Protection of Transmission Line

Over current protection

Transmission lines are a vital part of the electrical distribution system, as they provide the path to transfer power between generation and load. Transmission lines operate at voltage levels from 69kV to 765kV, and are ideally tightly interconnected for reliable operation.

The high level factors influencing line protection include the criticality of the line (in terms of load transfer and system stability), fault clearing time requirements for system stability, line length, the system feeding the line, the configuration of the line (the number of terminals, the physical construction of the line, the presence of parallel lines), the line loading, the types of communications available, and failure modes of various protection equipment.

Over current protection

Lines are protected by over current-, distance-, or pilot-relaying equipment, depending on the requirements. Over current relaying is the simplest and cheapest, the most difficult to apply, and the quickest to need readjustment or even replacement as a system changes.

It is generally used for phase- and ground-fault protection on station-service and distribution circuits in electric utility and in industrial systems, and on some sub-transmission lines where the cost of distance relaying cannot be justified.

It is used for primary ground-fault protection on most transmission lines where distance relays are used for phase faults, and for ground back-up protection on most lines having pilot relaying for primary protection. However, distance relaying for ground-fault primary and back-up protection of transmission lines is slowly replacing over-current relaying.

Overcurrent relaying is used extensively also at power-transformer locations for externa-fault back-up protection, but here, also, there is a trend toward replacing overcurrent with distance relays. It is generally the practice to use a set of two or three overcurrent relays for protection against interphase faults and a separate overcurrent relay for single-phase-to-ground faults. Separate ground relays are generally favored because they can be adjusted to provide faster and more sensitive protection for single-phase-to-ground faults than the phase relays can provide.

Overcurrent relaying is well suited to distribution-system protection for several reasons. Not only is overcurrent relaying basically simple and inexpensive but also these advantages are realized in the greatest degree in many distribution circuits. Very often, the relays do not need to be directional, and then no a-c voltage source is required. Also, two phase relays and one ground relay are permissible.

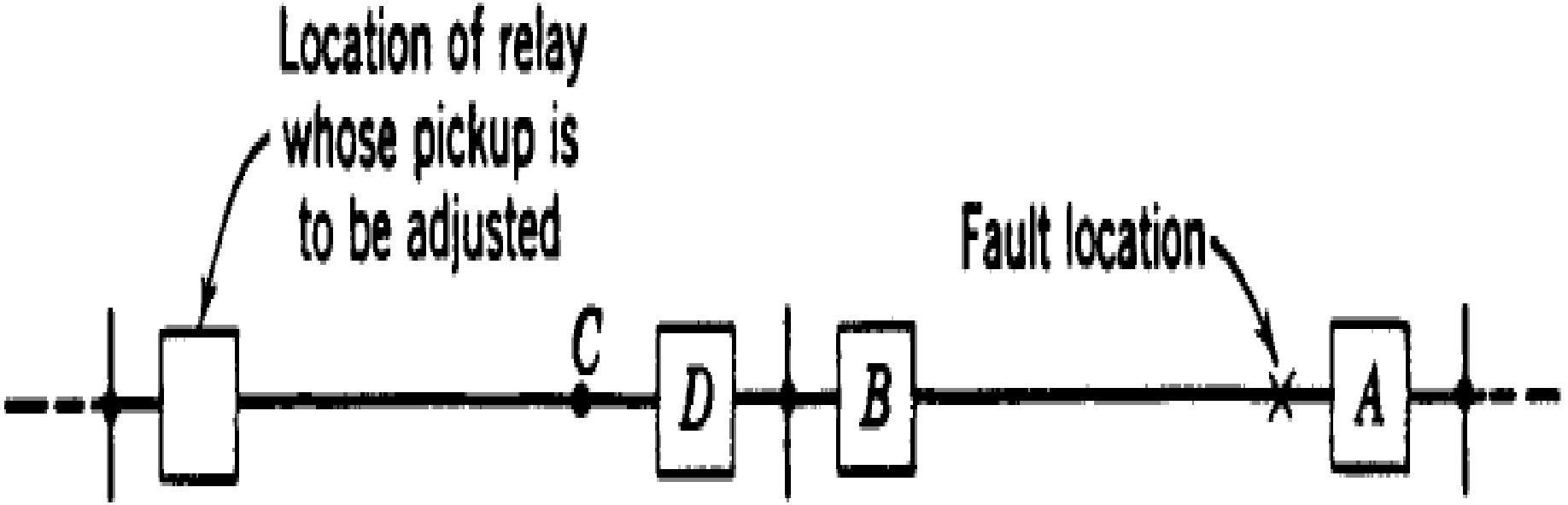

Fig. The fault location for adjusting the pickup for back-up protection.