



Fuse Saving Schemes in Feeder Relays

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Selectivity between feeder breaker and downstream devices is normally expected in typical distribution systems. However, in some situations the feeder breaker is set to trip for faults beyond a downstream branch fuse, before the fuse will blow. This practice is known as a "fuse saving" scheme and can save expensive fuse replacement and consumer extended outage time.

If the short circuit current in a substation is too high to prevent fuse damage, the scheme is not applicable. The fuse melting point and feeder breaker clearing must be compared for the fault current level at the fuse location to determine if a fuse saving scheme can be implemented. If the fuse melting time is below the sum of the protection and breaker operating times for the calculated short circuit value at the fuse location, the fuse saving scheme will not be applied.

The fuse saving scheme typically uses a low set instantaneous overcurrent element which will trip the feeder breaker before the fuse branch can blow, and the breaker is then immediately reclosed. The low set elements are automatically cut out of service after the first tripout, so that if the fault should persist the inverse time elements will have to operate to trip the circuit breaker. This gives time for the branch circuit fuse of the faulty circuit to blow if the fault is beyond the fuse. In this way the cost of replacing blown branch circuit fuses is minimized, and at the same time the branch circuit outage is also minimized. If the breaker is not tripped within a certain time after the reclosure, the low set instantaneous protection should be automatically returned to service.

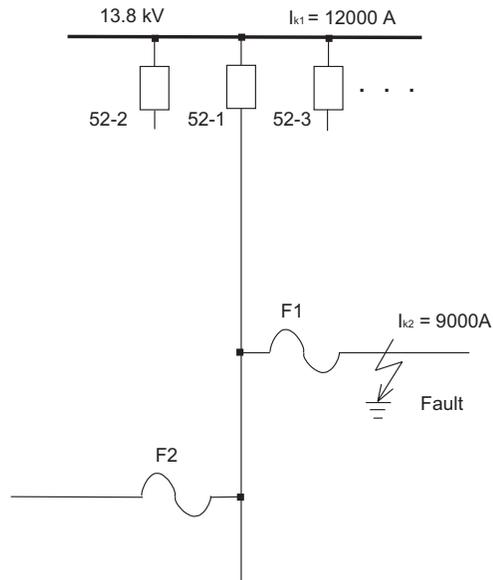
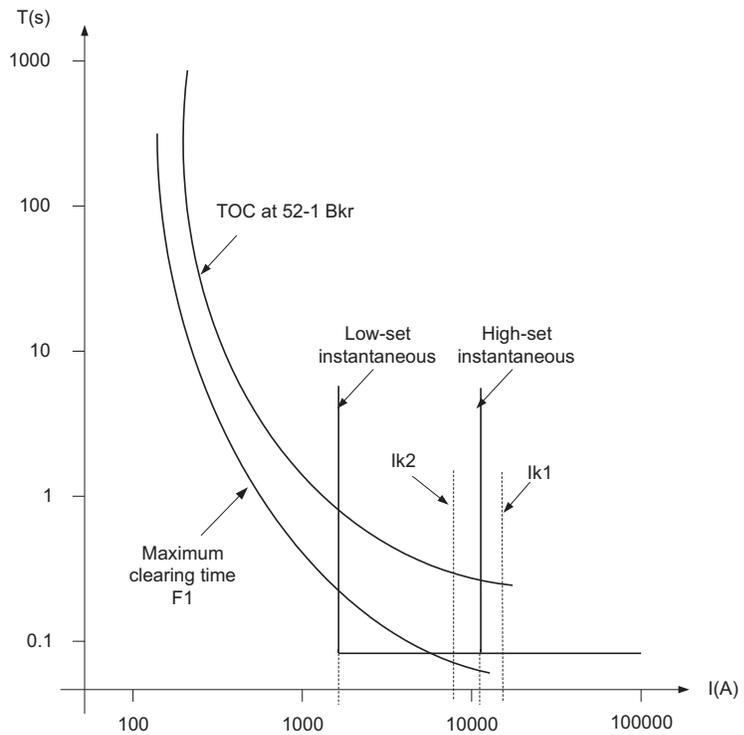
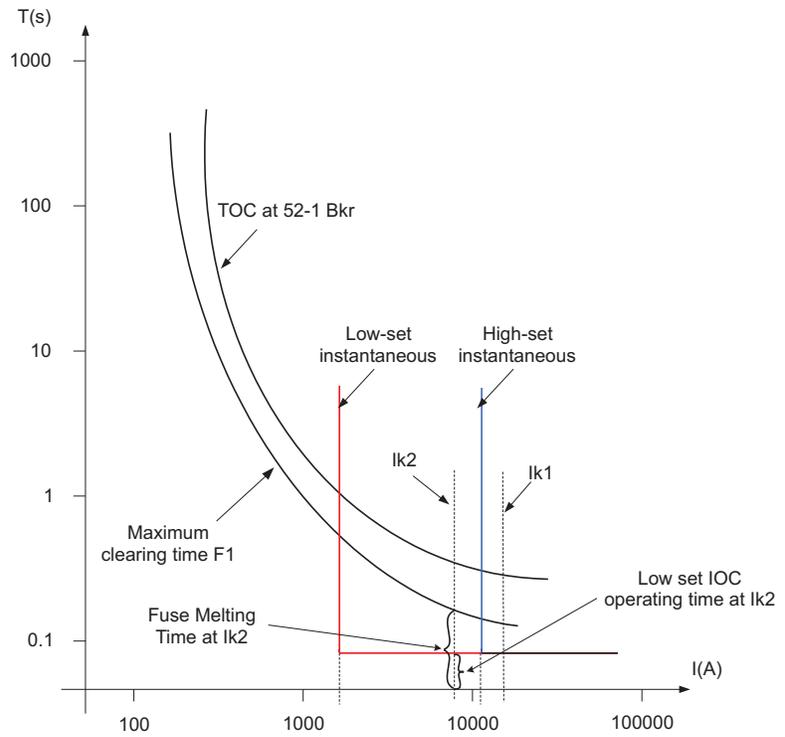


FIGURE 1. Fuse Saving Scheme

In the following graph, the fuse will melt before low-set instantaneous overcurrent operate for $I_k = 9000\text{ A}$ at the fuse F1 location. In this case, the fuse saving scheme cannot be applied, and therefore the low-set overcurrent should not be enabled.



However, with a fuse of a different characteristic, the fuse saving scheme application becomes possible. See the curves below:



In many situations the fuse saving scheme may not be applicable or desirable and the feeder protection will simply maintain coordination with all downstream devices.