Over current protection

Contd...

The first step is to choose the pickup of the relay so that it will (1) operate for all short circuits in its own line, and (2) provide back-up protection for short circuits in immediately adjoining system elements under certain circumstances. For example, if the adjoining element is a line section, the relay is set to pick up at a current somewhat less than it receives for a short circuit at the far end of this adjoining line section under minimum generating or other conditions that would cause the least current flow at the relay location. This is illustrated in Fig. 1.
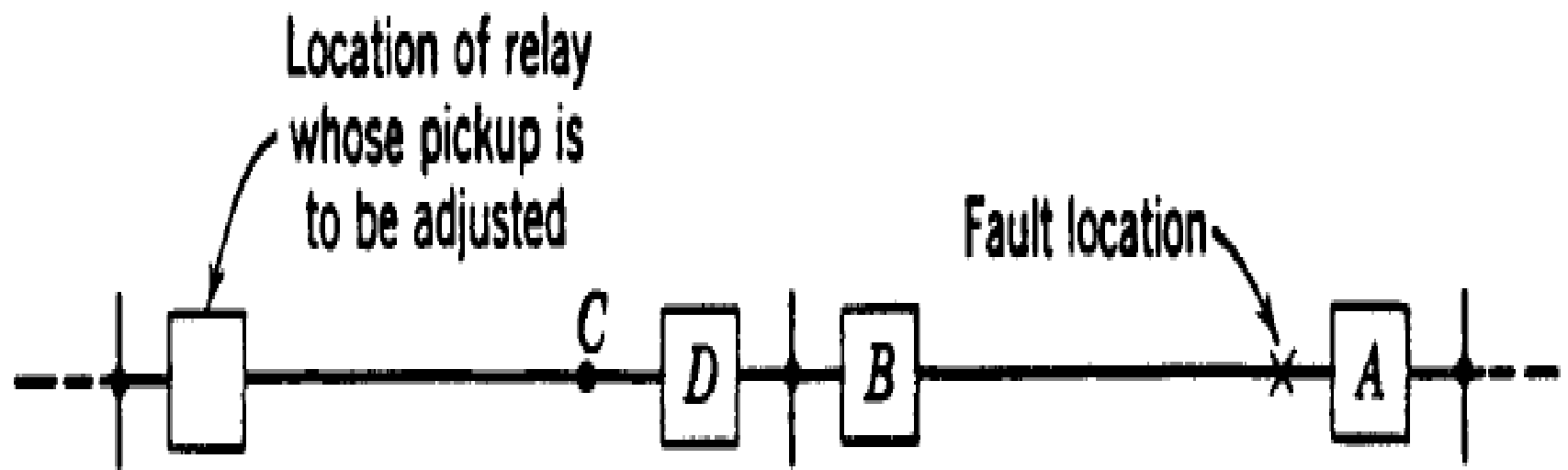
Fig. 1. The fault location for adjusting the pickup for back-up protection.

For a phase relay, a phase-to-phase fault would be assumed since it causes less current to flow than does any other fault not involving ground. However, a phase relay must not be so sensitive that it will pick up under emergency conditions of maximum load over the line from which it receives its current. For a ground relay, a single-phase-to-ground fault would be assumed; load current is not a factor in the choice of a ground-relayÕs pickup except in a distribution system where there is ground current normally because of unbalanced loading.

If there are two or more adjoining line sections, the fault should be assumed at the end of the section that causes the least current to flow at the location of the relay being adjusted. Because of the effect of parallel circuits not shown, less current will flow at the relay location of Fig. 1 if breaker A is closed than if A is open. If satisfactory adjustment can be obtained with A closed, so much the better. However, the relay under consideration is being adjusted to operate if breaker B fails to open; it is not generally assumed that breaker A will also fail to open.

Under certain circumstances, the relay will get less current for a phase-to-phase fault at C with breaker D closed and under minimum generating conditions than for the fault location shown in Fig. 1 with A open; the relay must be able to operate for this condition also. In order to use the most inverse portion of the relays time curves, the pickup in terms of primary current should be as high as possible and still be low enough so that the relay will operate reliably under the minimum fault-current condition.

Under such conditions, the relay should operate at no less than about 1.5 times its pickup, but as near to that value as conveniently possible. The reason for this rule is that, closer to the pickup current, the torque is so low that a small increase in friction might prevent operation or it might increase the operating time too much. It may be that the CT ratio and the relays range of adjustment do not permit adjusting for so low a multiple of pickup.