

## 2.1 Operating principles of relays:

### Principles

- A relay is automatic device which senses an abnormal condition of electrical circuit and closes its contacts. These contacts in turns close and complete the circuit breaker trip coil circuit hence make the circuit breaker tripped for disconnecting the faulty portion of the electrical circuit from rest of the healthy circuit.

### Pickup Level of Actuating Signal:

- The value of actuating quantity (voltage or current) which is on threshold above which the relay initiates to be operated. If the value of actuating quantity is increased, the electromagnetic effect of the relay coil is increased and above a certain level of actuating quantity the moving mechanism of relay starts to move.

### Reset Level:

- The value of current or voltage below which a relay opens its contacts and comes in original position.

### Operating Time of Relay:

- Just after exceeding pickup level of actuating quantity the moving mechanism (for example rotating disc) of relay starts moving and it ultimately close the relay contacts at the end of its journey. The time this elapses between the instant when actuating quantity exceeds the pickup value to the instant when the relay contacts close.

### Reset Time of Relay:

- The time which elapses between the instant when the actuating quantity becomes less than the reset value to the instant when the relay contacts returns to its normal position.

### Reach of Relay:

- A distance relay operates whenever the distance seen by the relay is less than the pre-specified impedance. The actuating impedance in the relay is the function of distance in a distance protection relay. This impedance or corresponding distance is called reach of the relay.

## Definition

- A relay is automatic device which senses an abnormal condition of electrical circuit and closes its contacts. These contacts in turns close and complete the circuit breaker trip coil circuit hence make the circuit breaker tripped for disconnecting the faulty portion of the electrical circuit from rest of the healthy circuit.

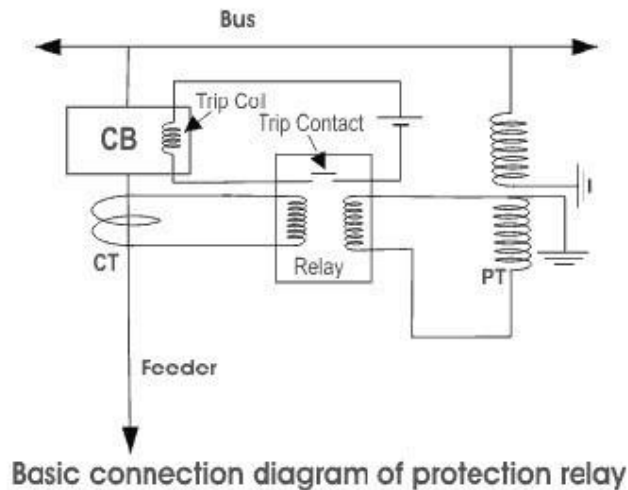


Figure: Basic diagram of protection relay [Source: "Principles of Powersystem" by V.K.Mehta, Page: 496]

- The basic connection of protection relay has been shown. It is quite simple. The secondary of current transformer is connected to the current coil of relay. And secondary of voltage transformer is connected to the voltage coil of the relay.
- Whenever any fault occurs in the feeder circuit, proportionate secondary current of the CT will flow through the current coil of the relay due to which mmf of that coil is increased. This increased mmf is sufficient to mechanically close the normally open contact of the relay.
- This relay contact actually closes and completes the DC trip coil circuit and hence the trip coil is energized. The mmf of the trip coil initiates the mechanical movement of the tripping mechanism of the circuit breaker and ultimately the circuit breaker is tripped to isolate the fault.