Basic Relaying

Electromechanical Overcurrent
Electrical Mechanical Overcurrent Relay

• The induction disc overcurrent relay is the basic building block of all relay protection.

• There are many types of very complex electromechanical relays but a complete understanding this relay will greatly aid in understanding of other relays.
Electrical Mechanical Relays

• Most all protective relays currently being put into service are microprocessor based multifunction devices.
• Never forget that these new devices and how they operate are based on their electromechanical predecessors.
The CO Relay is a single phase non-directional time overcurrent device. It is used to sense current level above the setting and normally is used to trip a circuit breaker to clear faults. A wide range of characteristics permit applications involving coordination with fuses, reclosers, cold load pickup, motor starting, or essentially fixed time applications. AC trip applications are described, but they are not recommended except in applications where a fault will not reduce the ac voltage below a level at which tripping will be reliable.
Class 1E Application

• Type CO
• Overcurrent Relay
• “Class 1E” is the safety classification of the electric equipment and systems in nuclear power generating stations that are essential to emergency shutdown of the reactor, containment isolation, cooling of the reactor, and heat removal from the containment and reactor, or otherwise are essential in preventing significant release of radioactive material to the environment.
What is a CO Relay

• Simply stated an induction disc overcurrent relay is a precision single phase shaded pole induction motor.
2.1 ELECTROMAGNET

The electromagnets for the types CO-5, CO-6, CO-7, CO-8 and CO-9 relays have a main tapped coil located on the center leg of an “E” type laminated structure that produces a flux which divides and returns through the outer legs. A shading coil causes the flux through the left leg to lag the main pole flux. The out-of-phase fluxes thus produced in the air gap cause a contact closing torque.
This CO relay also has an instantaneous overcurrent unit.
CO OVERCURRENT RELAY FOR PROTECTION OF A CIRCUIT BREAKER

- TOTAL OF FOUR RELAYS
- TIME OVERCURRENT FUNCTION ONLY

Figure 1: External Schematic of Hilo CO Relay for Phase and Ground Overcurrent Protection on a Three Phase System
Time dial set on three then the operating time at three times the tap setting will be 1.7 seconds. At 5 times the tap operate time will be 0.7 seconds.
CO OVERCURRENT RELAY

• Settings and Adjustments for CO type overcurrent relay
  – Tap setting (sets the current level for which the induction disc begins to move “creep”)
    • Some model of relays have a high/low tap setting to increase the setting range of the relay.
  – Time dial setting or lever setting (sets the distance the moving contact must travel before it makes contact with the stationary contact).
  – Target pickup current setting, 0.2 or 2.0 amps DC (sets the amount of DC current required to operate the target and seal in relay).
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• Contacts within the relay can make current but cannot break current.
• The circuit breaker 52a contacts in the schematic interrupts the DC trip current.
Figure 7: Internal Schematic of the Single Trip Relay With IIT
Calibrating a Time Overcurrent Relay

• Minimum pickup
  – This is the value of current for which the disk will just start to move (creep)
  – At this level of current significant time is required for the contact to close.
  – Contact make should be at the setting desired
  – Contact break will be at a current level slightly below the make value.
Calibrating a Time Overcurrent Relay

• Timing test
  – The current value will be some multiple of the pickup current i.e. “X 3”
  – The time will be obtained from the appropriate time curve
  – The disk must be fully reset before applying the current
Overcurrent Relay
Voltage controlled Overcurrent

DESCRIPTION

The Type IFCS relays include an induction disc time overcurrent unit with wound shading coils controlled by the contact of an undervoltage unit. This overcurrent unit is similar to the IFC51 (inverse) or the IFC53 (very inverse) except that the shading rings on the U magnet have been replaced with the wound shading coils.
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