Electromechanical Relays

INTRODUCTION

- **A relay is an electromechanical device that use small electrical currents and voltages to control larger electrical currents and voltages.**
- ***A relay is defined as an electrically controlled device that opens and closes electrical contacts, or activates and deactivates operation of other devices in the same or another electrical circuit.***

(Relays have unlimited possibilities ranging from industrial applications to consumer electronics such as microwave ovens and television sets)

Microwave oven : *Push of a few tiny buttons on the keypad gives commands to a microcontroller which can produce only very small output voltages. Those small voltages turn on a relay which is capable of controlling the large voltages and currents required to produce the heating affect that takes place.*

Television: *The tiny impulses from the hand-held remote unit controls a relay in the power supply.*

Separation of AC and DC circuits

Interface between electronic control circuits and power circuits

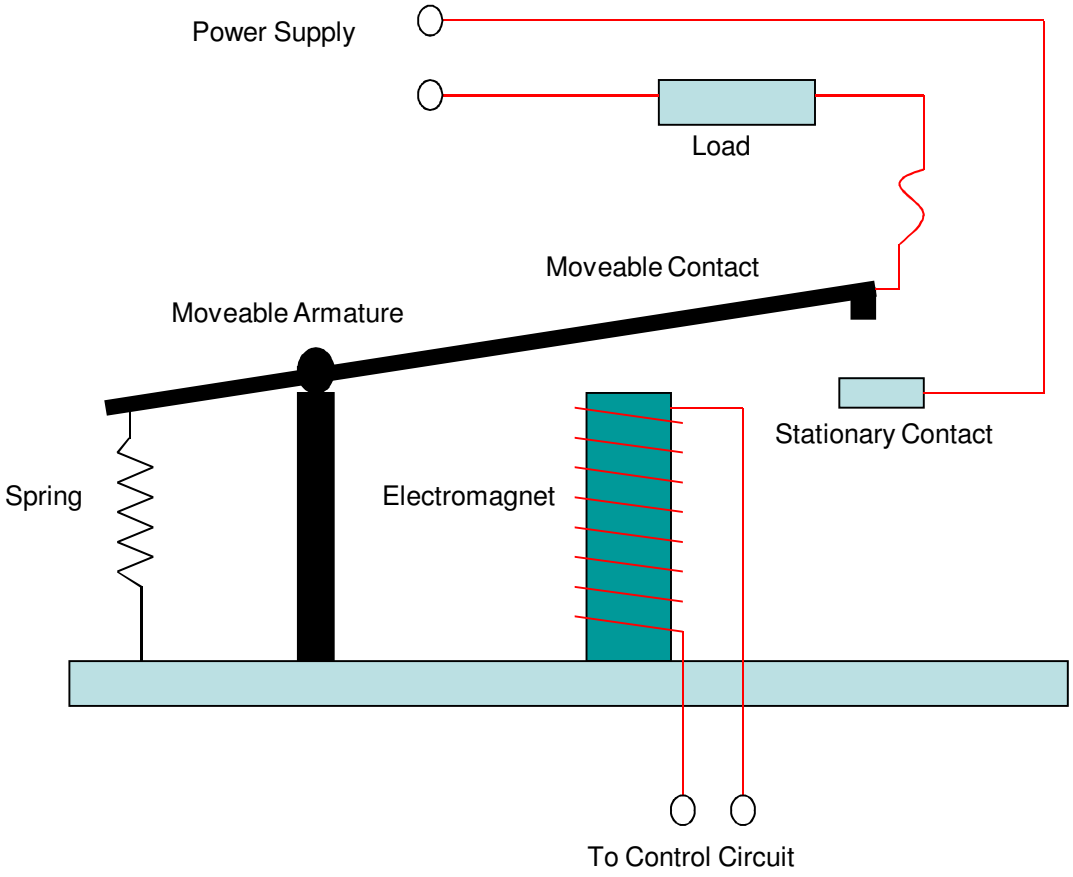
Two types of relay technology are available:-

1. **Mechanical**
2. **Solid State**

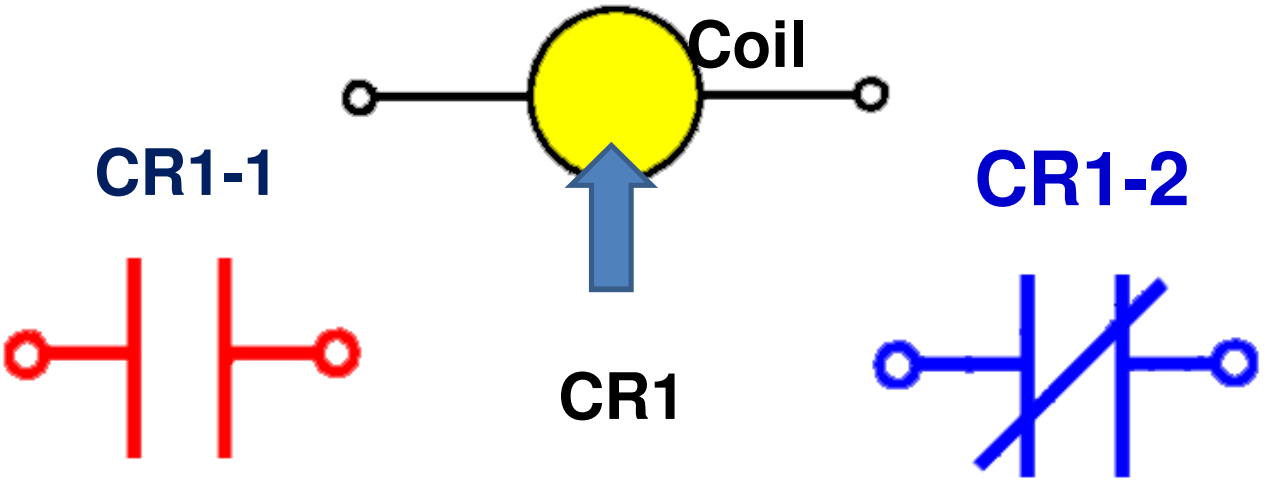
The Principle Behind Electromechanical Relays

- To open and close a relay an electromagnet is used. When the coil controlling the electromagnet is given a voltage, the electromagnet causes the contacts in the relay to connect and transfer current through the relay.

Electromechanical relay: a spring, moveable armature, electromagnet, moveable contact, and stationary contact. The spring keeps the two contacts separated until the electromagnet is energized, pulling the two contacts together. This completes the circuit and delivers power to the load.



Relay Symbol

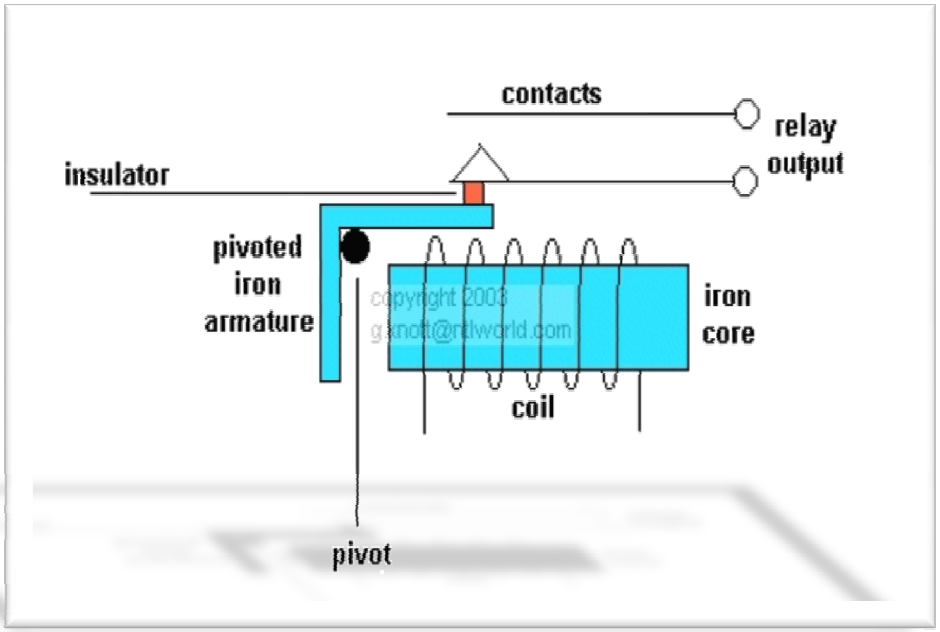


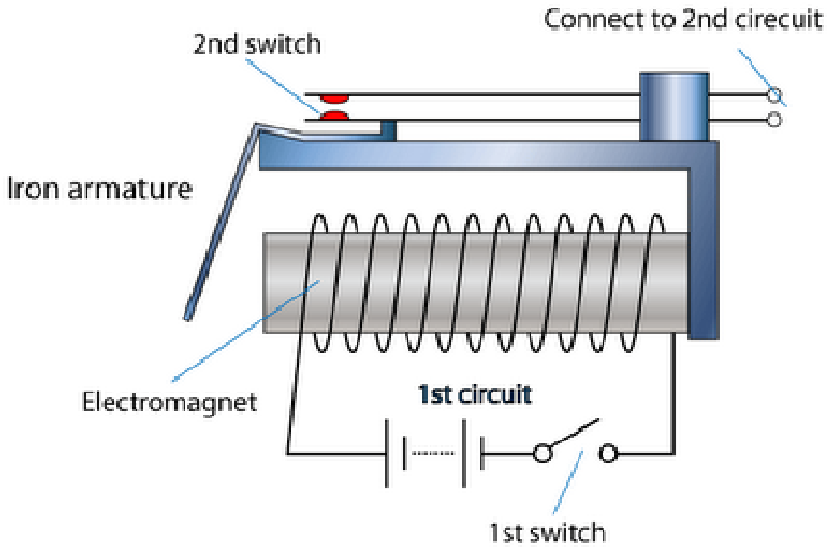
Normally open (NO) contact

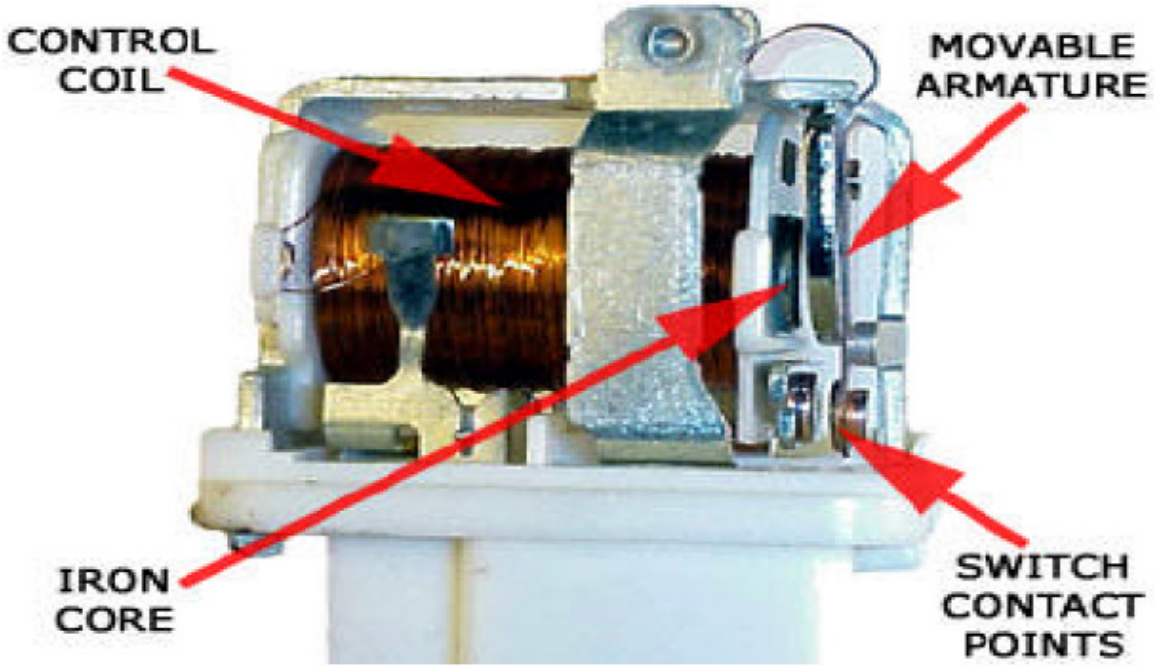
Normally closed (NC) contact

Contacts are open when no current flows through the coil but close as soon as the coil is energized.

Contacts are closed when no current flows through the coil but open as soon as the coil is energized.


contacts
relay output
insulator
pivoted iron armature
iron core
coil
pivot
copyright 2003
g.knott@rdlworld.com

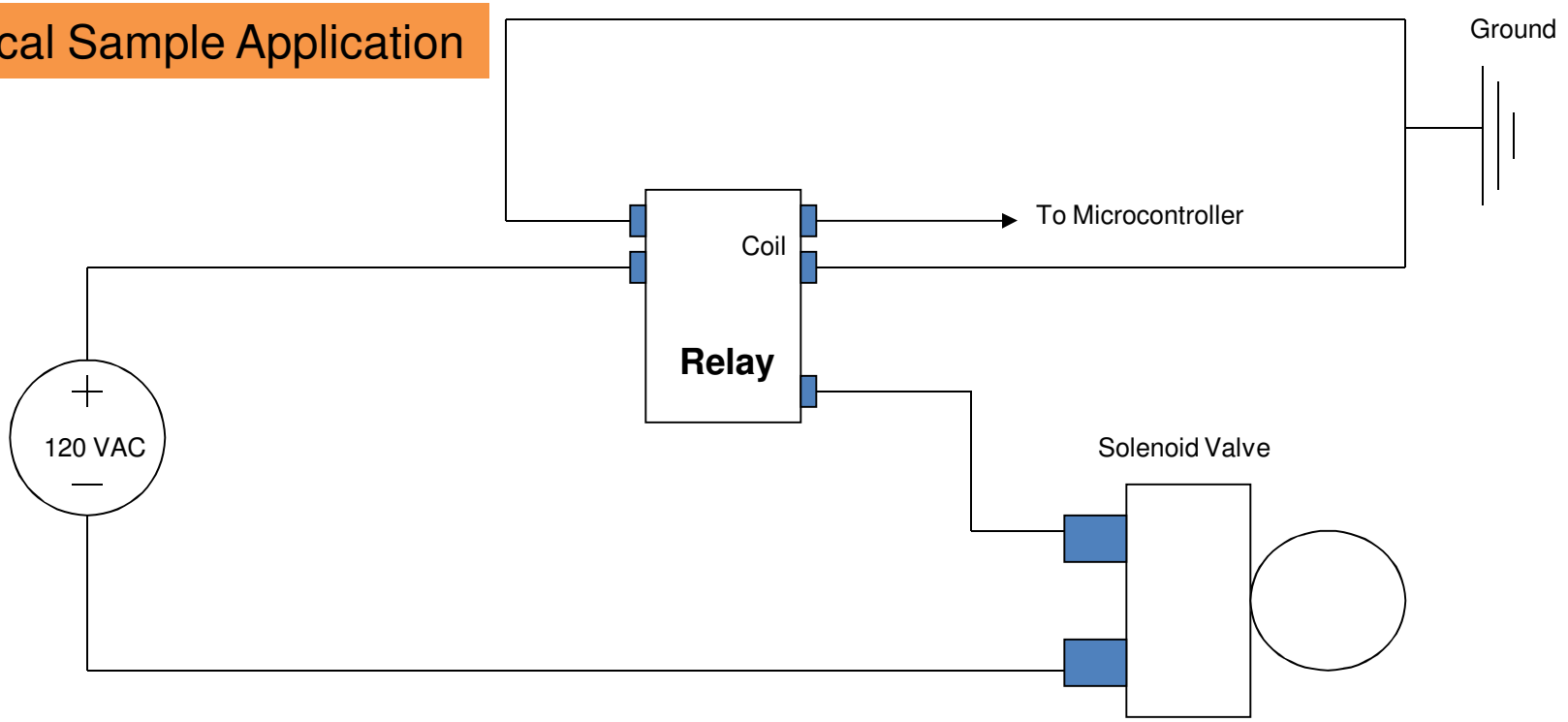

Connect to 2nd circuit
2nd switch
Iron armature
Electromagnet
1st circuit
1st switch


CONTROL COIL
MOVABLE ARMATURE
IRON CORE
SWITCH CONTACT POINTS

Important Specifications of Electromechanical Relays

- Coil Voltage – *Voltage required for switching*
- Contact Rating – *How much current the relay can handle*
- *Normally Open (NO) or Normally Closed (NC)*

Typical Sample Application



Circuit for Control of a 120 VAC Solenoid Valve

Applications of Relay

- Relays are used for: *Amplifying a digital signal, switching a large amount of power with a small operating power.*

- *Some special cases are:*
  - A telegraph relay, repeating a weak signal received at the end of a long wire
  - Controlling a high-voltage circuit with a low-voltage signal, as in some types of modems or audio amplifiers,
  - Controlling a high-current circuit with a low-current signal, as in the starter solenoid of an automobile,

- Detecting and isolating faults on transmission and distribution lines by opening and closing circuit breakers (protection relays)

Electromechanical Relay Advantages

- Contacts can switch AC or DC
- Low initial cost
- Very low contact voltage drop, thus no heat sink is required
- High resistance to voltage transients
- No Off-State leakage current through open contacts

Electromechanical Relay Limitations

- The contacts wear and thus have limited life depending on loads
- Short contact life when used for rapid switching applications or high loads
- Poor performance when switching high inrush currents
- Package Size

Conclusions

- Electromechanical relays are an excellent solution to separate electronic control circuitry and power circuitry.

- Electromechanical relays are not the best choice in high frequency switching applications and do have a limited life due to wear on the contacts inside the relay.

- When used in the a proper application, the electromechanical relay provides safe and reliable integration between power circuits and control circuits.