Using relays

Relays come in all shapes, sizes and ratings and were one of the first tools used by electrical engineers in switching high power loads using lower power or manual control systems. Relays were also instrumental in the development of PLC controllers.

A mechanical relay can be substituted for a solid state relay, but the cost in doing this can be prohibitive unless your system can't handle transients of any kind in which case solid state it is.

Principle of Operation

Relays leverage the principles of electromagnetic induction to produce a magnetic field. When this field is strong enough the switch mounted on a pivot, which is of metal construction moves in the direction of the field and closes the circuit. The closed circuit can be used to power entire systems or just switch one item on.

Advantages of using relays

- Low power systems can power high powered systems
- Electrical isolation
- High current loads
- Multiple items can be powered from the same switch

Usage considerations

- Profile and form
- Transients
- Minimum power required to produce electromagnetic field
- Arching and contact burn (wear and tear)

Implementing in circuit

Relays are available in many forms; the choice of SMD, PCB mount is available along with types that can be mounted on DIN rail. They all have the same basic architecture.

Coil: The coil is the part of the relay that must be energised. Energising the coil requires that the coil voltage be applied and then usually you will hear a faint or muffled "click" coming from inside the housing. The click means that the switch has moved position.

Tips: Even though the relay coil is rated at 5Vdc, applying a slightly lower voltage will still energise the coil, this can result in relay chatter because the coil is not fully energised to hold the contact in the normally open position

Common and Contact: Relays will always have a common connection. The common is where you connect the voltage that is to be switched. The common is connected to two other contacts namely the Normally Open (NO) or Normally Closed (NC).

Normally Open: This contact will produce a closed circuit when the relay is in an energised state

Normally Closed: This contact will produce a closed circuit when the relay is not in an energised state

In Circuit

Shown below is one example of a circuit diagram for a relay to help with associating with the real thing. These small relays are ideal for mounting on PCB and switch moderately high loads even AC loads. You will need to watch the current as the paper thin PCB tracks can and will simply lift off the PCB if and when too much current is passed.