



# LATCHING & FORM B REED RELAYS & SENSORS



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# Introduction

## Purpose

- › Explore the technology involved in the use and operation of Form B and Latching Reed Sensors & Relays

## Objectives

- › Define key terms of Form B and Latching sensors and relays
- › Describe the structure and function of a Form B and Latching Reed Relay
- › Describe the structure and function of a Form B and Latching Reed Sensor



# Key Terms

**Contact** - Contact blades making up a Reed Switch or Electromechanical Relay

**Contact, Form A** - A single pole single throw (SPST) normally open (N.O.) switch

**Contact, Form B** - A single pole single throw (SPST) normally closed (N.C.) switch

**Contact, Form E** - A latching contact that can exist in either the N.O. or N.C. state controlled by reversing the magnetic field



# Key Terms

**Bias or Permanent Magnet** - Steady magnetic field applied to the magnetic circuit of a relay or sensor. Aids or impedes operation of the switch contacts

**Coil** - Electromagnetic assembly made of copper insulated wire. When current is applied to the coil, a magnetic field is generated. When energized, its magnetic field operates the contacts

**De-energize** - The act of removing power from a relay coil

**Energization** - The application of power to a coil winding of a relay



# Key Terms

**Reed Switch or Reed Sensor** - A bare or encased switch containing glass sealed magnetic reeds as the contact members including mercury-wetted and dry contact types

**Reed Relay** - A relay containing one or more internal reed switches

**Latching Relay** - A relay that maintains its contacts in the last assumed position without needing to maintain coil energization. To change the state of the contacts, the magnetic field must be reversed.

**Normally Open (N.O.) Contacts (Form A)** - The contact state before any magnetic field is applied to them in which they exist in the open state

**Normally Closed (N.C.) Contacts (Form B)** - The contact state before any magnetic field is applied to them in which they exist in the closed state.

# FORM B NORMALLY CLOSED REED RELAYS



# Overview of Form B Normally Closed Reed Relays

- › The normally open Form A reed relay's internal reed switches exist in the normally open state
- › Applying coil power closes the contacts
- › The relay contacts may remain closed for long periods of time supplying continuous power such as in safety circuits
- › The Form B reed relay allows contact closure for extended periods without continuous power draw



## Form B Normally Closed Reed Relays

- › Normally Closed (Form B) Reed Relays require the use of a permanent magnet
- › This magnet is adjusted such that the reed switch changes from its normally open state to a normally closed contact state
- › In this case, no current or external energy is expended maintaining the reed switch in the closed position





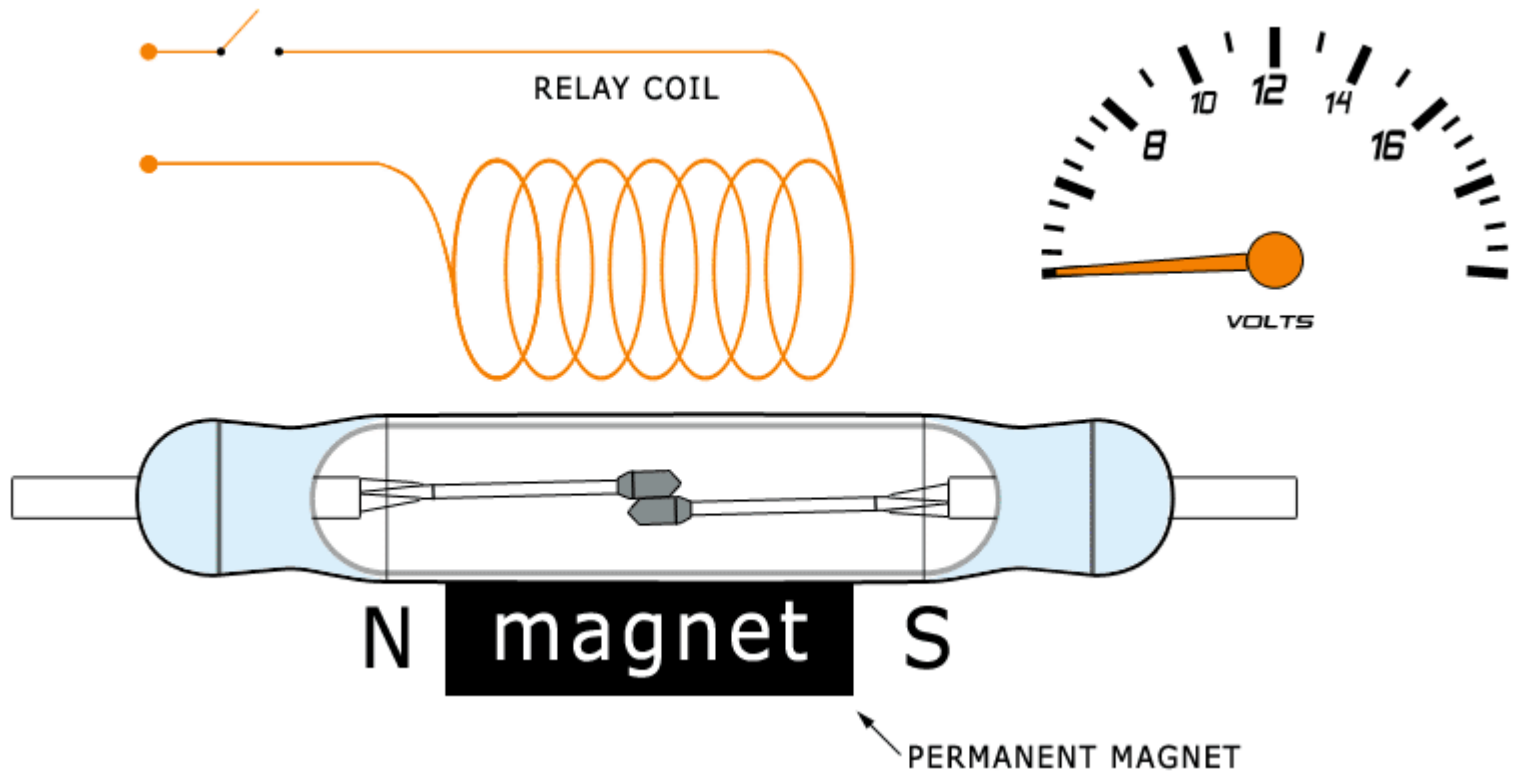
## Form B Normally Closed Reed Relays

- › A relay coil of equal strength and opposite polarity is needed to open the Reed Switch in the reed relay
- › To open the contacts the relay coil is energized with the relay's nominal voltage

# Form B Normally Closed Reed Relays

## Permanent Magnet

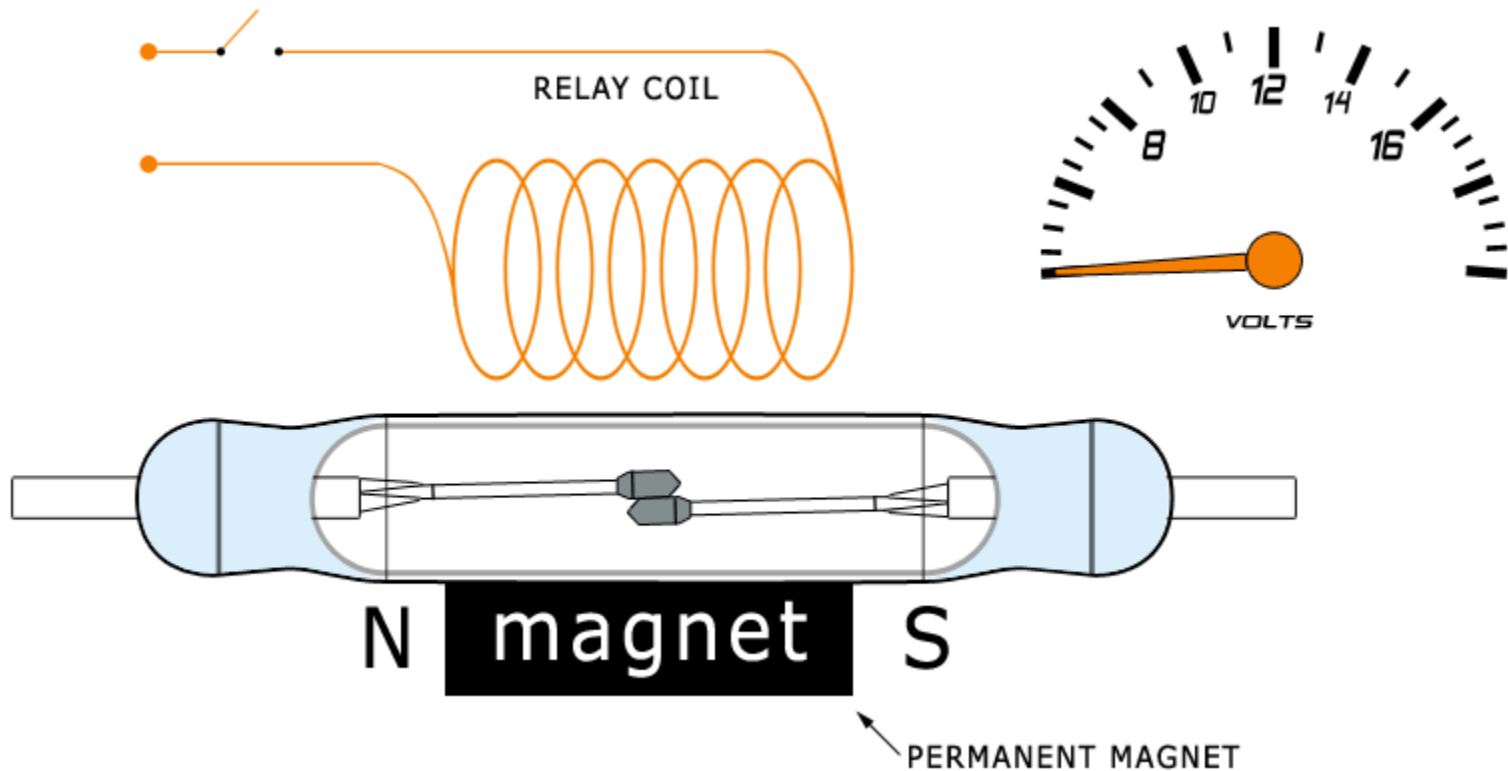
- › A permanent magnet keeps the contacts closed
- › No power is required



# Form B Normally Closed Reed Relays

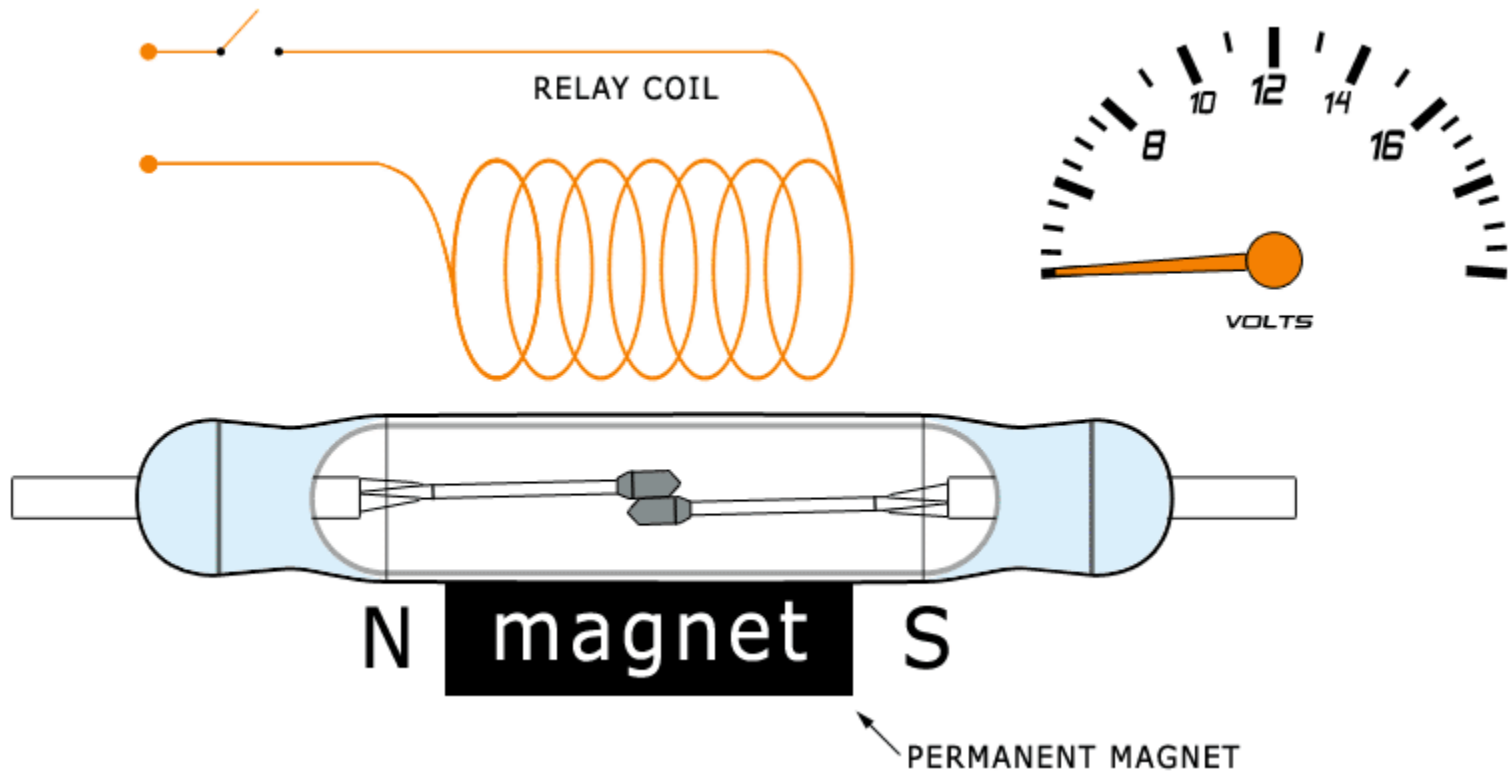
## Applying power to the Coil

- › Apply the relay's nominal coil power to open the contacts
- › The correct coil voltage polarity is important



# Form B Normally Closed Reed Relays

- › De-energizing the coil returns the contacts to their normally closed contact state provided by the permanent magnet



# LATCHING REED RELAYS

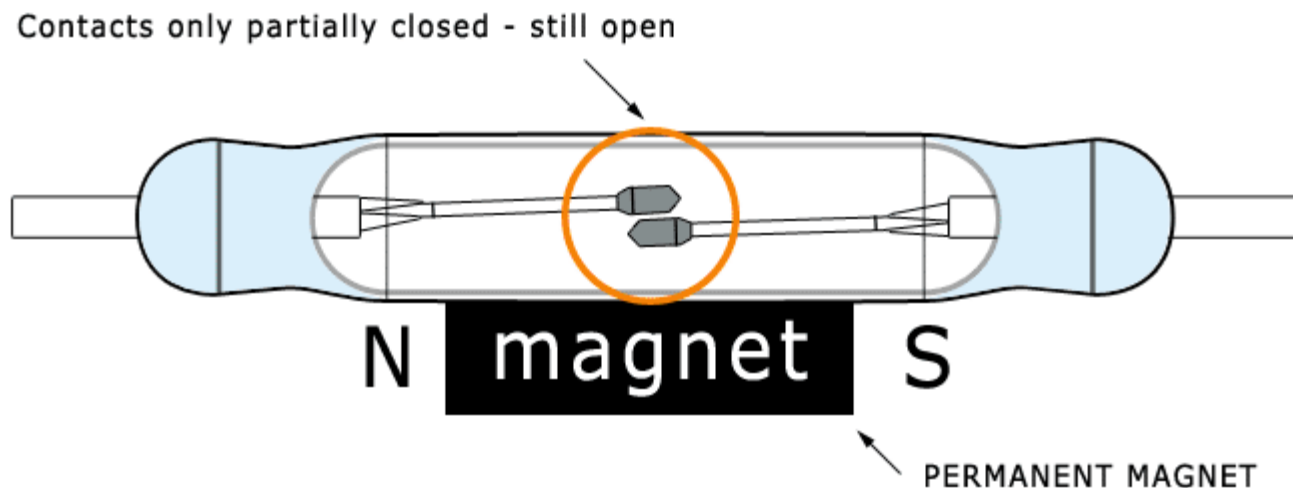


# Overview of Latching Reed Relays

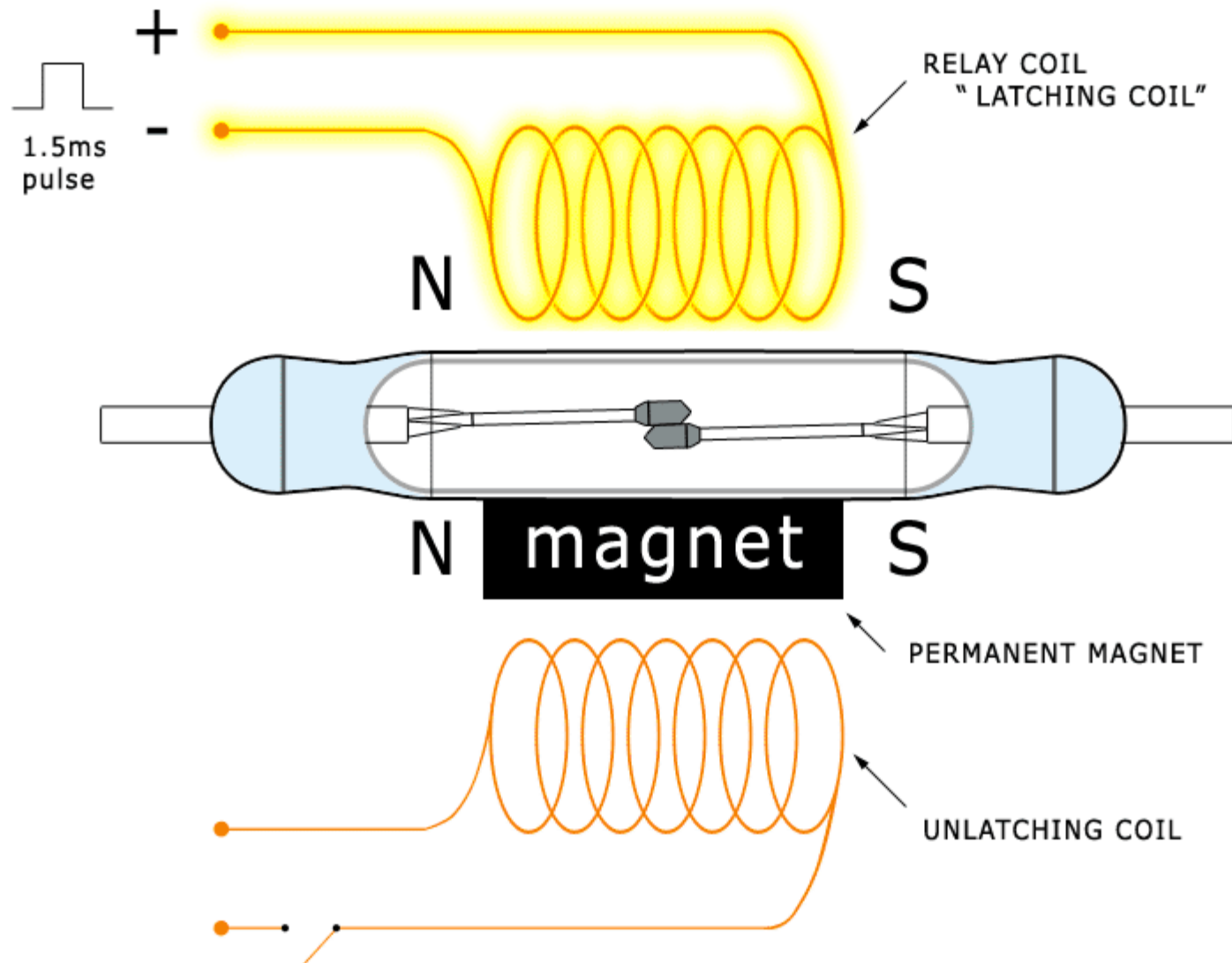
- › A latching reed relay has two bi-stable states
  1. Open contact state
  2. Closed contact state
- › In either state it draws no coil power
- › Generally the latching relay will have two coils
  1. A latching coil that closes the contacts
  2. An unlatching coil which will open the contacts

# Overview of Latching Reed Relays

- › The latching relay also requires an internal magnet for proper operation
- › The latching relay magnet is partially magnetized such that the reed switch contacts do not fully close

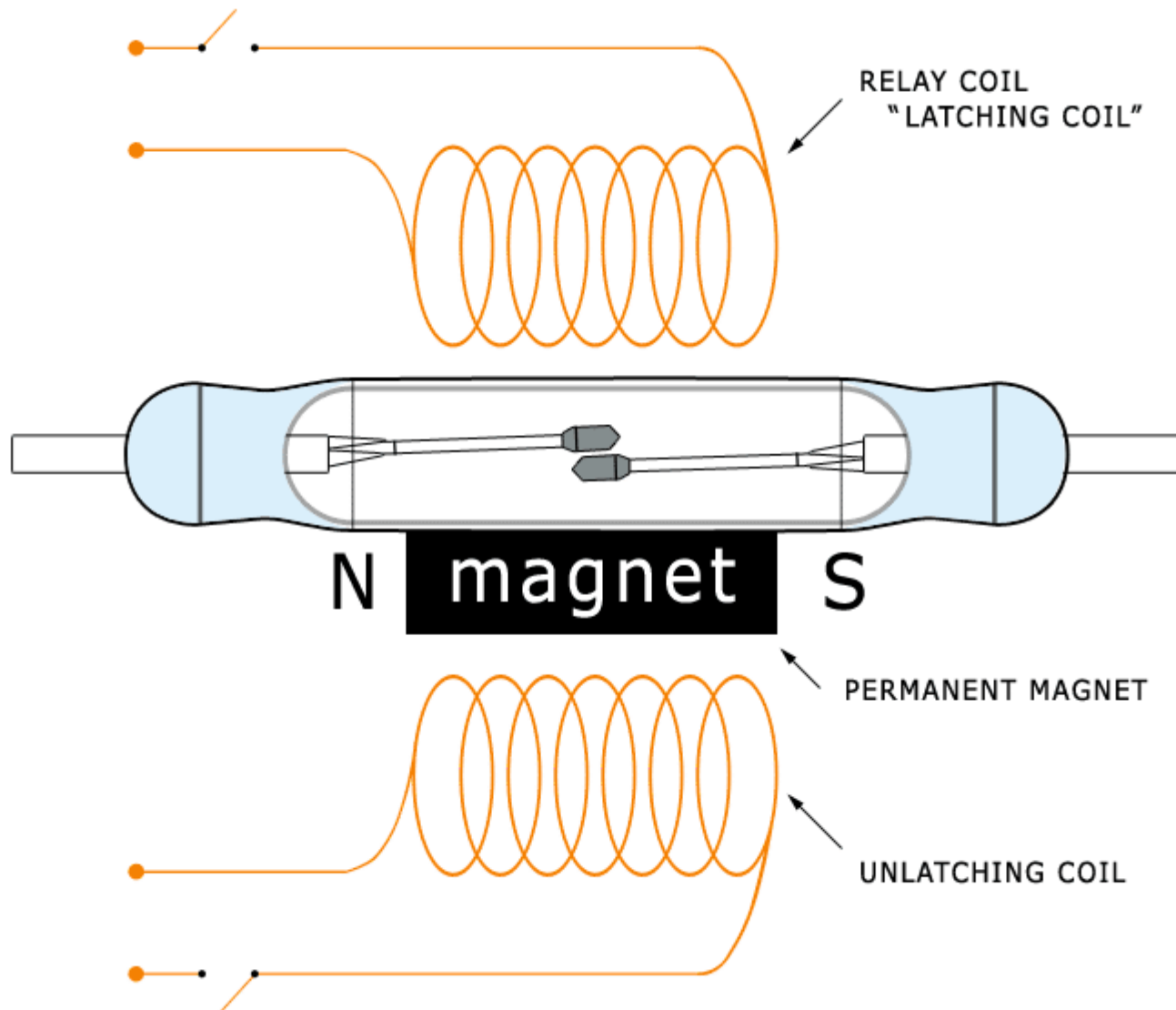


# Latching Reed Relays

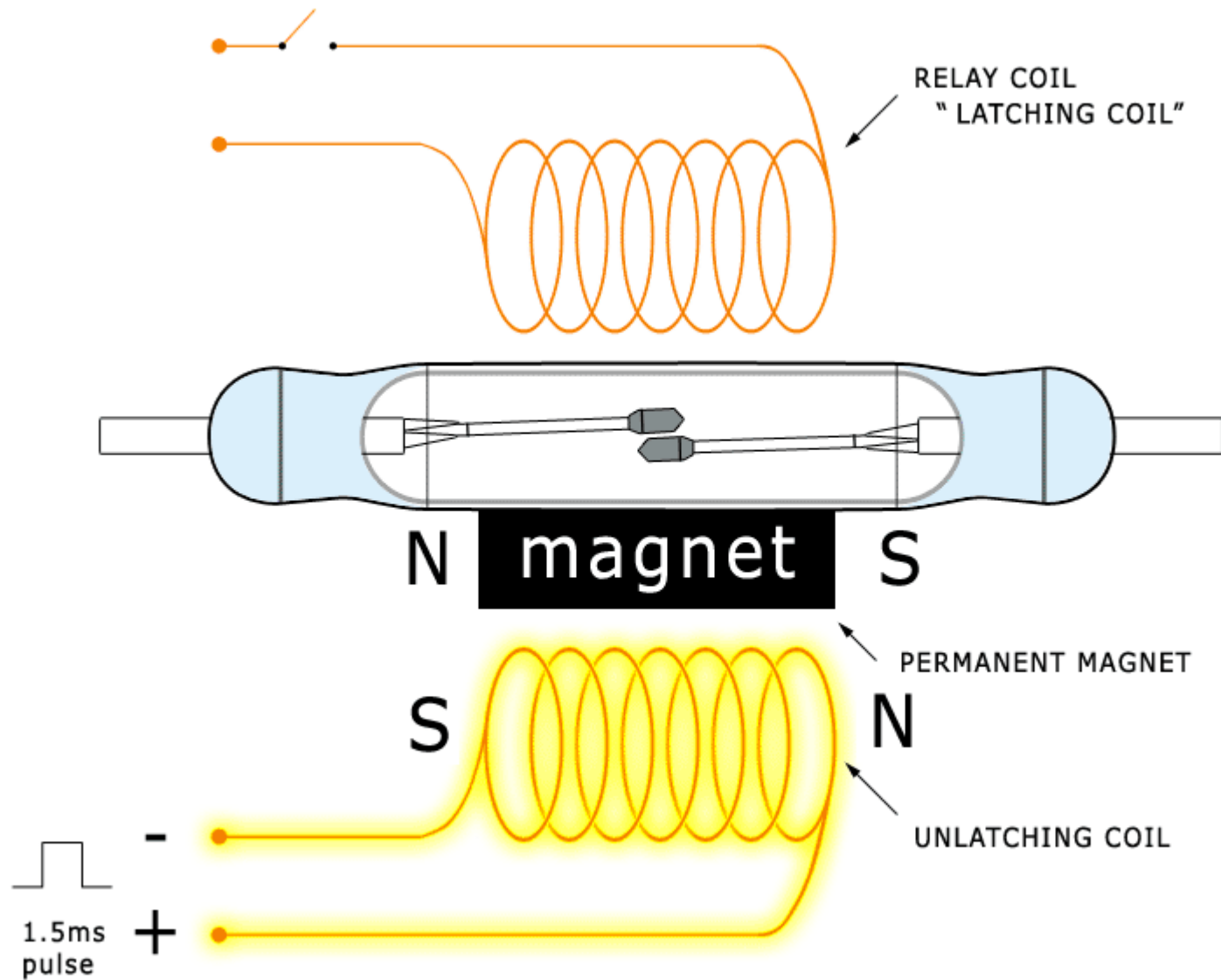




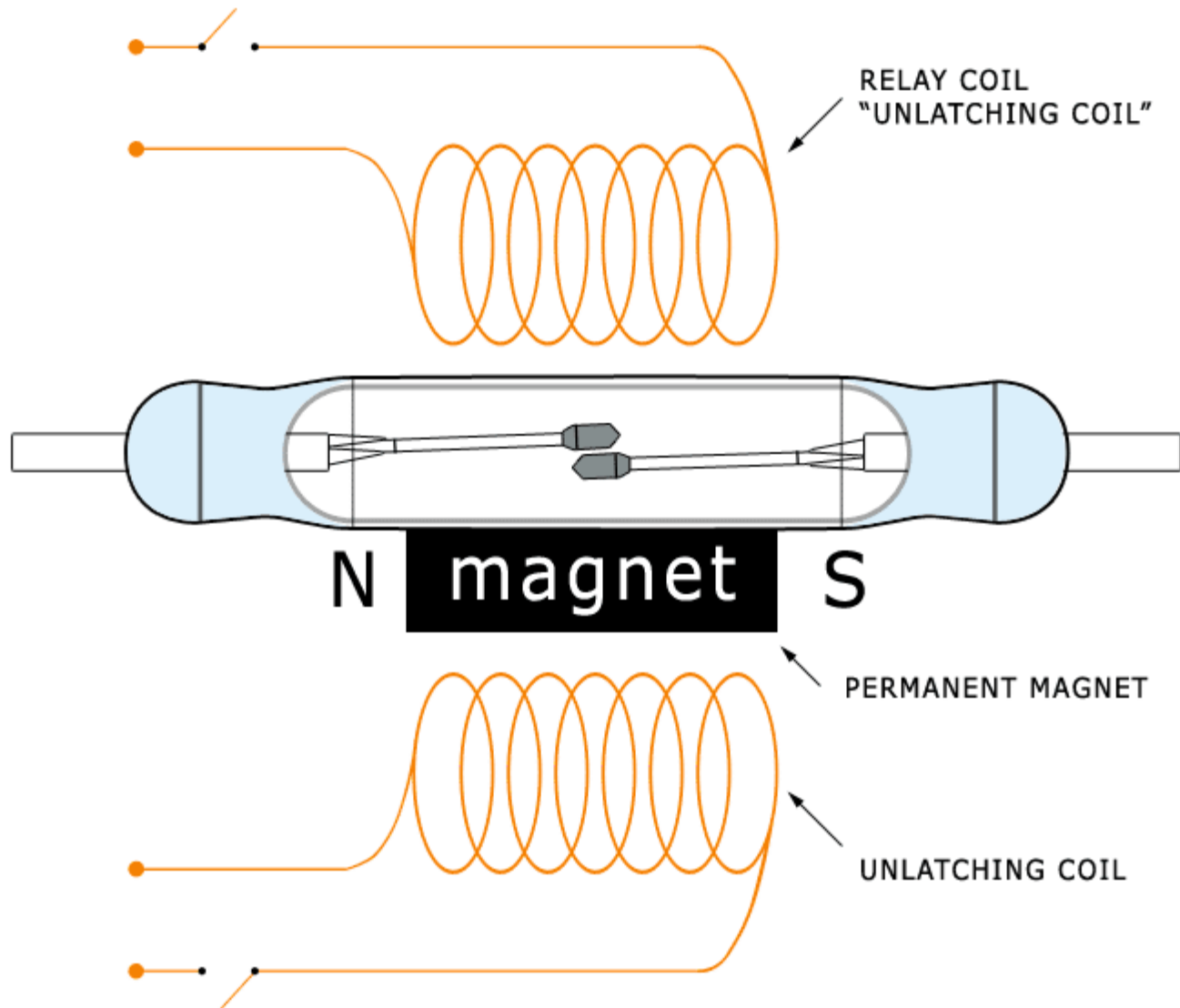
# Latching Reed Relays



# Latching Reed Relays



# Latching Reed Relays



# FORM B NORMALLY CLOSED REED SENSOR

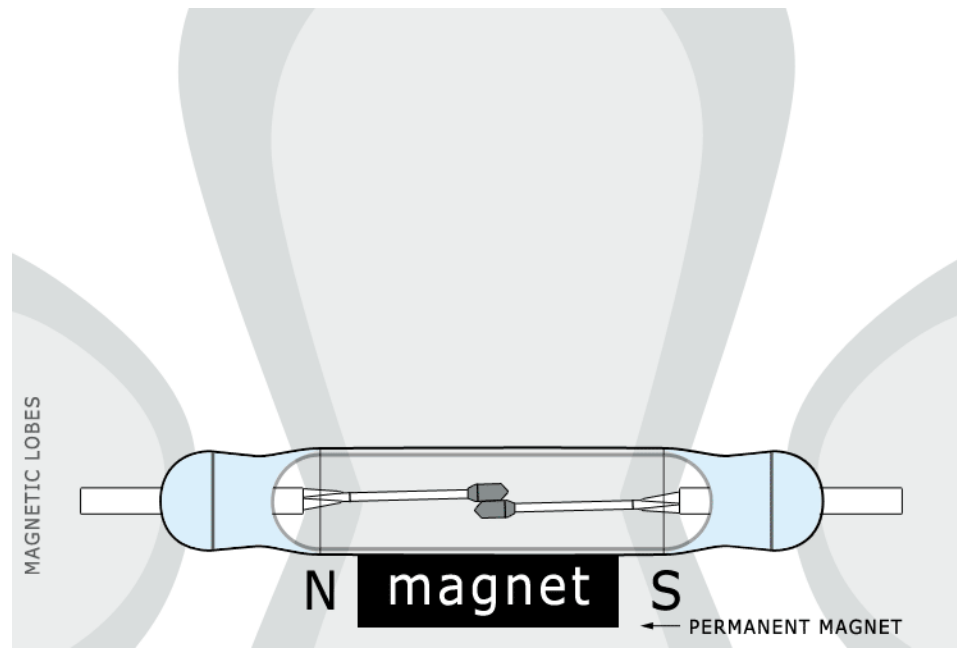


## Form B Normally Closed Reed Sensor

- › Reed sensors also have a reed switch as their main switching element
- › These reed switches exist in their normally open state
- › Reed sensors generally exist in the normally open state
- › The reed sensor can consist of simply a bare reed switch or a packaged device having one or more reed switches and/or magnets

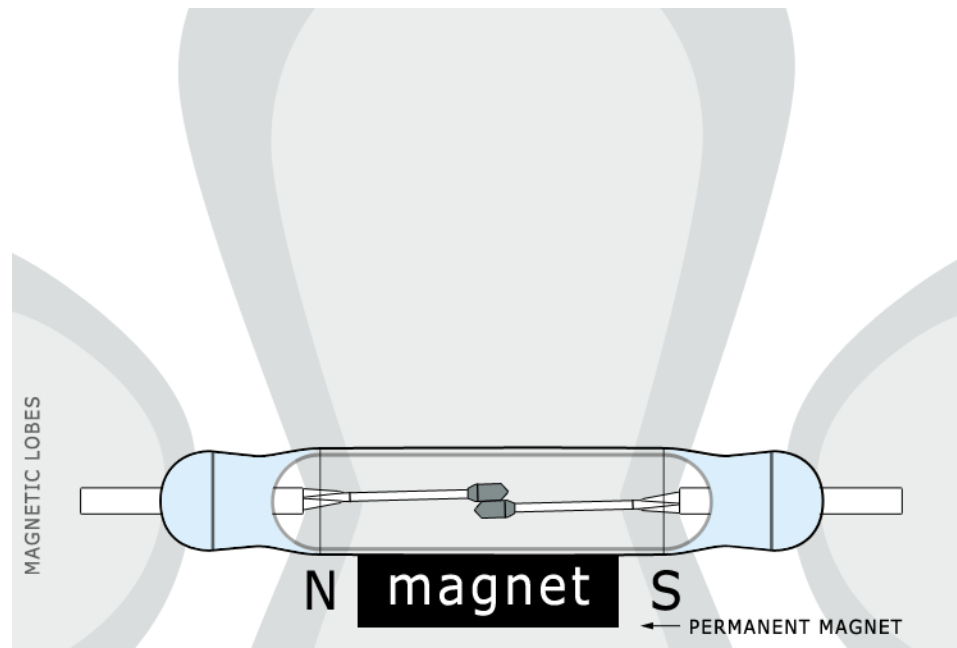
# Form B Normally Closed Reed Sensor

- › Form B reed sensors follow the same rules as with the Form B reed relays
- › A magnet that has been magnetized to a suitable level closes the contacts



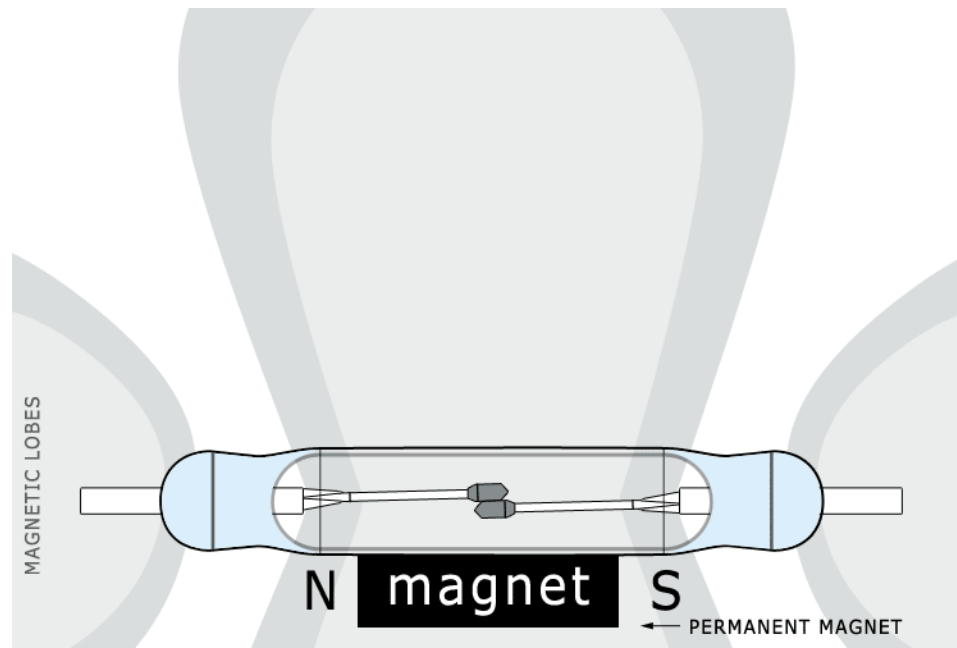
# Form B Normally Closed Reed Sensor

- › A magnet of opposite polarity cancels out the magnetic field thereby opening the contacts
- › Too strong a magnet may reclose the contacts
- › Proper operation requires the correct use magnetic lobe



# Form B Normally Closed Reed Sensor

- › Once the magnet is removed the contacts will reclose and stay in that state until a magnet is brought into its influence

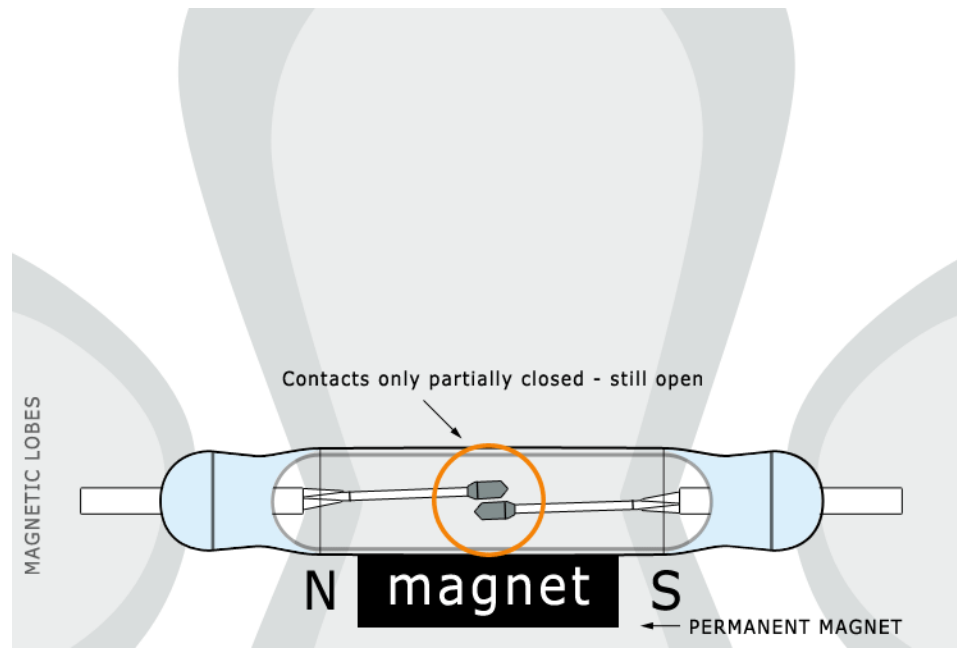




# LATCHING REED SENSOR

# Latching Reed Sensor

- A partially magnetized permanent magnet keeps the reed switch open
- A second magnet with an aiding field will close the contacts
- Removing the second magnet, the contacts remain in the closed state
- Applying the second magnet again with its field reversed opens the contacts





# Summary

- › The reed relay can be configured as a normally closed reed relay to conserve power when the requirement calls for extended use in the normally closed state
- › The reed sensor can be configured in the normally closed state as well for requirements calling for extended use in the normally closed state.
- › For applications calling for extremely small power requirements, a latching reed relay can be the best selection, particularly in battery powered devices.
- › Reed sensors can be used in a latching manner for specific design requirements

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