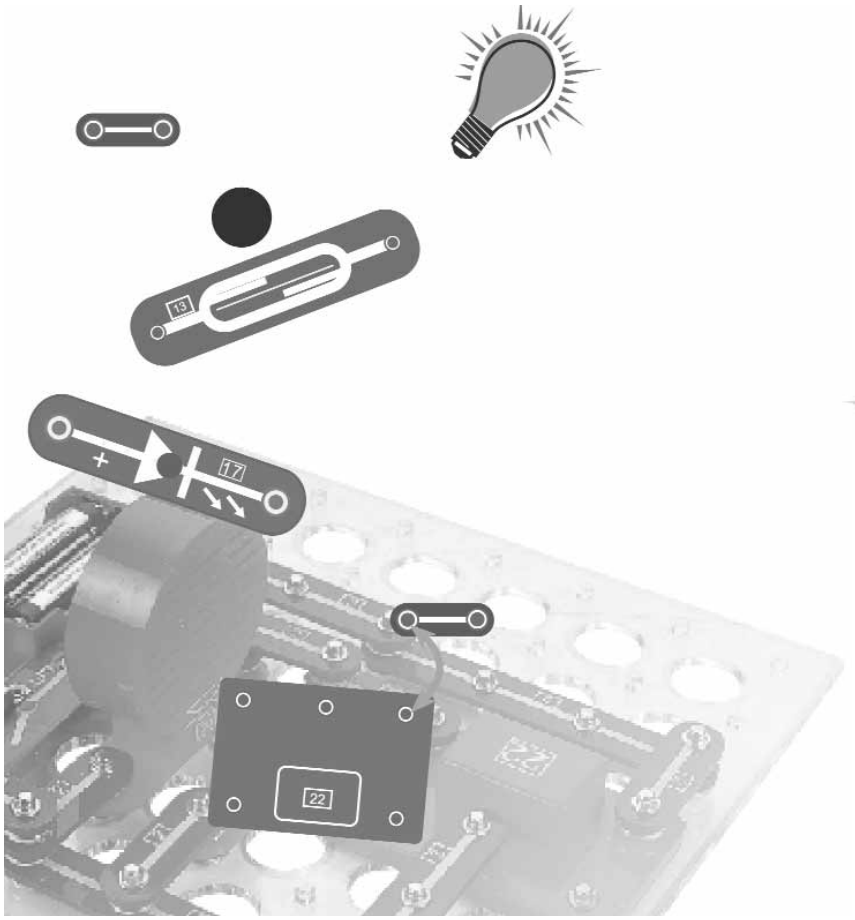
CONSTRUCTION C159



Preface

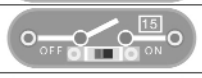
The Electronic Brain Box MINI88 is designed to teach the principles of electronics and is for use in the home or the classroom. It could be used to Key Stage 1 an 2 electronics.

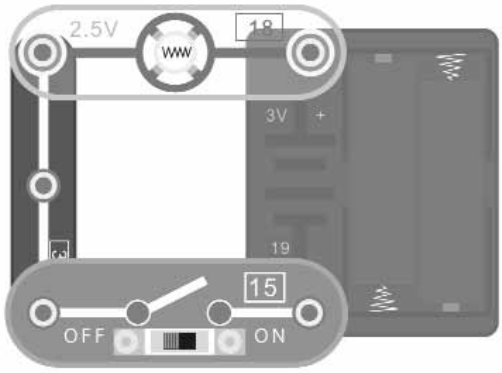
Students find the experiments stimulating and absorbing. It provides many hours of fun whilst learning the skills and concepts of electricity and electronics so necessary in today´s environment. The processof actually building the circuits provides a real understanding of how circuits work..

All the parts are designed for quick and easy assembly, components being connected together with press-studs.

Older children can increase their knowledge and understanding of electronics by designing their own circuits.

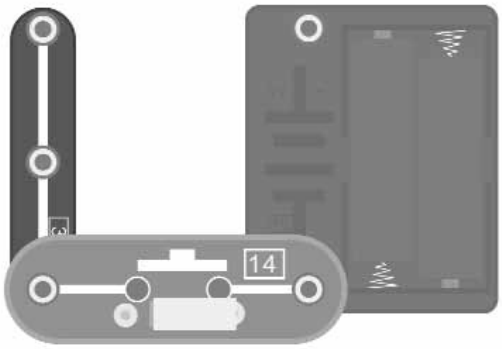
Parts list

N°	Description	Item	Quant.	N°	Description	Item	Quant.
1	One-Snap Connector		2	20	Speaker		1
2	Two-Snap Connector		6	22	Alarm IC Integrated Circuit)		1
3	Three-Snap Connector		3				
4	Four-Snap Connector		1	24	Motor		1
5	Five-Snap Connector		1		Magnet		1
13	Dry reed Switch		1		Yellow Fan		1
14	Press switch		1				
15	Slide switch		1				
17	Red LED (light emitting diode)		1				
18	2,5V lamp		1				
19	Battery Unit		2				

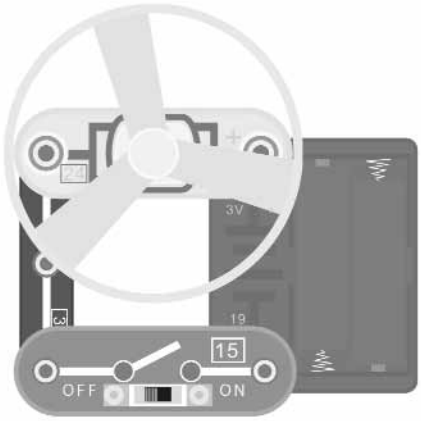


1. Lamp
   Close slide switch 15 and the lamp 18 will light up. Switch off and lamp 18 will go out.

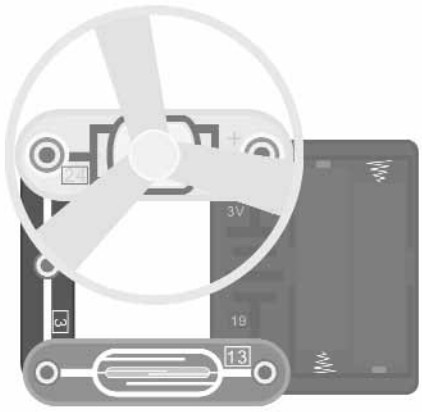
2. Magnet-controlled lamp
   Put a magnet near to dry reed switch 13, lamp 18 will light up. Put the magnet away from dry reed switch 13, lamp18 will go out.



3. Press switch controlled lamp
   Press the press switch 14, lamp 18 will light up.
   Release the press switch 14, lamp 18 will go out.

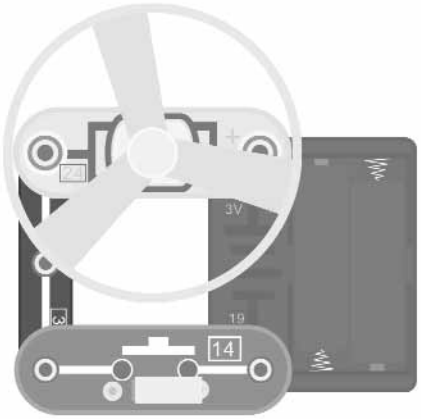


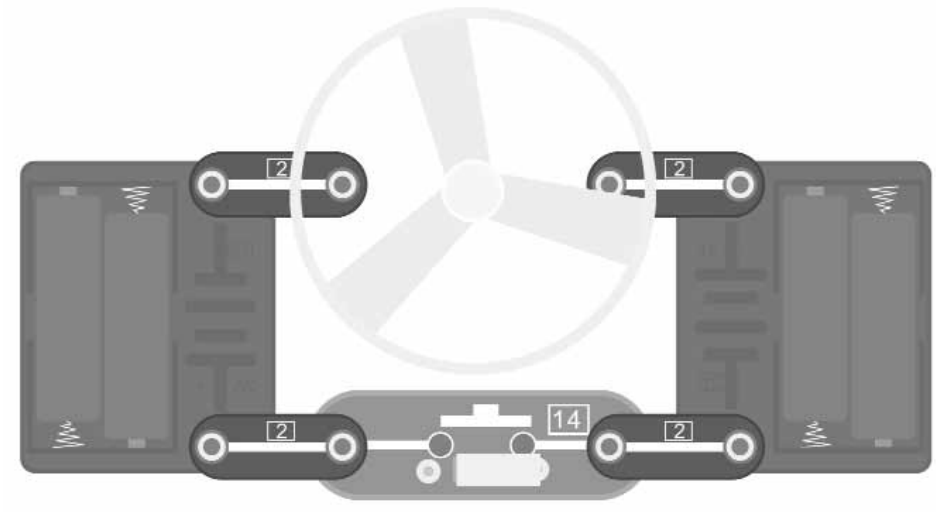
5. Magnet-controlled electric fan
   Place the yellow fan on the motor, bring a magnet close to the dry reed switch 13, the fan will spin round. Take the magnet away from dry reed switch 13 and the fan will stop rotating.



4. Electric fan
   Place the yellow fan on the motor, close the slide switch 15 and the fan will spin round.

6. Press switch controlled electric fan
   Place the yellow fan on the motor, press the press switch 14, the fan will rotate. Release the press switch 14, the fan will stop rotating.



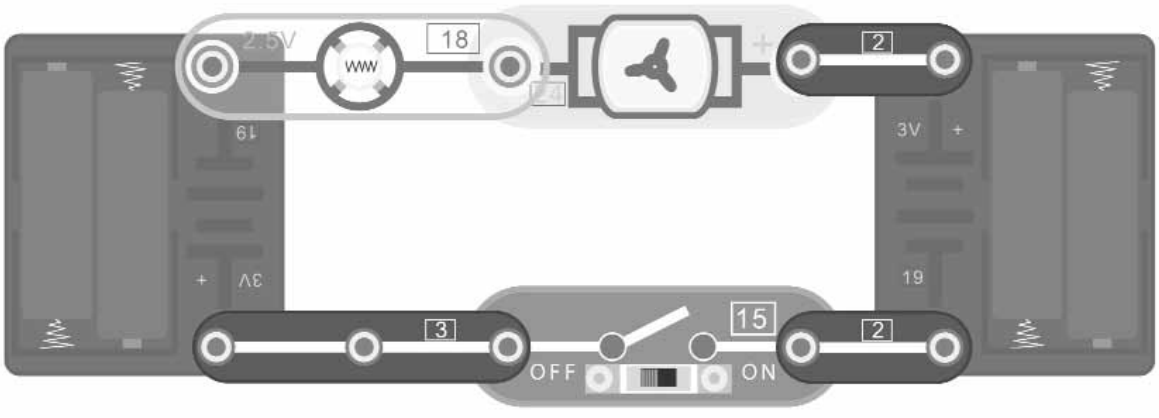


7. Flying fan
   Place the yellow fan on the motor, press the press switch 14, when the motor reaches its top speed, the dish will fly up into air. (Note: Keep your head out of the way!)

   Question: Why did the yellow fan fly into the air?

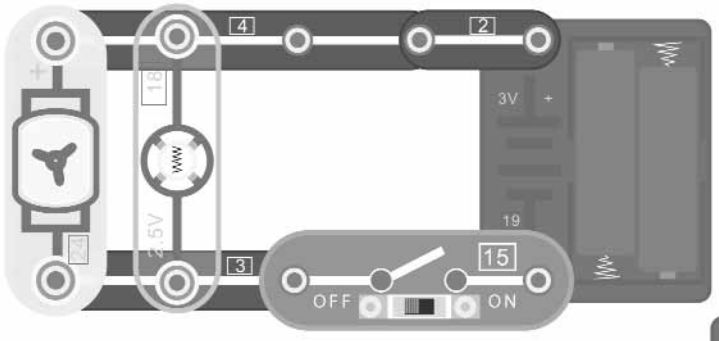
8. Magnet-controlled flying fan
   Replace the press switch 14 with dry reed switch 13, bring a magnet near to dry reed switch 13, when the motor reaches its top speed, the dish will fly up into air.
   (Note: Keep your head out of the way!)

9. Clockwise and anticlockwise rotation of an electric motor
   Replace the dry reed switch 13 with the press switch 14. Remove the electric motor 24, turn it round and replace it, press the press switch 14, you will see that the rotation of electric motor is reversed, the dish will not fly into air but becomes an electric fan blowing air upwards.



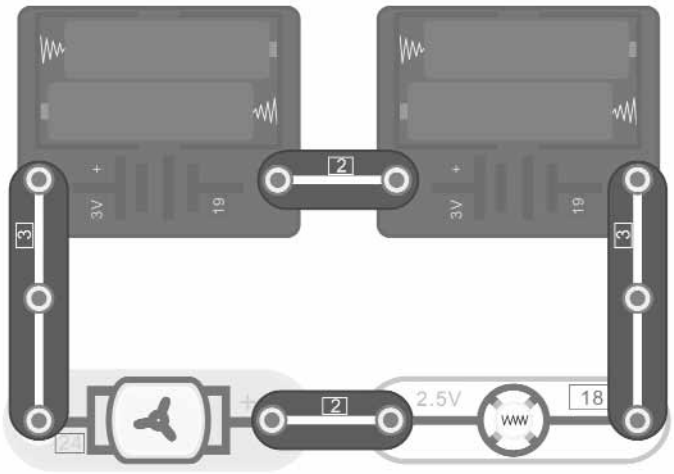
10. An electric motor an a lamp connected in series.
    Place the yellow fan on the motor, close the slide switch 15, the fan will begin to rotate an the lamp 18 will also light up. Switch off an the fan will stop rotating and the lamp 18 will also go out.

    Question: If the lamp is faulty, will the fan still rotate?



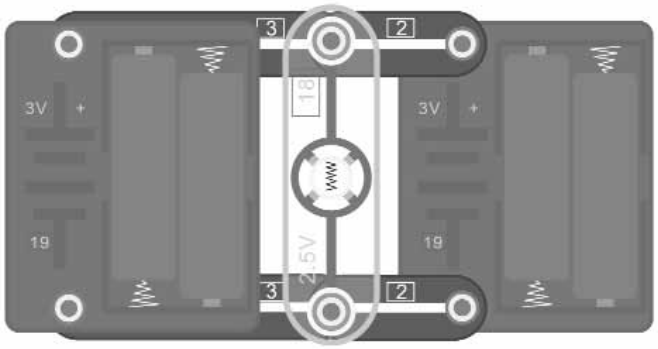
11. An electric motor an a lamp connected in parallel.
Place the yellow fan on the motor, close the slide switch 15, the fan will begin to rotate and the lamp 18 will also light up. Switch off, and the fan will stop rotating and the lamp 18 will also go out.

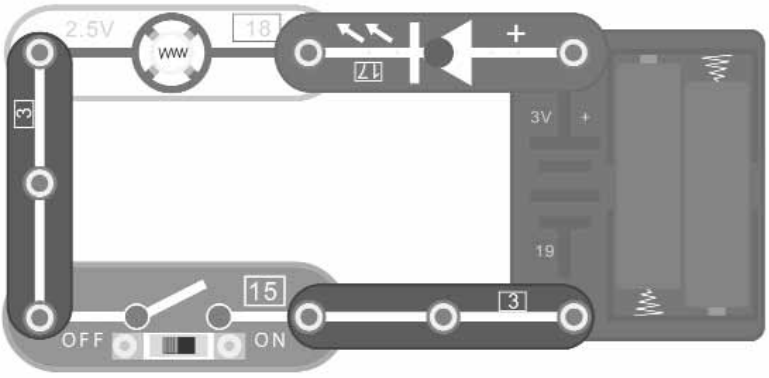
Question: If the lamp is faulty, will the fan still rotate?



12. Batteries connected in series.

Connect the positive terminal of one battery to negative terminal of another battery with a wire. This way, the batteries are connected in series and the total voltage is the sum of the two battery´s voltage. Both batteries have a voltage of 3 Volts, so the total voltage is 6 Volts.





13. Batteries connected in parallel.

Using two similar batteries, connect the two positive poles together and the two negative poles together.
In this parallel arrangement, the voltage will remain the same but it will lengthen the battery´s service life.

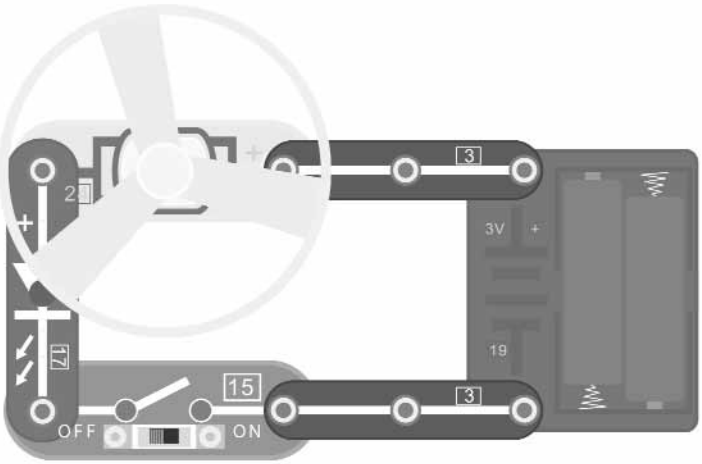
14. Using a LED (light emitting diode) LED´s require a resistor wired in series to prevent it burning out, you can see this on the underside of the LED.

Close the slide switch 15, the red LED 17 will light up.

15. Magnet-controlled LED

Replace the slide switch 15 with dry reed switch 13. Bring a magnet near to the dry reed switch 13, the
Red LED 17 will light up, take the magnet away, the red LED 17 will go out.

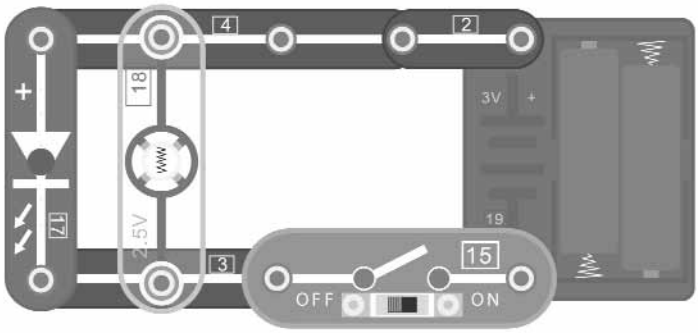
Question: Can you think of a use for this circuit?

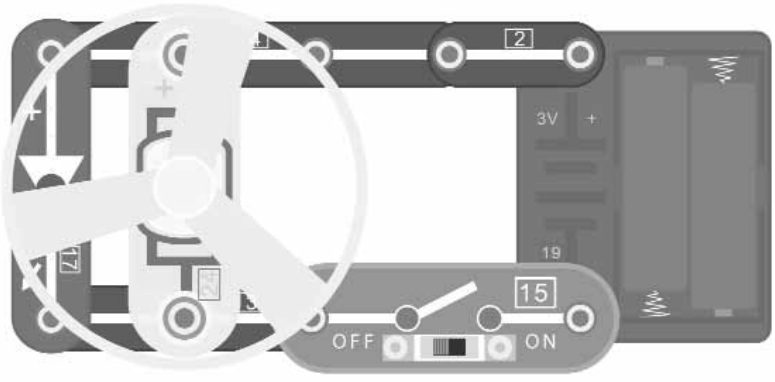


16. An LED and an electric fan connected in series.
Close the slide switch 15 and the red LED 17 will light up. The motor 24 will not rotate, because the
motor requires a large current and this is prevented by the LED. Compare this circuit 17.

17. An LED and a lamp connected in parallel.

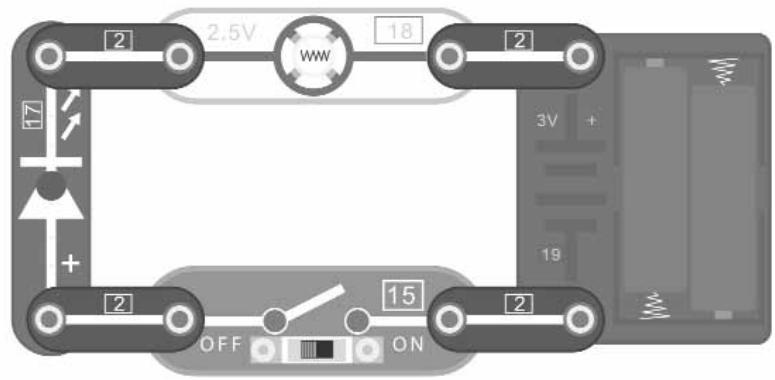
Close the slide switch 15, the red LED 17 and lamp will 18 light up at the same time.
If youf wish to have all the components working at the same time, then wire them in parallel and not in series.





18. An LED and an electric fan connected parallel.
Close the slide switch 15, the red LED 17 will light up and the fan will begin to rotate.

Question: If the LED is faulty, will the fan still rotate?

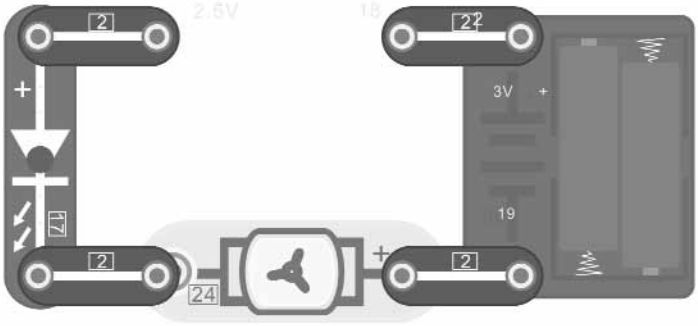


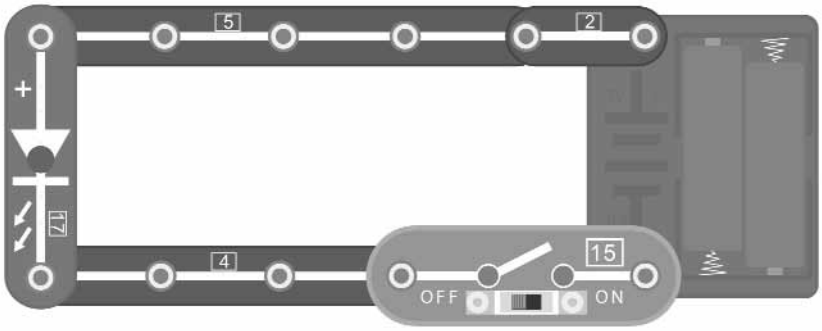
19. One-way conductivity of LED.

Close the slide switch 15, you will see that the red LED 17 will all not light up, this is because the LED wll only allow the current flow from positive to negative and not from negative to positive. To test this, turn the LED round.

20. Series connection of LED, lamp and electric motor

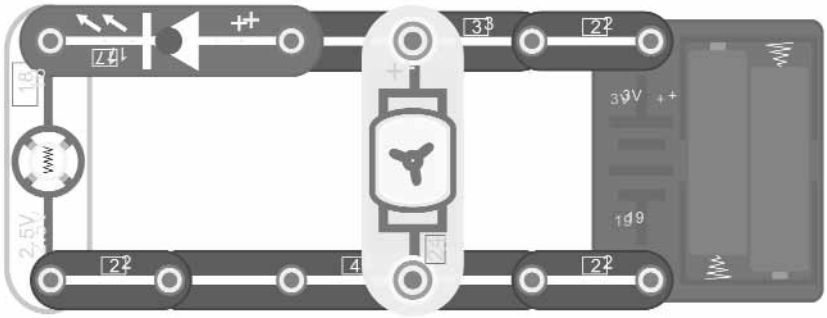
After connecting circuit, only red LED 17 lights up, the lamp 18 and motor 24 won´t work for small current.





21. An LED, lamp and electric motor connected in parallel.

Close the slide switch 15, the red LED 17 and the lamp 18 will light up and at the same time, the motor 24 will rotate. LED´s are often used as visual indicators to show that a circuit is switched on.

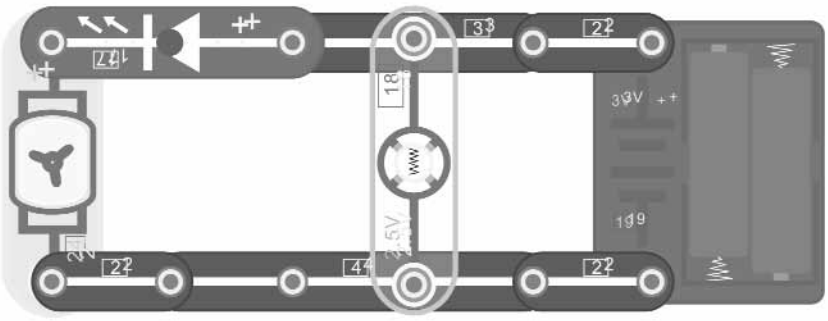


22. Series-parallel connection of LED, lamp and electric motor (1)

After connecting circuit, motor 24 begin to rotate, the red LED 17 will light up, but the lamp 18 won´t light up, this is because the lamp and LED are connected in series, current passing through the lamp is too small. After series connecting LED, the lamp also connects to motor in parallel, this calls connecting in series-parallel.

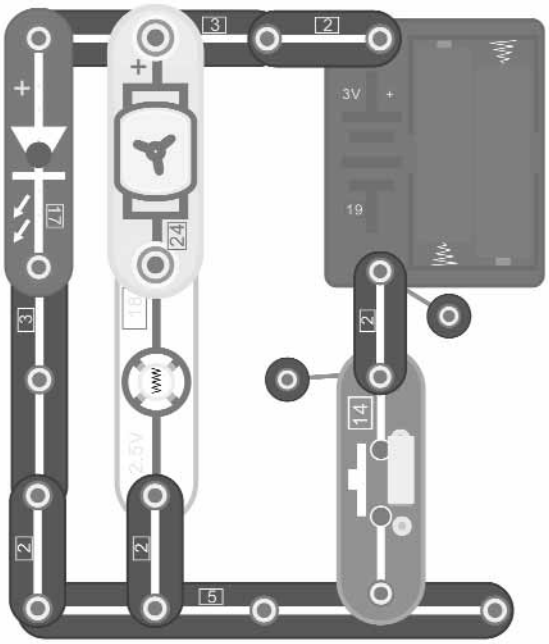
23. Series-parallel connection of LED, lamp and electric motor (2)

After connecting circuit, the lamp 18 and red LED 17 will light up, but the motor 24 won´t work, the principle as above.



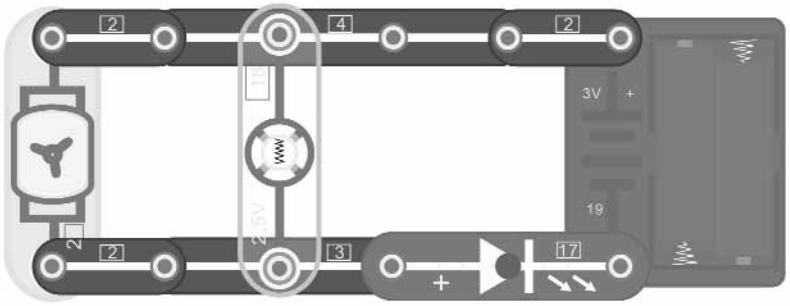
24. Series-parallel connection of LED, lamp and electric motor (3)

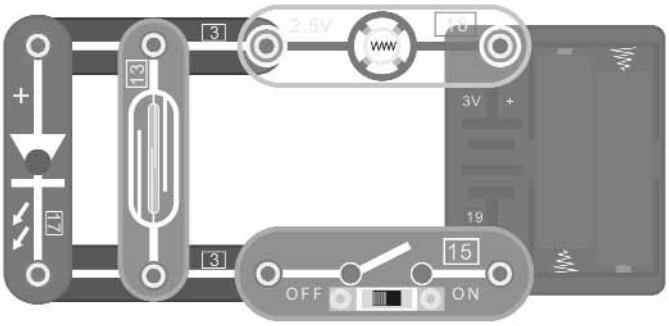
    Press the press switch 14, the red LED 17 and lamp 18 will light up, the motor 24 will also begin to rotate.



25. Series-parallel connection of LED, lamp and electric motor (4)

    After connecting circuit, only the red LED 17 will light up, the motor 24 and lamp 18 won´t work normally.





26. Switched Lamp and LED.

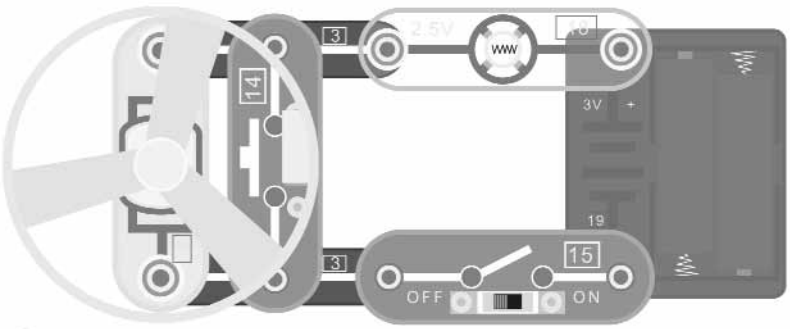
    Close the slide switch 15, only the red LED 17 will light up, put a magnet near to dry reed switch 13, the red LED 17 will go out and the lamp 18 will light up.

27. Electric fan and LED worked by turns

    Replace the lamp 18 with motor 24, operation as above.

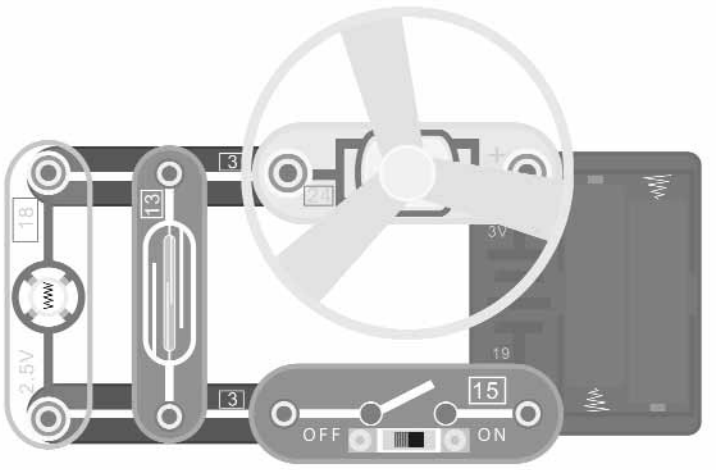
28. Switched lamp and motor.

    Close the slide switch 15, the lamp 18 will light up and the motor 24 will begin to rotate. Press the press switch 14, the motor will stop and the brightness of the lamp 18 will increase. Note, if the motor fails to restart when the switch is released, switch off switch 15.



29. Magnet-controlled light-changeable lamp

    Replace the press switch 14 with dry reed switch 13, you many control the lightness of lamp by a magnet.

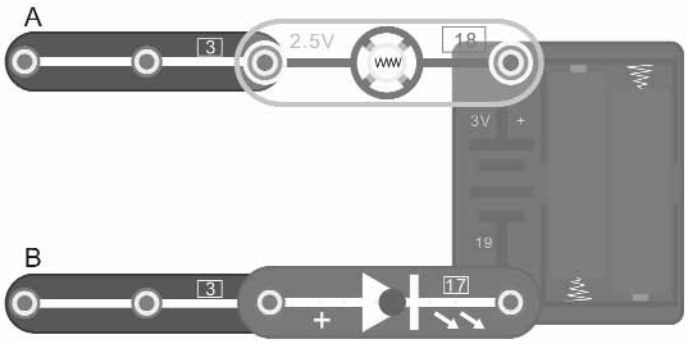


30. Magnet-controlled speed-changeable electric fan

Close the slide switch 15, the lamp 18 will light up, the motor 24 will begin to rotate, controlling the dry reed switch 13 with a magnet, the rotating speed of fan will be changed.

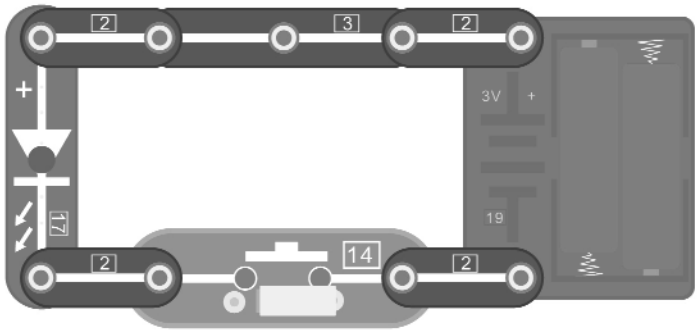
31. Press switch controlled speed-changeable electric fan

Replace the dry reed switch 13 with press switch 14, press the switch, the rotating speed of fan will be changed.



32. Circuit tester.

The tester can check out whether a coil of wire has any breaks in it or not. Put the two ends of the coil on terminals A and B, if the red LED 17 lights up, the wire is unbroken, if the red LED 17 doesn´t light up, the wire has a break in it.

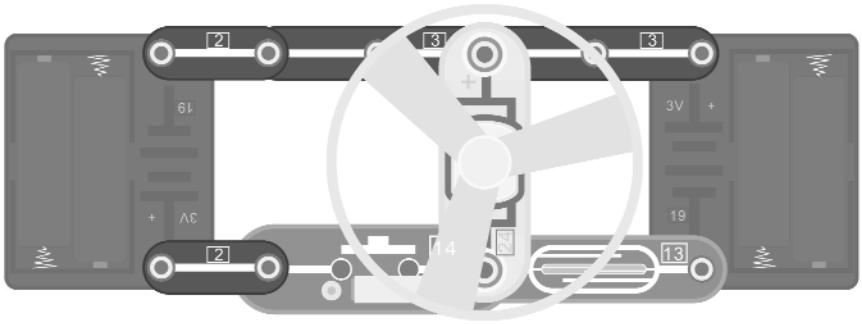


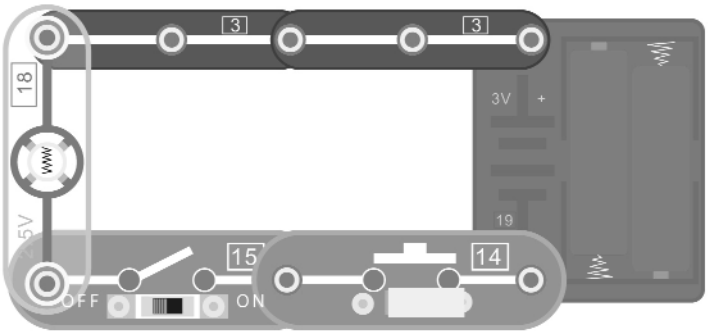
33. Simple and easy signalling practice.

Press the press switch 14 rhythmically; the red LED 17 will flash, so it can be used for sending messages in Morse code or make up your own code!

34. Changing the direction of rotation of an electric motor.

Press the press switch 14, the fan will be rotated anticlockwise. Release the press switch 14, put a magnet near to the dry reed switch 13, the fan will rotate in clockwise direction.
(Safety Note: Do not have both switches on at the same time, or you will damage the batteries.)

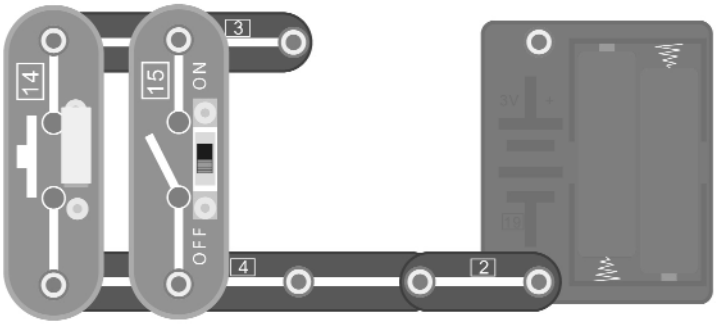




35. The AND gate.

Two switches are connected in series to control a lamp.You must press the press switch 14 and close the slide switch 15 at the same time, then the lamp 18 will light up. It is called an AND gate because both switch 14 AND switch 15 must be on.

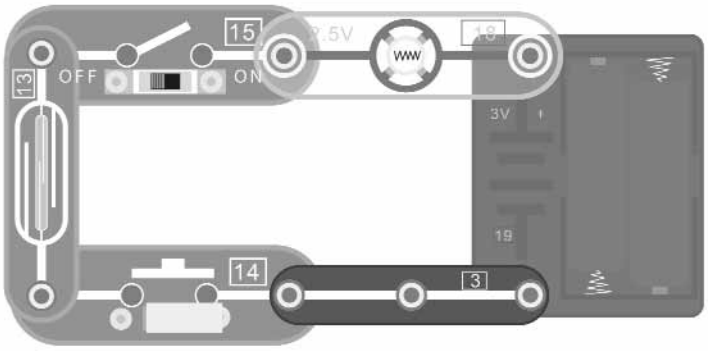
Question: Can you think where this AND gate might be used?



36. The OR gate.

Two switches in parallel are used to control a lamp. The lamp can be switched on by either of the switches. It can be switched on by switch 14 OR switch 15.

Question:
Can you think of a use for the OR gate?
You may well have one in your house?

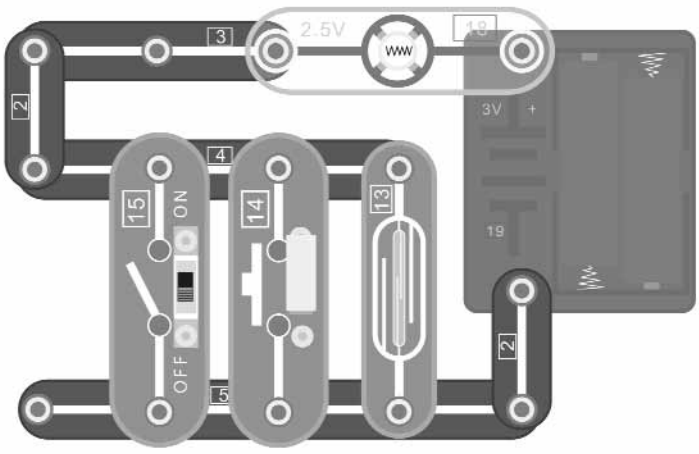


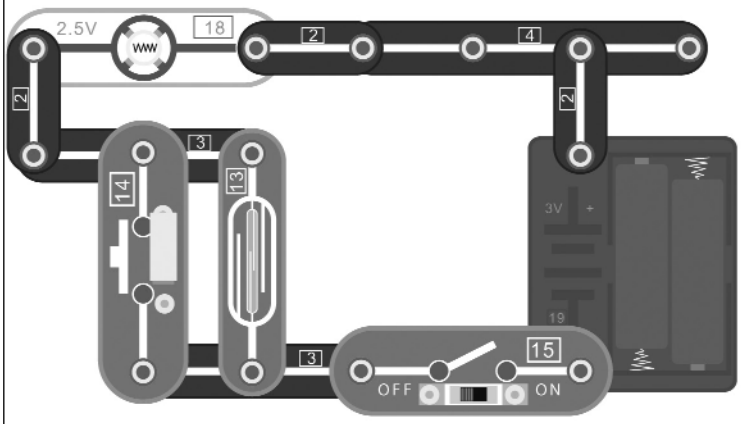
37. Three series connected switches to control a lamp

After connecting circuit, you must close the slide switch 15, press the press switch 14 and put a magnet near to dry reed switch 13, the lamp 18will light up.

38. Three parallel connected switches to control a lamp

After connecting circuit, close the slide switch 15 or press the press switch 14 or put a magnet near to dry reed switch 13 will make the lamp 18 lit up, if you want the lamp to be gone out, you must switch off all these three switches.





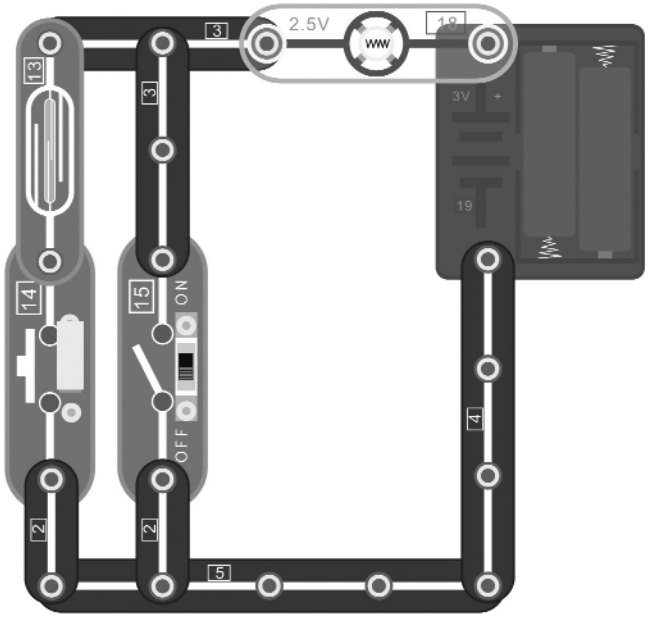
40. This circuit uses two switches in series with one switch in parallel to control a lamp or other device(2).

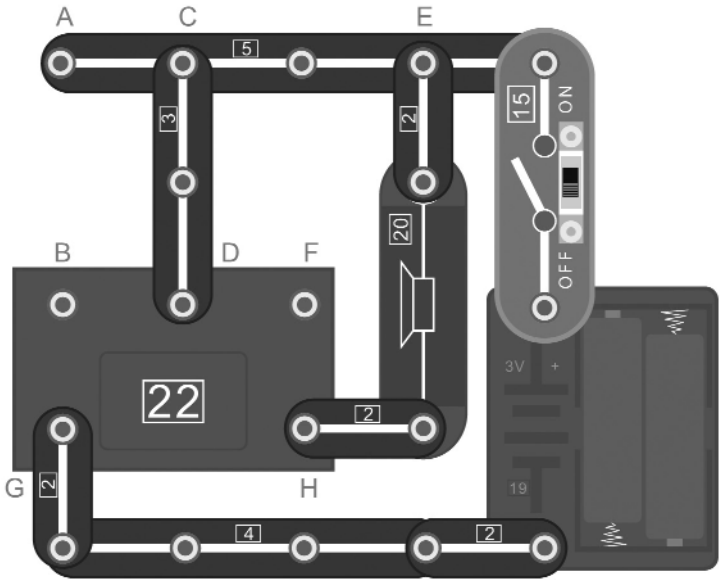
    The lamp 18 can be switched on by closing slide switch 15, or by closing both switches 13 and 14 at the same time.

    The circuit might be used at a missile site. The commander could fire the missile by closing slide switch 15. If he was away, the missile could be fired if two other officers closed their switches.

39. This circuit uses two switches in series with one switch in parallel to control a lamp or other device (1).

    Close the slide switch 15, the lamp 18 won`t light up, then press the switch or put a magnet near to dry reed switch13, the lamp will light up, if you want the lamp to be gone out, you must switch off switch and dry reed switch, or switch off main slide switch 15.





41. Sound of police car
    Close the slide switch 15, the speaker 20 will give out sound of police car.

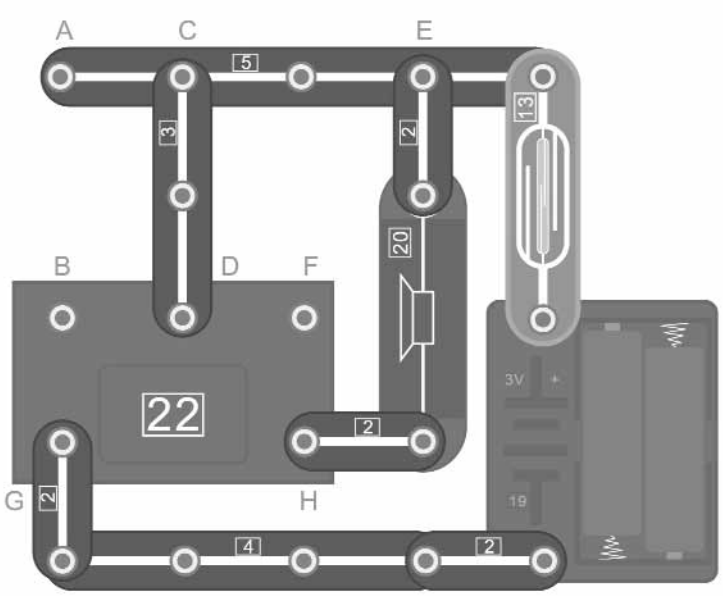
42. Sound of machine gun
    Connect terminal CD and EF, close the slide switch 15, the speaker 20 will give out sound of machine gun.

43. Sound of fire engine
    Connect terminal AB and CD, close the slide switch15, the speaker 20 will
    Give out sound of fire engine.

44. Sound of ambulance
    Connect terminal CD and BG, close the slide switch 15, the speaker 20 will give out sound of ambulance.

45. Sound of gamin machine.
    Connect terminals A & B, close the slide switch 15, the speaker 20 will make the sound of a gaming machine.

46. Sound of vibration
    Connect terminal AB and FH, close the slide switch 15, the speaker 20 will give out sound of vibration.



47.Magnet-controlled sound of police car

Put a magnet near to dry reed switch 13, the speaker 20 will give out sound of police car.

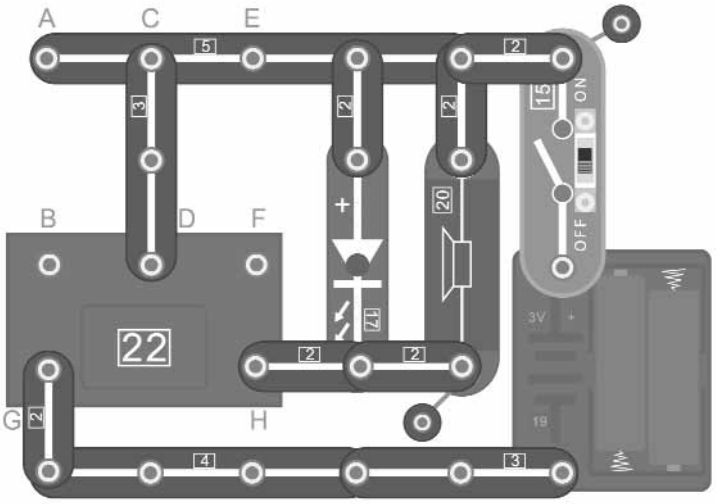
48. Magnet-controlled sound of machine gun
Connect terminal CD and EF, put a magnet near to dry reed switch13, the speaker 20 will give out sound of machine gun.

49. Magnet-controlled sound of fire engine
Connect terminal AB and CD, put a magnet near to dry reed switch 13, the speaker 20 will give out sound of fire engine.

50. Magnet-controlled Sound of ambulance
Connect terminal CD and BG, put a magnet near to dry reed switch13, the speaker 20 will give out sound of ambulance.

51. Magnet-controlled sound of game machine
Single connect terminal AB, put a magnet near to dry reed switch 13, the speaker 20 will give put sound of game machine.

52. Magnet-controlled sound of vibration
Connect terminal AB and FH, put a magnet near to dry reed switch13, the speaker 20 will give out sound of vibration.



53. Red-light alarming sound of police car
Close the slide switch 15, the speaker 20 will give out sound of police car, the red LED17 will give put red light at the same time to play true effect.

54. Red-light alarming sound of machine gun.
Connect terminal CD and EF, close the slide switch 15, the speaker 20 will give out sound of machine gun, the red LED17 will give out red light at the same time to play true effect.

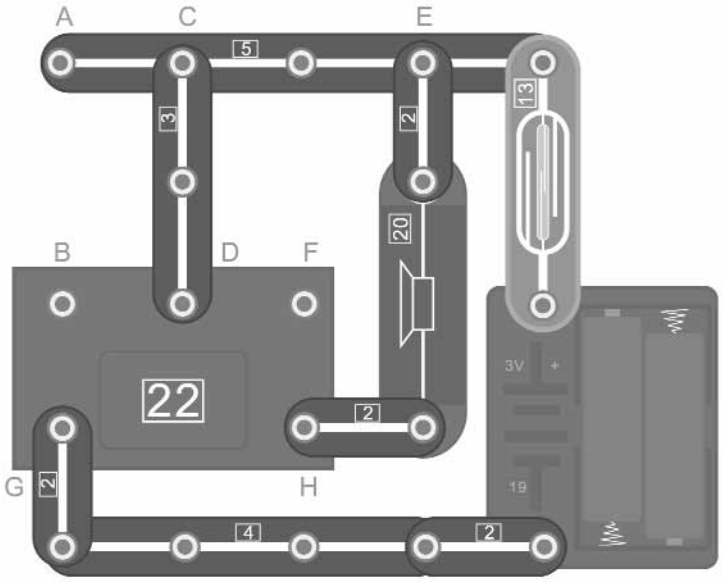
55. Red-light alarming sound of fire engine
Connect terminal AB and CD, close the slide switch 15, the speaker 20 will give out sound of fire engine, the red LED 17 will give out red light at the same time to play true effect.

56. Red-light alarming sound of ambulance

Connect terminal CD and BG, close the slide switch 15, the speaker 20 will give put sound of ambulance, the red LED 17 will give out red light at the same time to play true effect.

57. Red-light alarming sound of game machine
Single connect terminal AB, close the slide switch15, the speaker 20 will give out sound of machine gun, the red LED17 will give put red light at the same time to play true effect.

58. Magnet-controlled red-light alarming sound of vibration
Connect terminal AB and FH, close the slide switch 15, the speaker 20 will give out sound of vibration, the red LED 17 will give out red light at the same time to play true effect.



59. Magnet-controlled red-light alarming sound of police car put a magnet near to dry reed switch 13, the speaker 20 will give out sound of police car, the red LED17 will give out red light at the same time to play true effect.

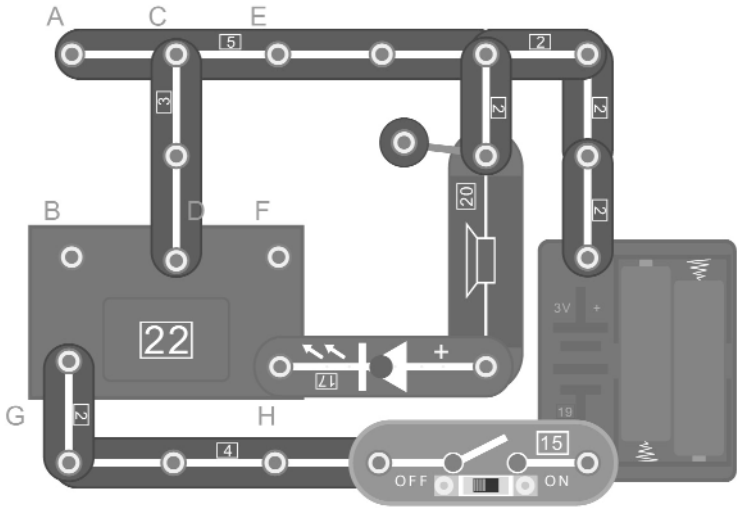
60 Magnet-controlled red-light alarming sound of machine gun.
Connect terminal CD and EF, put a magnet near to dry reed switch 13, the speaker 20 will give out sound of machine gun, the red LED17 will give put red light at the same time to play true effect.

61. Magnet-controlled red-light alarming sound of fire engine
Connect terminal AB and CD, put a magnet near to dry reed switch13, the speaker 20 will give out sound of fire engine, the red LED17 will give out red light at the same time to play true effect.

62. Magnet-controlled red-light alarming sound of ambulance
Connect terminal CD and BG, put a magnet near to dry reed switch 13, the speaker 20 will give out sound of game machine, the red LLED 17 will give out red light at the same time to play true effect.

63. Magnet-controlled red-light alarming sound of game machine
Single connect terminal AB, put a magnet near to dry reed switch 13, the speaker 20 will give out sound of game machine, the red LED17 will give out red light at the same time to play true effect.

64. Magnet-controlled red-light alarming sound of vibration
Connect terminal AB and FH, put a magnet near to dry reed switch 13, the speaker20 will give out sound of vibration, the red LED17 will give out red light at the same time to play true effect.



65. Low sound of police car with light
Close the slide swith 15, the speaker 20 will give out low sound of police car, the red LED17 will light up at the same time.

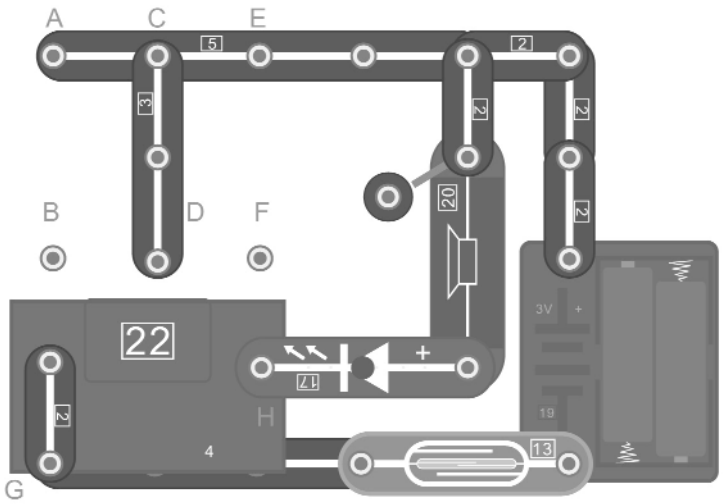
66.Low sound of machine gun with light
Connect terminal CD and EF, close the slide swith15, the speaker 20 will give out low sound of machine gun,
The red LED17 will light up at the same time.

67. Low sound of fire engine with light
Connect terminal AB and CD, close the slide switch 15, the speaker 20 will give out low sound of fire engine, the red LED 17will light up at the same time.

68. Low sound of ambulance with light
Connect terminal CD and BG, close the slide switch 15, the speaker 20 will give out low sound of game machine, the red LED17 will light at the same time.

69. Low sound of game machine with light
Single connect terminal AB, close the slide switch 15, the speaker 20 will give out low sound of game machine, the red LED17 will light up at the same time.

70. Low sound of vibration with light.
Connect terminal AB and FH, close the slide switch 15 , the speaker 20 will give out low sound of vibration
The red LED17 will light up at the same time.



71. Magnet-controlled low sound of police car with light
    Put a magnet near to dry reed switch13, the speaker 20 will give out low sound of police car, the red LED17 will light up at the same time.

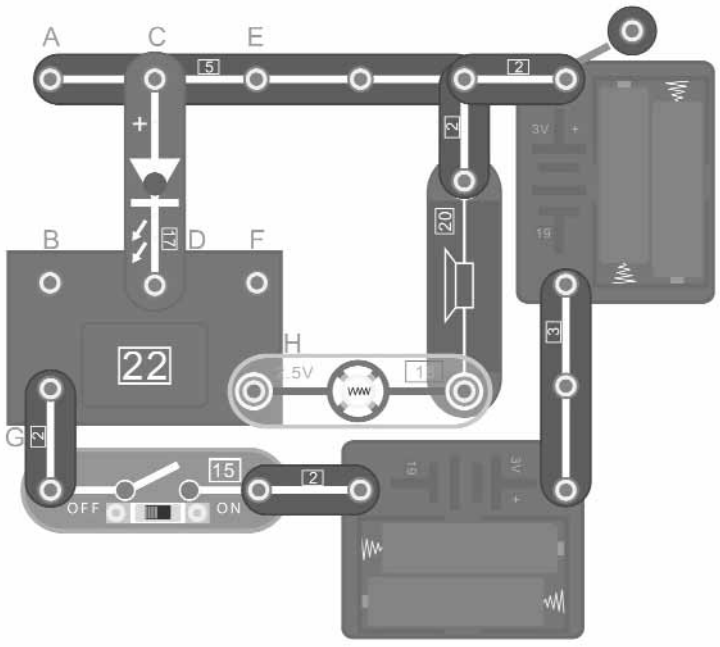
72. Magnet-controlled low sound of machine gun with light
    Connect terminal CD and EF, put a magnet near to dry reed switch 13, the speaker 20 will give out low sound of machine gun, the red LED17 will light up at the same time.

73. Magnet-controlled low sound of fire engine with light
    Connect terminal AB and CD, put a magnet near to dry reed switch 13, the speaker 20 will give out low sound of fire engine, the red LED17 will light up at the same time.

74. Magnet-controlled low sound of ambulance with light
    Connect terminal CD and BG, put a magnet near to dry reed switch 13, the speaker 20 will give out low sound of ambulance, the red LED17 will light up at the same time.

75. Magnet-controlled low sound of game machine with light
    Single connect terminal AB, put a magnet near to dry reed switch 13, the speaker 20 will give out low sound of game machine, the red LED17 will light up at the same time.

76. Magnet-Controlled low sound of vibration with light
    Connect terminal AB and FH, put a magnet near to dry reed switch 13 , the speaker 20 will give out low sound of vibration, the red LED17 will light up at the same time.

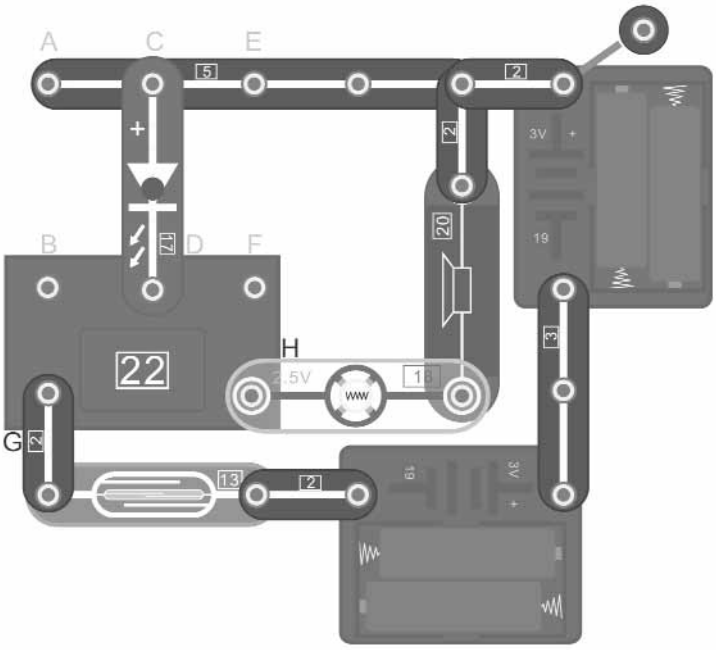


77. Middle sound of police car with light
    Close the slide switch 15, the speaker20 will give out sound of middle sound of police car, the red LED 17 will light up at the same time and the lamp 18 will also light up.

78. Middle sound of machine gun with light
    Connect terminal CD and EF, close the slide switch 15, the speaker 20 will give out sound of middle sound of machine gun, the red LED17 will light up at the same time and the lamp18 will also light up.

79. Middle sound of fire engine with light
    Connect terminal AB and CD, close the slide switch 15, the speaker 20 will give out sound of middle sound of fire engine, the red LED17 will light up at the same time and the lamp18 will also light up.

80. Middle sound of ambulance with light
    Connect terminal CD and BG, close the slide switch 15, the speaker 20 will give out sound of middle sound of ambulance, the red LED17 will light up at the same time and the lamp 18 will also light up.

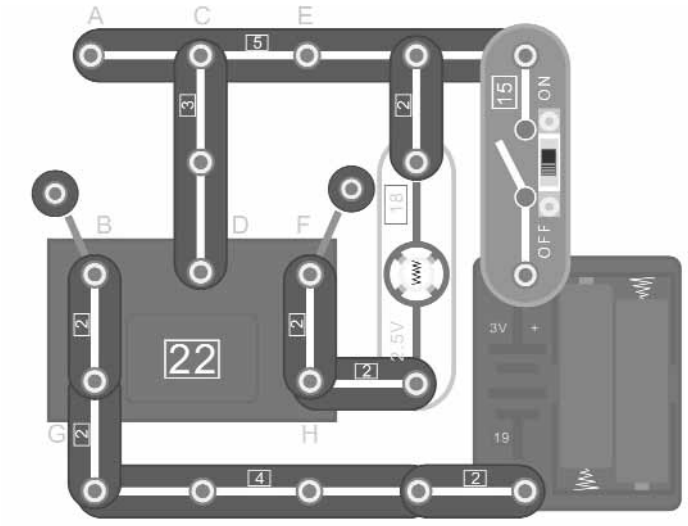


81. Magnet-controlled middle sound of police car with light
Put a magnet near to dry reed switch 13, the speaker 20 will give out middle sound of police car, the red LED17 will light up at the same time and the lamp 18 will also light up.

82 Magnet-controlled middle sound of machine gun with light
Connect terminal CD and EF, put a magnet near to dry reed switch13, the speaker20 will give out middle sound of machine gun, the red LED17 will light up at the same time and the lamp 18 will also light up.

83. Magnet-controlled middle sound of fire engine with light
Connect terminal AB and CD, put a magnet near to dry reed switch 13, the speaker20 will give out middle sound of fire engine, the red LED17 will light up at the same time and the lamp18 will also light up.

84. Magnet-controlled middle sound of ambulance with light
Connect terminal CD and BG, put a magnet near to dry reed switch13, the speaker20 will give out middle sound of ambulance, the red LED17 will light up at the same time and the lamp 18 will also light up.



85. Speedy flash lamp
Close the slide switch15, the lamp 18 Will flash quickly.

86. Magnet-controlled speedy flash lamp
Replace the slide switch 15 With dry reed switch 13, put a magnet near to dry reed switch, the lamp 18 will flash quickly.

87. Slow flash lamp
Unconnect the wire of terminal BG and FH, connect terminal BF, close the slide switch 15, the lamp 18 will flash slowly.

88. Magnet-controlled slow-speed flash lamp
Unconnect the wire of terminal BG and FH, connect terminal BF, replace the slide switch15 with dry reed switch13, put a magnet near to dry reed switch, the lamp 18 will flash slowly.