

Problem

Show that an electromagnetic relay can be used to switch circuits (operating current circuits) on and off and as a changeover switch.

Equipment

Plug-in board	06033.00	1
On/off switch	39139.00	1
Relay, 1017 V	39148.00	1
Lamp holder E10	17049.00	2
Filament lamp, 12 V/0.1 A, E10, 2 pcs.	07505.03	(1)
Wire building block	39120.00	3
Connecting cables, 25 cm, red	07360.01	1
Connecting cables, 25 cm, blue	07360.04	1
Connecting cables, 50 cm, red	07361.01	2
Connecting cables, 50 cm, blue	07361.04	2
Power supply, 0...12 V-, 6 V~, 12 V~	13505.93	1

Introductory Information

Have a look at the relay being used before starting the experiment.

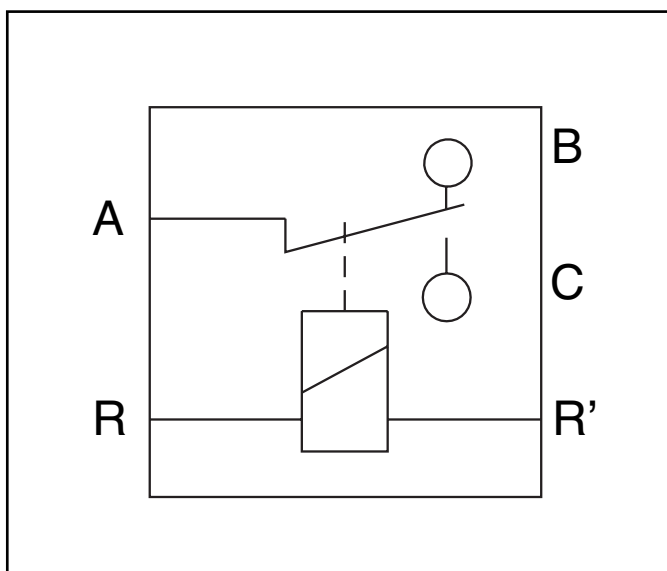
Two of the prongs projecting from the bottom of the relay casing are connected to the relay (R and R'), and the other one is connected to the center contact A of a switch respectively. The connections to the contacts B and C are established by means of cables.

If the circuit containing the coil of the magnet (called the **control circuit**) is not switched on, the conductive connections have the same configuration as those printed on the relay casing.

A connection that is switched on while the control circuit is switched off is called a **break contact**. In this case, the relay functions as an **opening contact** in the **operating circuit**.

A connection that is switched off while the control circuit is switched off is called a **make contact**. In this case, the relay functions as a closing contact in the operating circuit. Complete Table 1 based on Fig. 1.

Fig. 1



Set-Up and Procedure

- Set up experiment as shown in Fig. 2 with the control circuit and initially one operating circuit (operating circuit 1 with filament lamp L1). On/off switch should be off.
- Set direct voltage for the control circuit to 12 V- and alternating voltage for the operating circuit to 12 V~.
- Switch on power supply unit and observe filament lamp L1.
- Toggle the on/off switch back and forth to turn the control circuit on and off repeatedly. Observe L1 and note observations under (1).
- Interrupt operating circuit 1 by removing filament lamp L1 and add filament lamp L2 to operating circuit 2 (Fig. 3).
- Switch control circuit on and off repeatedly. Observe L2 and note observation under (2).
- Turn operating circuit 1 on once again by putting filament lamp back in circuit. Turn control circuit on and off repeatedly while observing both filament lamps. Note observations under (3).
- Switch power supply unit off.

Observations

(1)

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(2)

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(3)

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Table 1

Control circuit is	Connection exists between points	Connection is interrupted between points
switched off		
switched on		

Evaluation

1. Relays can be used as opening contacts (1), closing contacts (2), or changeover contacts (3).
List some possible applications for relays.

2. What are some of the advantages to using relays as switches?

Fig. 2

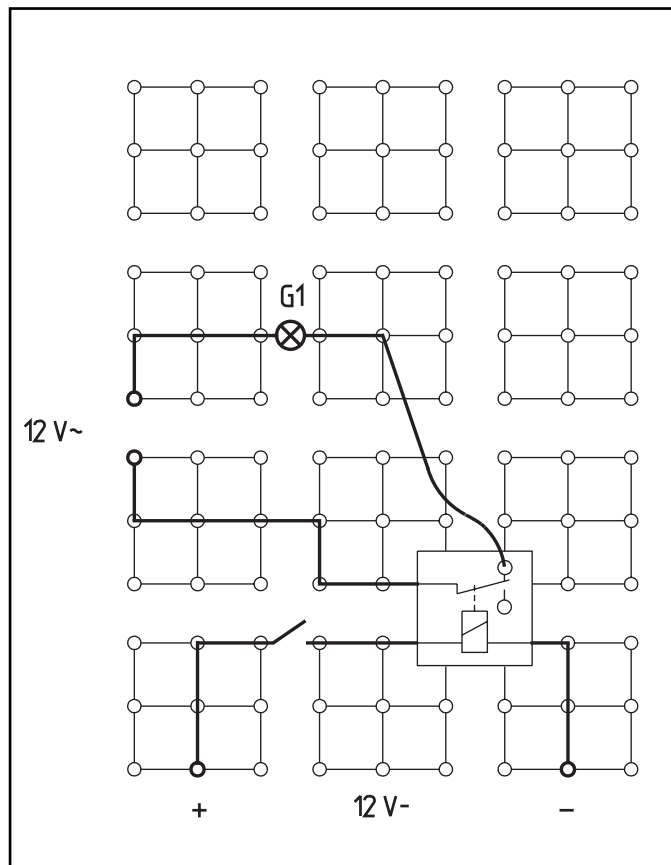
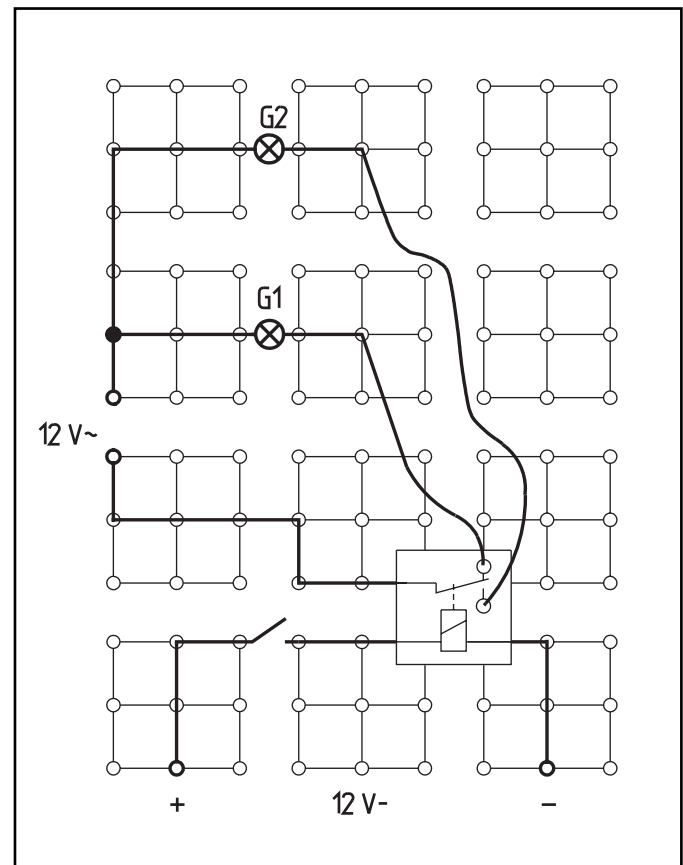


Fig. 3



(How does a relay trigger a switching process?)

The students are familiar with the construction and functioning of electromagnets and, generally, are also aware of their use in simple relays.

The changeover relay used in this experiment is more complicated. It is therefore recommended that the instructor go over the introductory information with the students. This makes it easier for the students to gain an understanding of the relatively intricate circuitry in the experiment.

Note on Set-Up and Procedure

So that the circuitry remains relatively easy to follow, the students should use 25 cm connecting cables to make the connections to the switching contacts on the relay (shown in Fig. 1 as the contact points B and C).

Introductory Information

Table 1

Control circuit is	Connection exists between points	Connection is interrupted between points
switched off	A and B	A and C
switched on	A and C	A and B

Observations

- (1) The operating circuit is interrupted when the control circuit is switched on and vice versa.
- (2) The operating circuit is switched on when the control circuit is switched on and vice versa.
- (3) Switching the control circuit on and off switches over from one operating circuit to the other.

Evaluation

1. Applications for relays:
 - telephone systems,
 - street lights,
 - fire alarms,
2. Relays can control distant and hard-to-reach operating circuits, thereby saving on costs and materials.

Notes

One of the advantages to using relays is that they can be used to switch high-power operating current with a weak control current. Such relays are called magnetic contactors or switches.

Relays can also switch high operating voltages at a low control voltage.

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Relays



(How does a relay trigger a switching process?)

Room for notes