

Power System Protection

S.A.Soman

Department of Electrical Engineering
IIT Bombay

PSM Setting and Relay Coordination (Tutorial for Phase
Faults)

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Power System
Protection

S.A.Soman

PSM Setting
for Primary
and Backup
Protection

Lack of Coordination
Problem

IEC Standard
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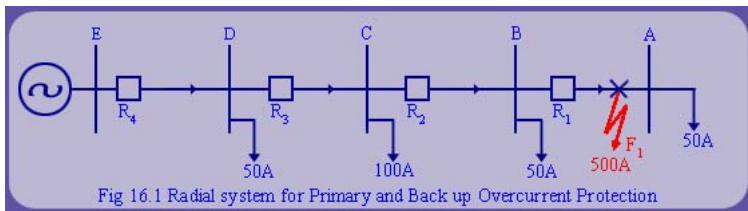
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PSM Setting for Primary and Backup Protection



- Pick up current should be above 1.25 times maximum load current.
- Pick up current should be limited to $\frac{2}{3}$ rd of minimum fault current.
- Backup protection is provided by time discrimination principle.

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Algorithm for Overcurrent Relay

R	MxFL	MnPC	MnFC	MxPC	MxFC	PSM	TMS
R_1	50	62.5	250	167	500	160	0.025
R_2	100	125	650	167	1200	167	0.07
R_3	200	250	1100	433	2000	400	0.086
R_4	250	312.5	1600	733	3500	700	0.097

where, MxFL = Max feeder segment load current

MnPC = Min limit on pickup current

MnFC = Min fault current on remote bus

MxFC = Max fault current

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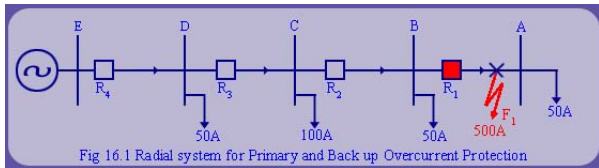
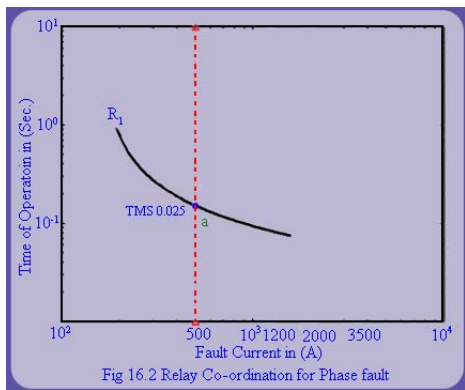
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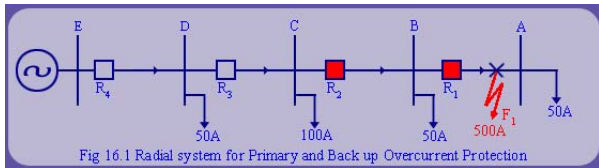
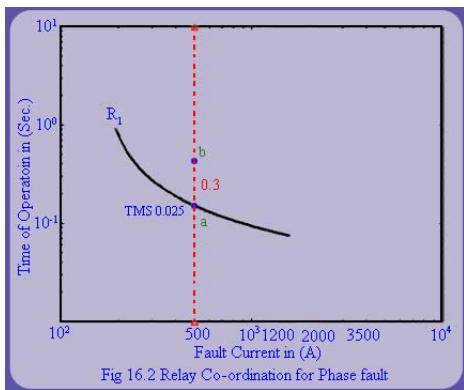
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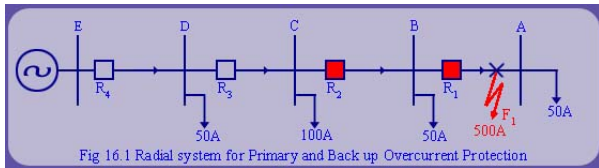
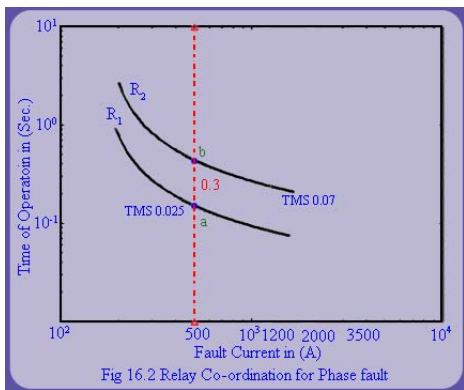
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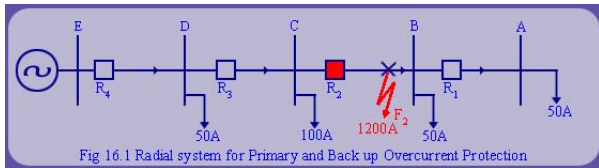
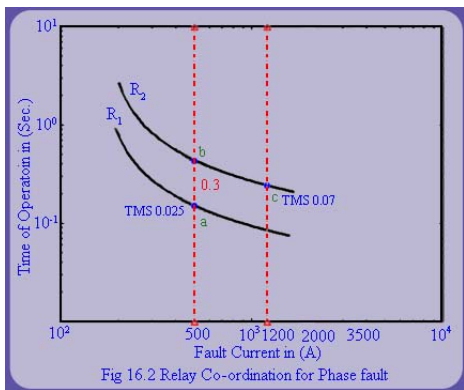
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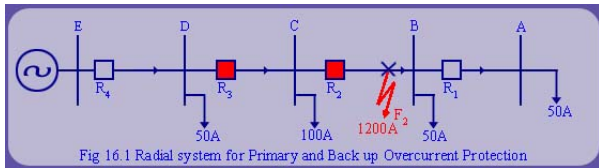
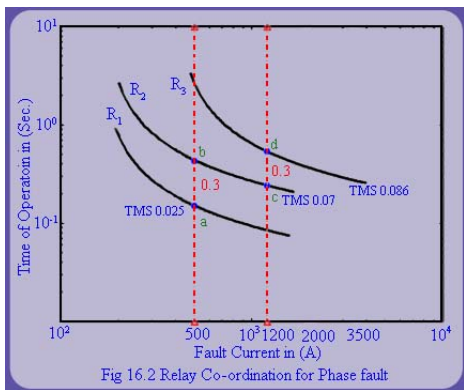
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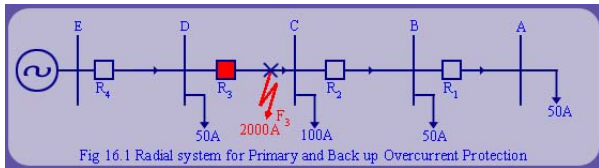
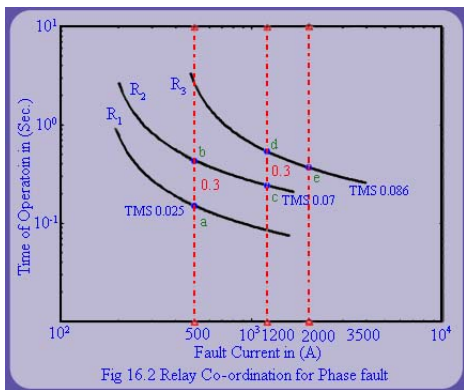
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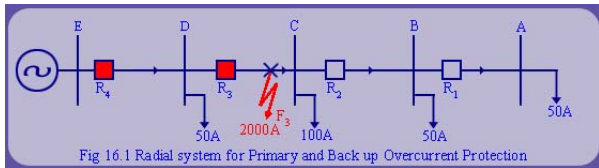
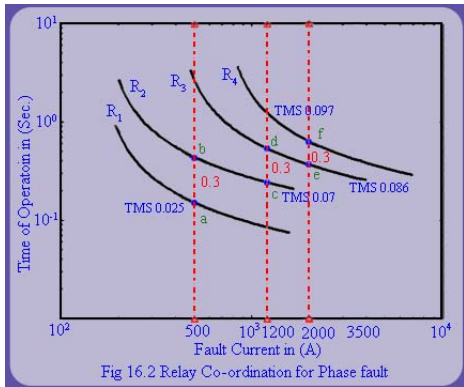
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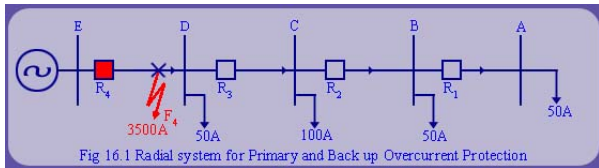
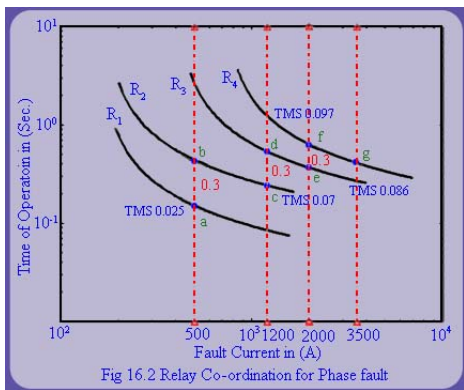
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Fault Type and CT Burden

In three phase CT connection, the burden on individual CT will depend upon

- Type of connection, i.e. star or delta.
- Type of fault, i.e. phase fault or ground fault.

For a three phase fault in a star connected CT, the effective impedance seen by the CT will be

$$Z = R_S + R_L + Z_R$$

For a three phase to ground fault, it will be,

$$Z = R_S + 2R_L + Z_R$$

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Problem 2

- An 8MVA, 138/13.8kV transformer is connected to an infinite bus. If a bolted three phase fault occurs at F, find out the fault current. The impedance of the transformer is 10% and location of the fault is close to the bus as shown in the figure.
- If the distribution feeder has 600/5 C200 CT with a knee point of 100V, calculate the voltage developed across CT and comment on its performance. CT secondary resistance is 0.414Ω , lead wire resistance is 0.411Ω and relay impedance is 0.259Ω .

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- If the existing 8MVA transformer is replaced with a new 28MVA transformer with 10% leakage impedance, find out the new fault current. Will this new fault current lead to CT saturation?
- In case CT saturates, comment on the performance of
 - Primary relay
 - Back up relay
 - Coordination between primary and back up relay pair