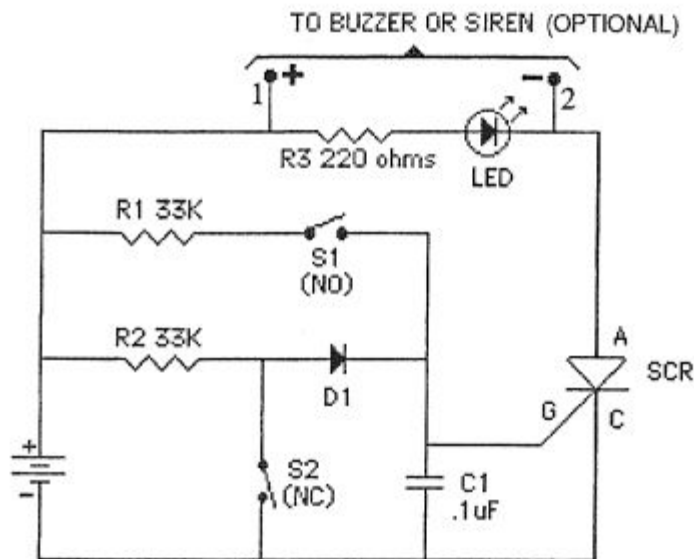
Step 3 - When your students have completed the experiment, collect all the Parts Kits and batteries for later use.

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 Burglar Alarm circuit that can be triggered by a Normally-Open switch as well as a Normally-Closed switch. Here is the SCHEMATIC DIAGRAM of the circuit you will build.



This circuit was invented by engineers who needed a circuit that would be able to sense either a switch opening up or a switch closing.

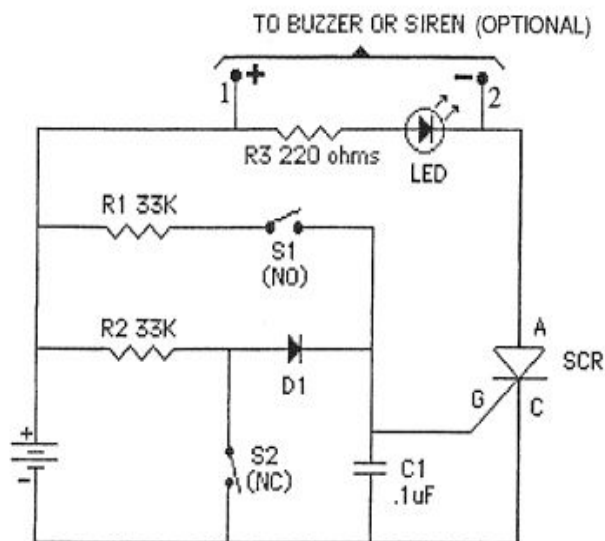
The LED in this circuit represents the ALARM. When the LED lights up, it means that the ALARM is 'sounding'. You can add a buzzer to this circuit so it will actually make a noise.

This circuit uses the unique property of an SCR which is that when an SCR is triggered to conduct, it will not stop conducting current until all power is removed from the whole circuit. That is to say, when the ALARM is set off, it will keep 'sounding' until the battery is removed from the circuit.

(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 BURGLAR ALARM circuit that you will build.



You will notice that this circuit has 3 resistors, a capacitor, a diode, an LED, a battery snap, and an SCR. In addition, you see on the schematic two switches. One is labeled Normally-Open and the other Normally-Closed.

Normally-Open means that the switch will not conduct current unless it is 'closed'. For example, when you turn on a lamp at home, you close a normally-open switch.

Normally-Closed means the switch is conducting current until it is 'opened'. On businesses, we glue metal foil on the windows so that if any window breaks the foil is cut and sets off the ALARM. The foil is used as a Normally-Closed switch.

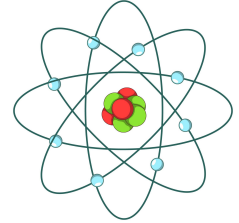
(Continue to Page 3)

PURPOSE OF THIS EXPERIMENT

MC1-12-R-3

*** To BUILD A BURGLAR ALARM CIRCUIT USING AN SCR.

PARTS NEEDED FOR EXPERIMENT



In this experiment, you will use

a BATTERY SNAP



an SCR



an LED



DIODE



220 Ohm resistor



33k Ohm resistor



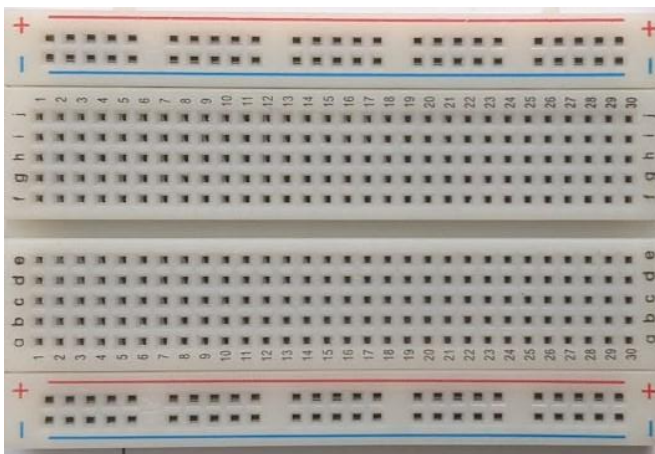
33k Ohm resistor



10 Jumper Wires



a SOLDERLESS CIRCUIT BOARD



a 0.1uF capacitor



You will also need a good 9 Volt battery

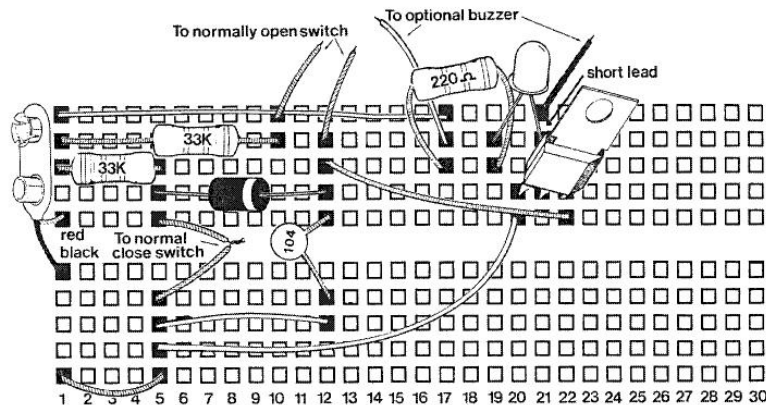
(Continue to Page 4)

DO THE EXPERIMENT (part 1 of 2)

MC1-12-R-4

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

Step 1 - Take out all the parts needed and a Solderless Circuit Board and 9-Volt battery.



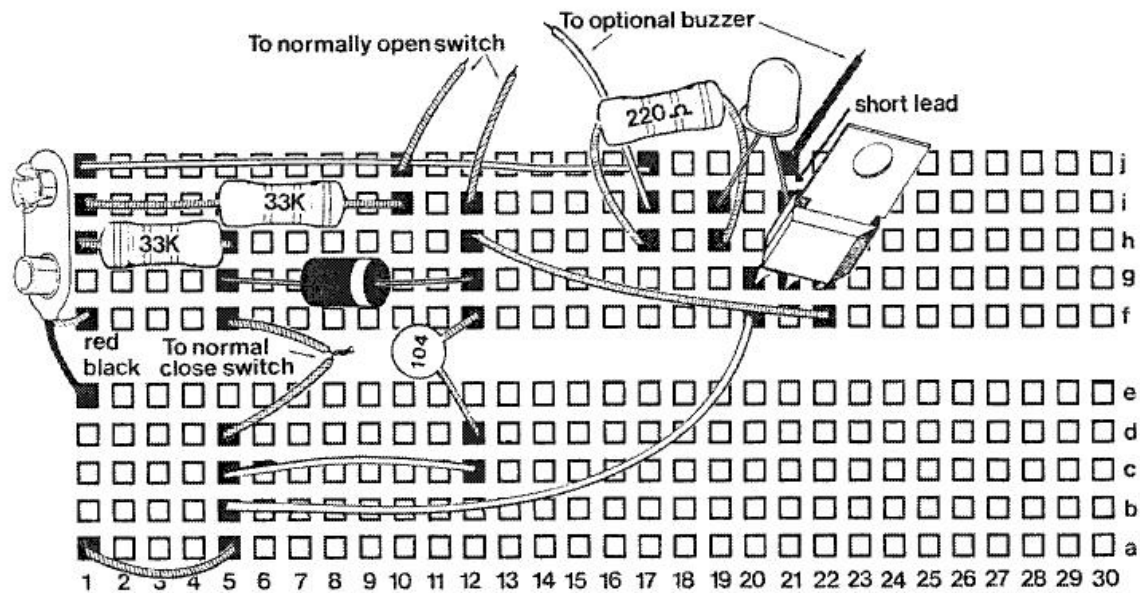
Step 2 - Install all the parts on the Solderless Circuit Board in this order. Check them off as you go.

- Install an LED with the Short Lead in hole 21i and the Long Lead in hole 19i
- Install the 220 Ohm resistor (red, red, brown, gold) in holes 17h to 19h
- Install the 33k Ohm resistor (blue, gray, red, gold) in holes 1h to 5h
- Install the 33k Ohm resistor (brown, blue, orange, gold) in holes 1i to 10i
- Install the SCR with the Cathode in hole 20g, Anode 21g, Gate in hole 22g
- Install the 0.1uF(104) disc Capacitor in holes 12d to 12f
- Install the Diode - Cathode in hole 12g, Anode in hole 5g
- Install Jumper Wire #1 in holes 1j to 17j
- Install Jumper Wire #2 in holes 5d to loose end
- Install Jumper Wire #3 in holes 5f to loose end
- Install Jumper Wire #4 in holes 5c to 12c
- Install Jumper Wire #5 in holes 1a to 5a
- Install Jumper Wire #6 in holes 5b to 20f
- Install Jumper Wire #7 in holes 12h to 22f
- Install Jumper Wire #8 in holes 10j to loose end
- Install Jumper Wire #9 in holes 12i to loose end
- 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)

MC1-12-R-5



Step 3 - "Connect the battery to the Battery Snap. You should NOT see the LED turn on. It should remain off until you touch the Normally-Open switch wires together or until you open the Normally-Closed switch wires.

Once you turn on the LED, (which means you have 'triggered' the ALARM), the LED will not turn off until you disconnect the battery from the circuit.

CONCLUSION

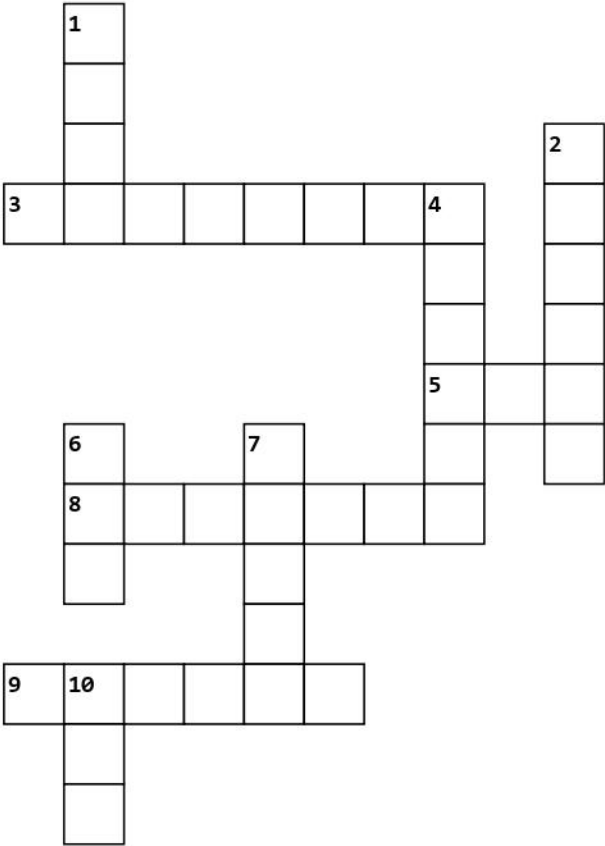
You should have observed that you can build a burglar alarm using an SCR. This alarm circuit has two types of switches, a Normally-Open and a Normally-Closed switch.

This alarm circuit can be used to protect automobiles, homes, and businesses.

(End of Experiment 11)

CROSSWORD

Experiment 12 - "Burglar Alarm Circuit"



Across

- 3.** The 220 Ohm _____ limits the current flowing through the LED.
- 5.** How many capacitors do we use in this circuit?
- 8.** Diode D1 in this circuit has its _____ connected to the GATE of the SCR.
- 9.** Switch S2 in this circuit is a normally-_____ switch.

Down

- 1.** To "trigger" this alarm circuit, we have to put a small positive voltage on the _____ of the SCR.
- 2.** You could connect a _____ to this circuit.
- 4.** To turn off this alarm, you have to _____ the power from the circuit.
- 6.** The negative of the battery is connected directly to the CATHODE of the SCR.
- 7.** How many pins are there on the SCR that we use in this circuit?
- 10.** When the _____ is lit, it indicates that this alarm has been "tripped".

Experiment 12 - "Burglar Alarm Circuit"

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

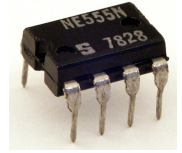
1. To turn off this alarm, you have to _____ the power from the circuit.
2. When the _____ is lit, it indicates that this alarm has been "tripped".
3. The 220 Ohm _____ limits the current flowing through the LED.
4. How many capacitors do we use in this circuit?
5. How many pins are there on the SCR that we use in this circuit?
6. To "trigger" this alarm circuit, we have to put a small positive voltage on the _____ of the SCR.
7. Switch S2 in this circuit is a normally-_____ switch.
8. Diode D1 in this circuit has its _____ connected to the GATE of the SCR.
9. You could connect a _____ to this circuit.
10. The negative of the battery is connected directly to the CATHODE of the SCR.



QUIZ for Exp 12 or STEM KIT #12 in the Mr Circuit Electronics Training Lab 1

This Quiz covers the training learned by completing

“Build a Burglar Alarm Circuit” Experiment 12



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

- A
B
C
D

#1 How do you turn off this alarm once it is tripped?
A. touch a negative voltage to the Gate
B. open the normally-open switch
C. remove power from the circuit
D. close the normally-closed switch

#6 When the 33k Ohm resistor is connected to the Gate, what happens?
A. the alarm is turned off
B. the alarm is triggered
C. the alarm is reset
D. nothing

- A
B
C
D

- A
B
C
D

#2 What item in this alarm circuit indicates that the alarm has been tripped?
A. the LED
B. the Diode
C. the SCR
D. the resistor

#7 The cathode of the LED is connected to what pin on the SCR?
A. the Gate
B. the Cathode
C. the Emitter
D. the Anode

- A
B
C
D

- A
B
C
D

#3 Which component limits the current flowing through the LED?
A. the SCR
B. the 220 ohm resistor
C. the Diode
D. the 0.1 disc capacitor

#8 How many pins are there on an SCR.
A. 1
B. 2
C. 3
D. 4

- A
B
C
D

- A
B
C
D

#4 To trigger the alarm, which lead on the SCR has to receive a small positive voltage?
A. EMITTER
B. CATHODE
C. ANODE
D. GATE

#9 In this circuit, there are how many switches to trigger the alarm circuit?
A. 1
B. 2
C. 3
D. 5

- A
B
C
D

- A
B
C
D

#5 Where would you connect a buzzer to this alarm circuit?
A. across R3 and the LED
B. across R1 and S1
C. across R2 and D1
D. across the SCR

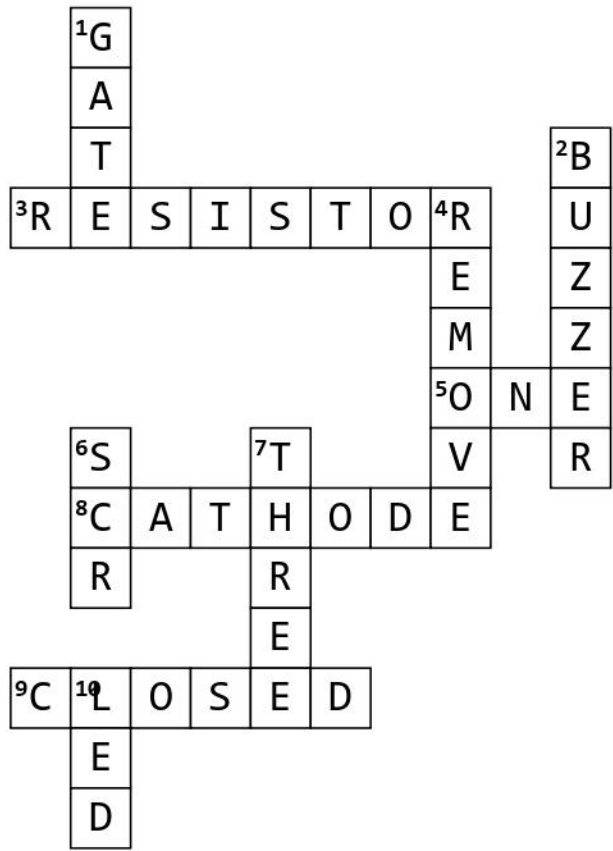
#10 How many capacitors do we use in this circuit?
A. 3
B. 2
C. 1
D. 4

- A
B
C
D

Score []

ANSWERS FOR CROSSWORD

Experiment 12 - "Burglar Alarm Circuit"



Across

- 3. The 220 Ohm _____ limits the current flowing through the LED.
- 5. How many capacitors do we use in this circuit?
- 8. Diode D1 in this circuit has its _____ connected to the GATE of the SCR.
- 9. Switch S2 in this circuit is a normally-_____ switch.

Down

- 1. To "trigger" this alarm circuit, we have to put a small positive voltage on the _____ of the SCR.
- 2. You could connect a _____ to this circuit.
- 4. To turn off this alarm, you have to _____ the power from the circuit.
- 6. The negative of the battery is connected directly to the CATHODE of the SCR.
- 7. How many pins are there on the SCR that we use in this circuit?
- 10. When the _____ is lit, it indicates that this alarm has been "tripped".

ANSWERS FOR WORD SEARCH

Experiment 12 - "Burglar Alarm Circuit"

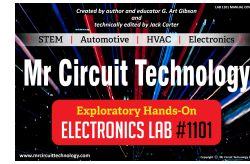
V N R G I Y S I T D T O H M N U M P B K
 F E E V T K Q R A C A T H O D E C J R F
 F D S Q R M Z Y P B B S V N Y K L F X J
 B L X Y S P Z U M X V D B P B A O H P P
 B W R E W W S T V L P D K M A I S H X P
 H I Q H C R C Z R E O Z U Y G M E B R W
 U B Q Q H B V D N D N F T F Q D D Q D I
 U Z Y B I U Y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

1. To turn off this alarm, you have to _____ the power from the circuit.
2. When the _____ is lit, it indicates that this alarm has been "tripped".
3. The 220 Ohm _____ limits the current flowing through the LED.
4. How many capacitors do we use in this circuit?
5. How many pins are there on the SCR that we use in this circuit?
6. To "trigger" this alarm circuit, we have to put a small positive voltage on the _____ of the SCR.
7. Switch S2 in this circuit is a normally-_____ switch.
8. Diode D1 in this circuit has its _____ connected to the GATE of the SCR.
9. You could connect a _____ to this circuit.
10. The negative of the battery is connected directly to the CATHODE of the SCR.

**QUICK-CHECK ANSWER KEY for Experiment 12 QUIZ
for Mr Circuit Electronics Training (“Burglar Alarm”)**

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.

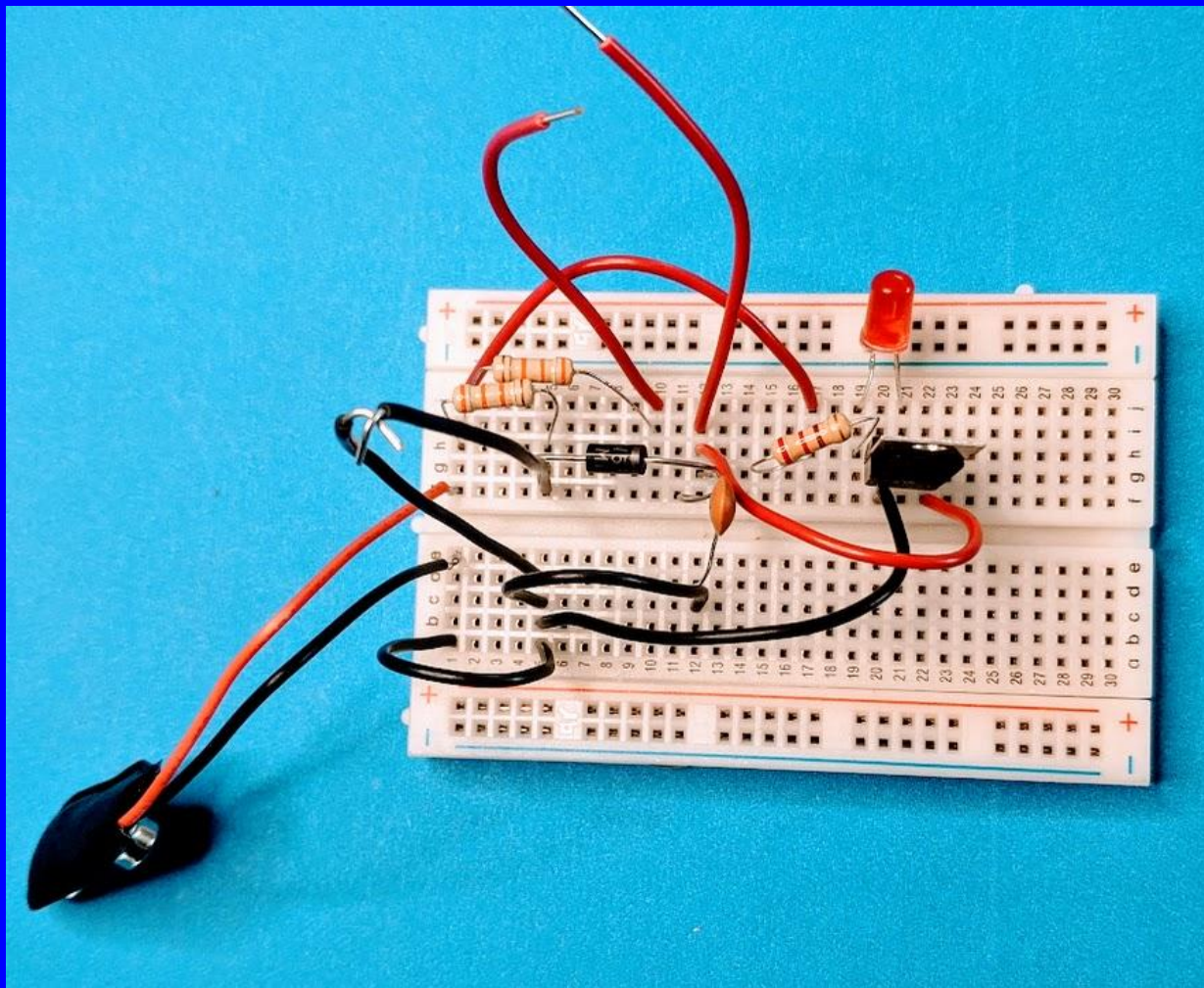
Count the right answers and record the score of right answers in your grade book.



<p>A B C D</p>	<p>#1 How do you turn off this alarm once it is tripped?</p> <p>A. touch a negative voltage to the Gate B. open the normally-open switch C. remove power from the circuit D. close the normally-closed switch</p>	<p>#6 When the 33k Ohm resistor is connected to the Gate, what happens?</p> <p>A. the alarm is turned off B. the alarm is triggered C. the alarm is reset D. nothing</p>	<p>A B C D</p>
<p>A B C D</p>	<p>#2 What item in this alarm circuit indicates that the alarm has been tripped?</p> <p>A. the LED B. the Diode C. the SCR D. the resistor</p>	<p>#7 The cathode of the LED is connected to what pin on the SCR?</p> <p>A. the Gate B. the Cathode C. the Emitter D. the Anode</p>	<p>A B C D</p>
<p>A B C D</p>	<p>#3 Which component limits the current flowing through the LED?</p> <p>A. the SCR B. the 220 ohm resistor C. the Diode D. the 0.1 disc capacitor</p>	<p>#8 How many pins are there on an SCR.</p> <p>A. 1 B. 2 C. 3 D. 4</p>	<p>A B C D</p>
<p>A B C D</p>	<p>#4 To trigger the alarm, which lead on the SCR has to receive a small positive voltage?</p> <p>A. EMITTER B. CATHODE C. ANODE D. GATE</p>	<p>#9 In this circuit, there are how many switches to trigger the alarm circuit?</p> <p>A. 1 B. 2 C. 3 D. 5</p>	<p>A B C D</p>
<p>A B C D</p>	<p>#5 Where would you connect a buzzer to this alarm circuit?</p> <p>A. across R3 and the LED B. across R1 and S1 C. across R2 and D1 D. across the SCR</p>	<p>#10 How many capacitors do we use in this circuit?</p> <p>A. 3 B. 2 C. 1 D. 4</p>	<p>A B C D</p>

BUILD A BETTER FUTURE by UNDERSTANDING SCIENCE-ELECTRONICS

A BURGLAR ALARM CIRCUIT

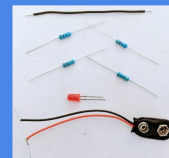


BASIC ELECTRONICS LAB 1

“A BURGLAR ALARM CIRCUIT”

(Poster MC1-12-P01)

(Page 12)



PRICE LIST May 2024

PARTS KIT	Mr Circuit Series 1	Price
Number	SCIENCE / ELECTRONICS "PARTS KITS"	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
MC1-11-PK	Parts Kit for "How a 555 Timer IC Works"	\$2.95
MC1-12-PK	Parts Kit for "Burglar Alarm circuit"	\$3.95
MC1-13-PK	Parts Kit for "Solar-Activated Night Light circuit"	\$3.95
MC1-14-PK	Parts Kit for "DC to 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
Set-MC1-PK	Complete Set of All Series 1 Parts Kits (31 total)	\$120.00

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