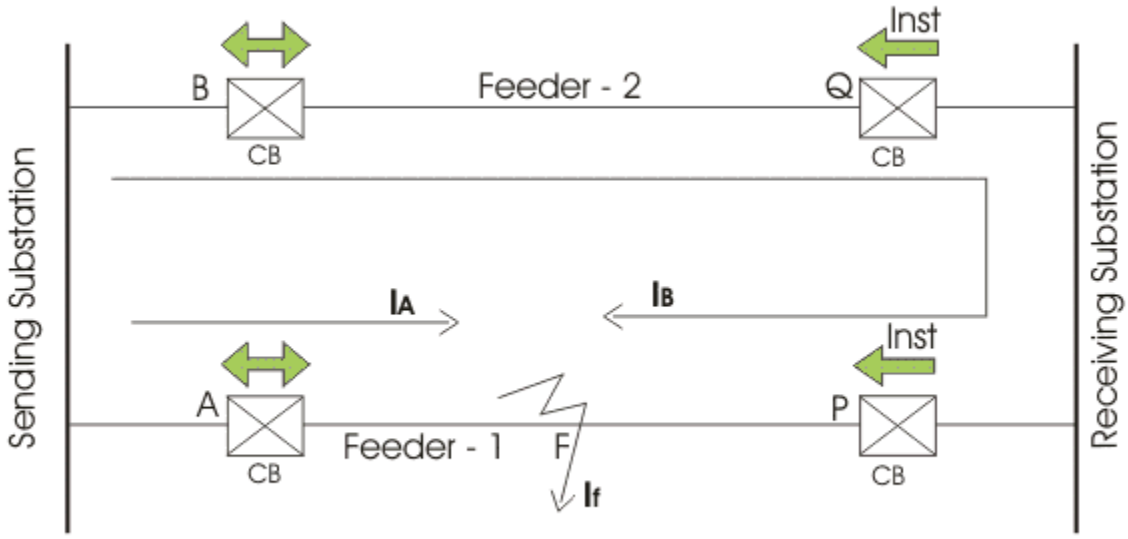
Over Current Protection of Parallel Feeders

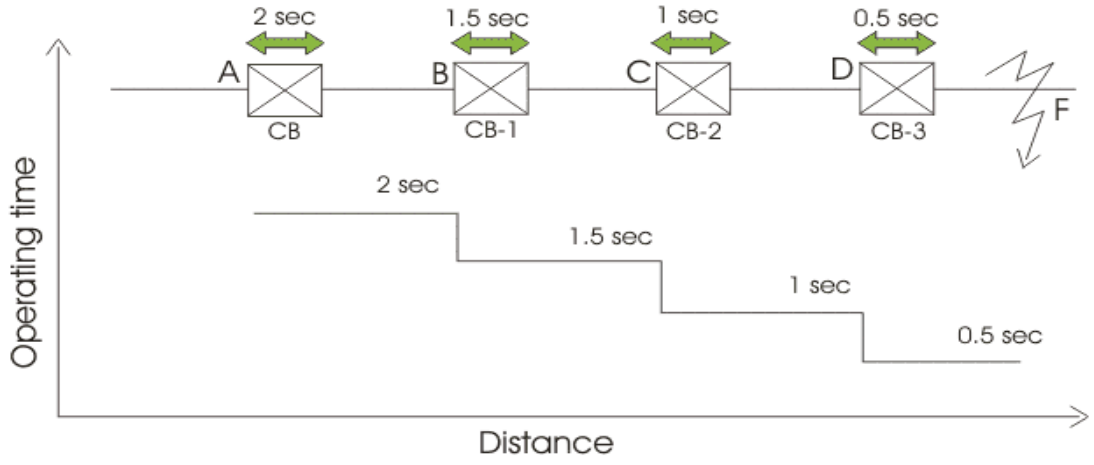
For maintaining stability of the system it is required to feed a load from source by two or more than two feeders in parallel. If fault occurs in any of the feeders, only that faulty feeder should be isolated from the system in order to maintain continuity of supply from source to load. This requirement makes the protection of parallel feeders little bit more complex than simple non direction over current protection of line as in the case of radial feeders. The protection of parallel feeder requires to use directional relays and to grade the time setting of relay for selective tripping.There are two feeders connected in parallel from source to load. Both of the feeders have non-directional over current relay at source end. These relays should be inverse time relay. Also both of the feeders have directional relay or reverse power relay at their load end. The reverse power relays used here should be instantaneous type. That means these relays should be operated as soon as flow of power in the feeder is reversed. The normal direction of power from source to load.

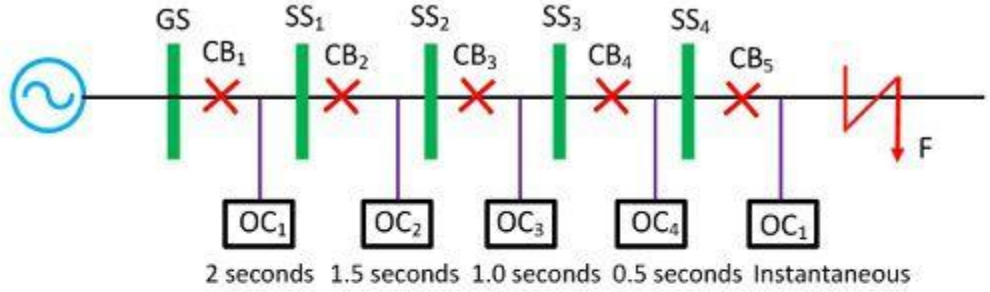
Now, suppose a fault occurs at point F, say the fault current is I_f. This fault will get two parallel paths from source, one through circuit breaker A only and other via CB-B, feeder-2, CB-Q, load bus and CB-P. This is clearly shown in figure below, where I_A and I_B are current of fault shared by feeder-1 and feeder-2 respectively.

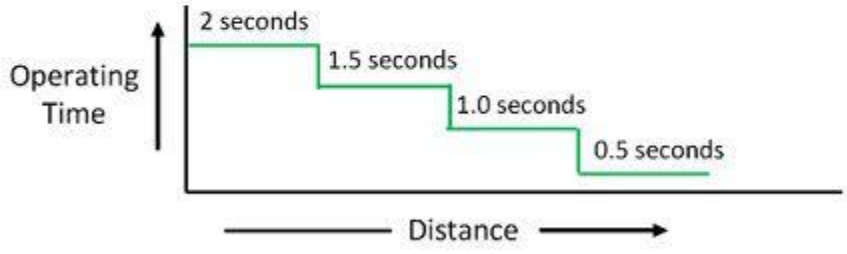


As per Kirchoff's current law, $I_A + I_B = I_f$.

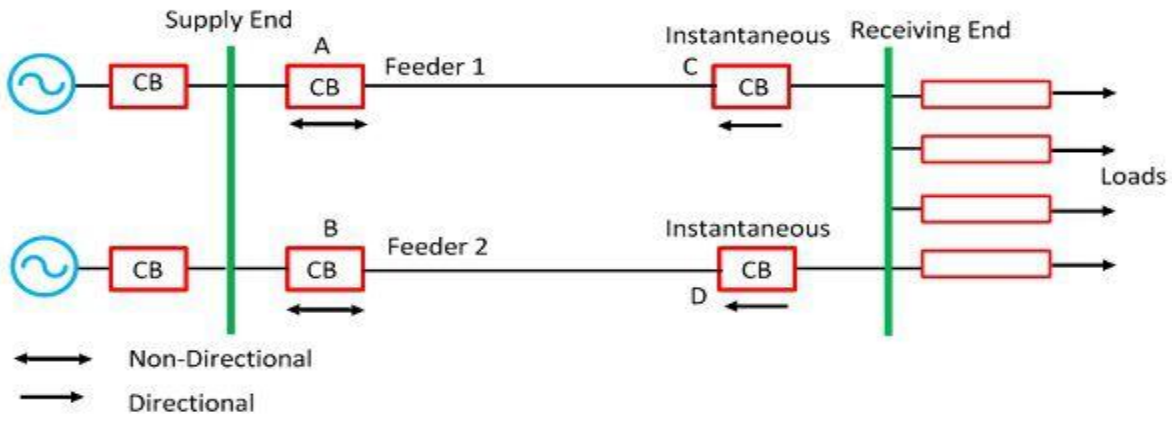
Now, I_A is flowing through CB-A, I_B is flowing through CB-P. As the direction of flow of CB-P is reversed it will trip instantly. But CB-Q will not trip as flow of current (power) in this circuit breaker is not reversed. As soon as CB-P is tripped, the fault current I_B stops flowing through feeder and hence there is no question of further operating of inverse time over current relay. I_A still continues to flow even CB-P is tripped. Then because of over current I_A, CB-A will trip. In this way the faulty feeder is isolated from system.







Time Graded Protection for Radial Feeders

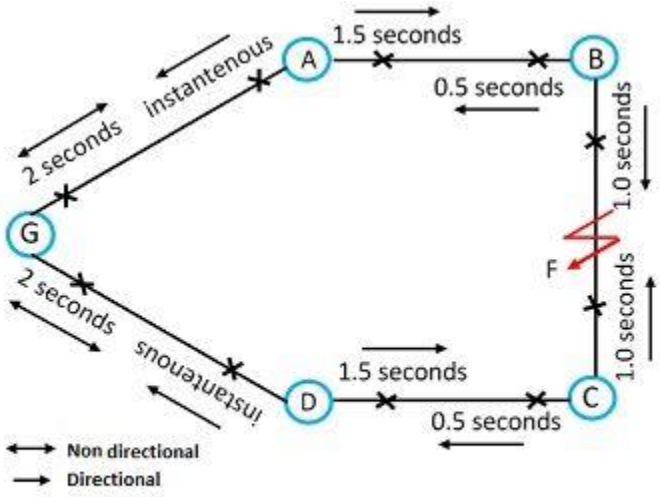


Protection of Parallel Feeders

Protection of Ring Main System

The ring main is a system of interconnection between a series of the power station by a different route. In the main ring system, the direction of power can be changed at will, particularly when the interconnection is used.

The elementary diagram of such a system is shown in the figure below where G is the generating station, and A, B, C, and D are substation. At the generating station, the power flow only in one direction and hence no time lag overload relays is used. The time grade overload relay is placed at the end of the substation, and it will trip only when overload flows away from the substation which they protect.



Protection of Ring System

Going round the ring in the direction GABCD the relay on the further side of each station are set with decreasing time lags. At generating station 2 seconds at station A, B, C and 1.5 seconds, 1.0 second, 0.5 second and instantaneous respectively. Similarly going round the ring in the opposite direction the relay on the outgoing sides would be set as follows.

If the fault occurs at point F, the power F is fed into the fault through two paths ABF and DCF. The relay to operate is that between substation B and fault point F and substation C and fault point F. Thus the fault on any section will cause the relay on that section to operate, and the healthy section will be operating uninterruptedly.