



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE605 PROTECTION AND SWITCHGEAR

III YEAR /VI SEMESTER

Unit 3- APPARATUS PROTECTION

Topic: Differential Protection of Alternators



Introduction

- The most common system used for the protection of stator winding faults employs circulating-current principle.
- In this scheme of protection, currents at the two ends of the protected section are compared.
- Under normal operating conditions, these currents are equal but may become unequal on the occurrence of a fault in the protected section.
- The difference of the currents under fault conditions is arranged to pass through the operating coil of the relay.
- The relay then closes its contacts to isolate protected section from the system.
- This form of protection is also known as *Merz-Price circulating current scheme*.



Construction



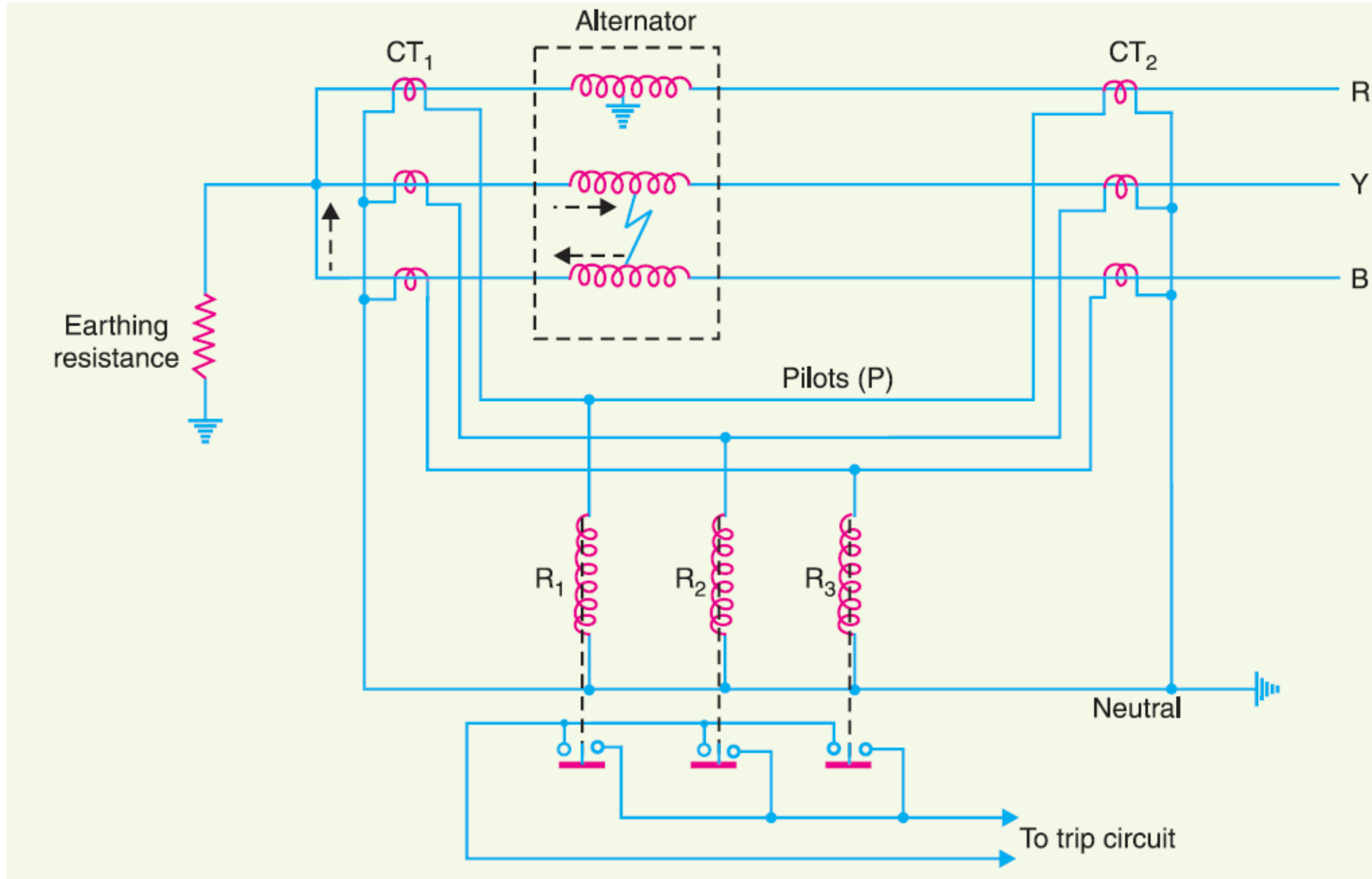
- Identical current transformer pairs $CT1$ and $CT2$ are placed on either side of each phase of the stator windings.
- The secondaries of each set of current transformers are connected in star ; the two neutral points and the corresponding terminals of the two star groups being connected together by means of a four-core pilot cable.
- Thus there is an independent path for the currents circulating in each pair of current transformers and the corresponding pilot P .



Construction



- The relay coils are connected in star, the neutral point being connected to the current-transformer
- common neutral and the outer ends one to each of the other three pilots.
- In order that burden on each current transformer is the same, the relays are connected across equipotential points of the three pilot wires and these equipotential points would naturally be located at the middle of the pilot wires.
- The relays are generally of electromagnetic type and are arranged for instantaneous action since fault should be cleared as quickly as possible.





Operation



- Under normal operating conditions, the current at both ends of each winding will be equal and hence the currents in the secondaries of two CTs connected in any phase will also be equal.
- Therefore, there is balanced circulating current in the pilot wires and no current flows through the operating coils ($R1$, $R2$ and $R3$) of the relays.
- When an earth-fault or phase-to-phase fault occurs, this condition no longer holds good and the differential current flowing through the relay circuit operates the relay to trip the circuit breaker.



Assessment



Which type of relay represents the phasor difference of two or more similar electrical quantities exceed a predetermined value?

- A. Over load relay
- B. Differential relay.
- C. Over voltage relay
- D. Thermal relay





References



1. SuniS Rao, “Switchgear, Protection and Power System (Theory, Practice & Solved Problems)”, Khanna Publishers, New Delhi, 2019.
2. Paithankar Y G, Bhide S R, “Fundamentals of Power System Protection”, Prentice Hall of India Pvt Ltd., New Delhi, 2nd Edition, 2014.
3. Badriram, Vishwakarma B.H, “Power System Protection and Switchgear”, New Age International Pvt Ltd Publishers, 2nd Edition 2017.

Thank You