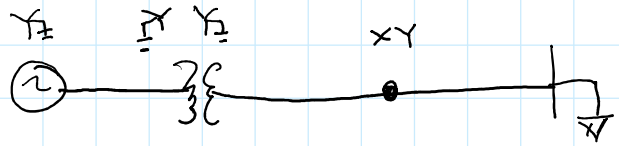
Series Faults:

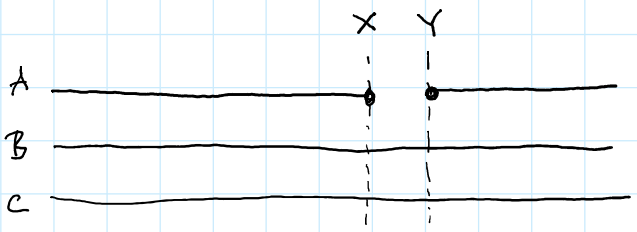
Causes: Broken Conductors, Blown Fuses, Open-Pole Condition

Effects: System Unbalance (negative and zero Sequence)

Consideration: System load (Load Current)

One-Phase Open





Boundary Conditions;

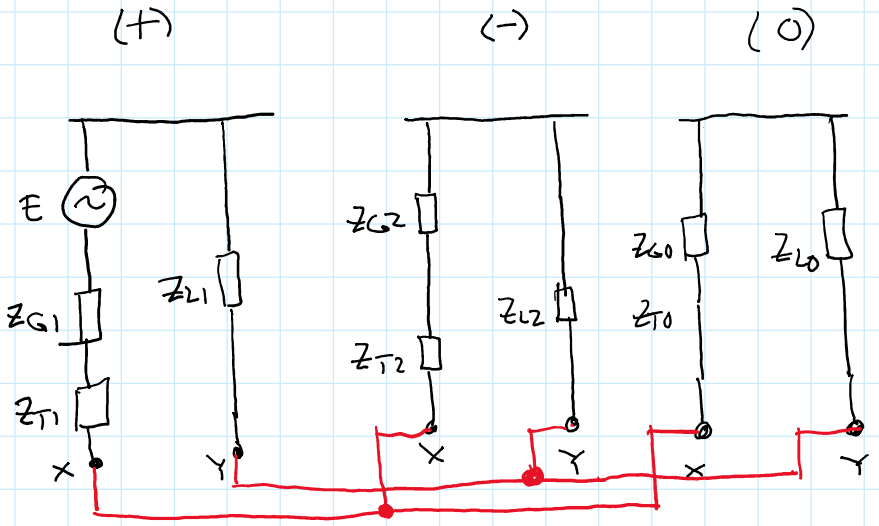
$I_A = 0$; $V_{BXY} = 0$; $V_{CXY} = 0$

Solving for Sequence Quantities (using Phase A as Reference)

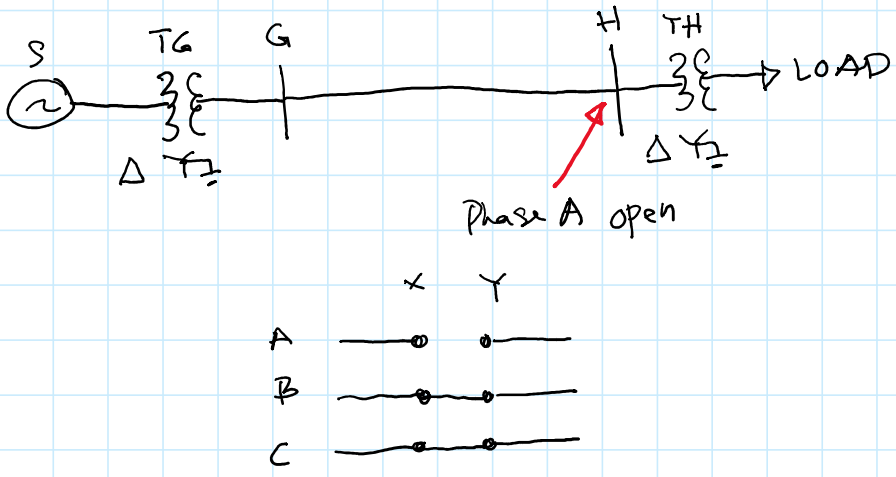
Since $I_A = 0$, then $I_A = I_1 + I_2 + I_0 = 0$

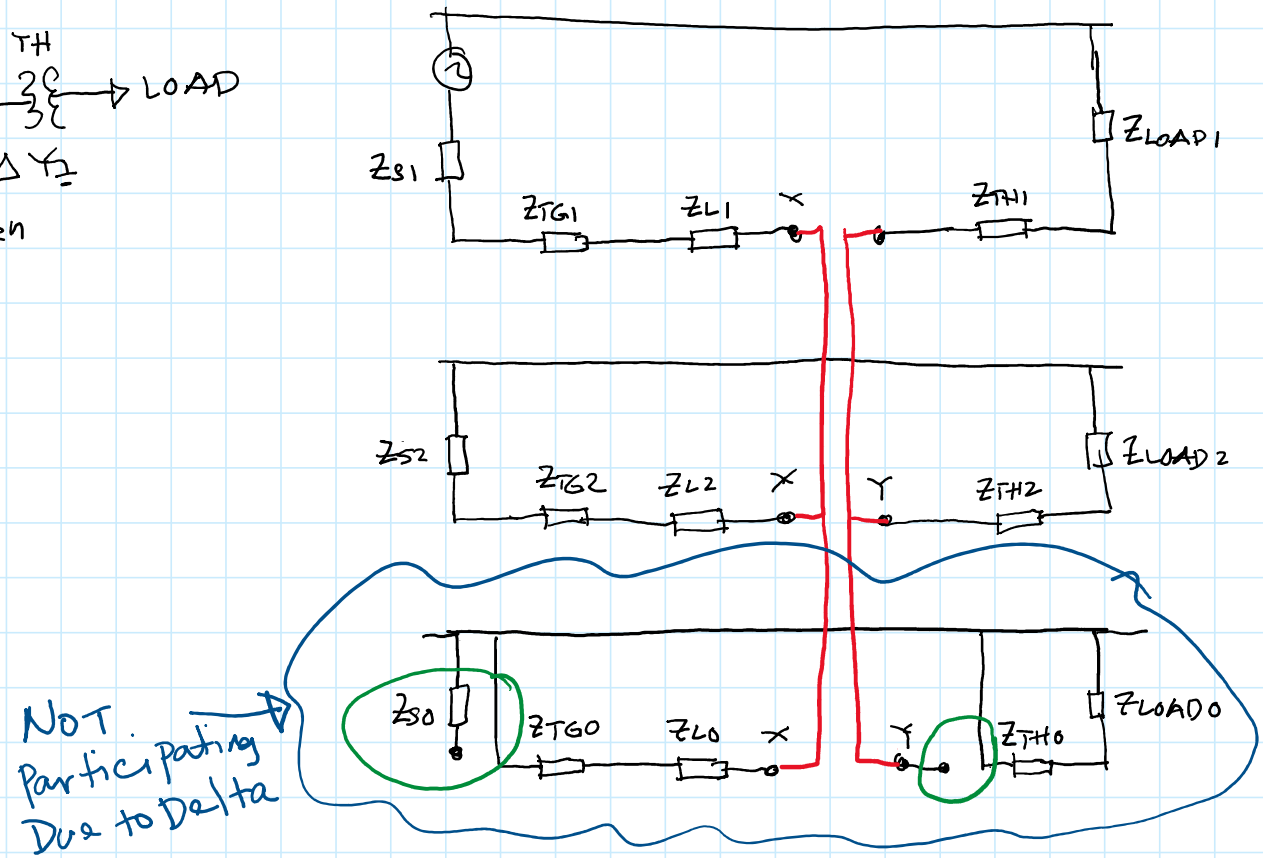
$$3V_{0XY} = V_A + V_B + V_C = V_A$$
$$3V_{1XY} = V_A + aV_B + a^2V_C = V_A$$
$$3V_{2XY} = V_A + a^2V_B + aV_C = V_A$$

$$V_1 = V_2 = V_0 = V_A$$

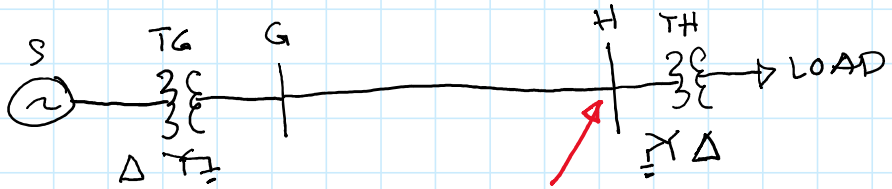


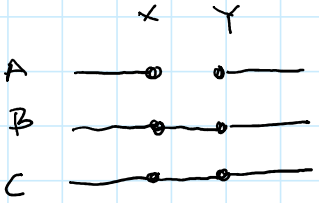
One Phase Open Delta-Wye Transformer:

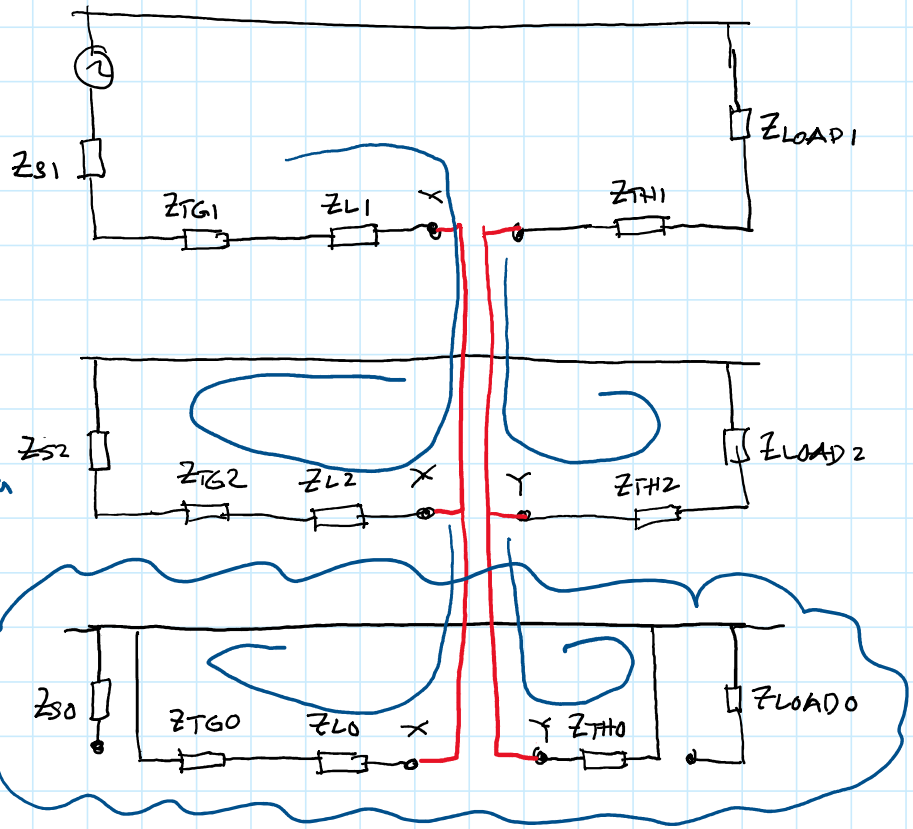




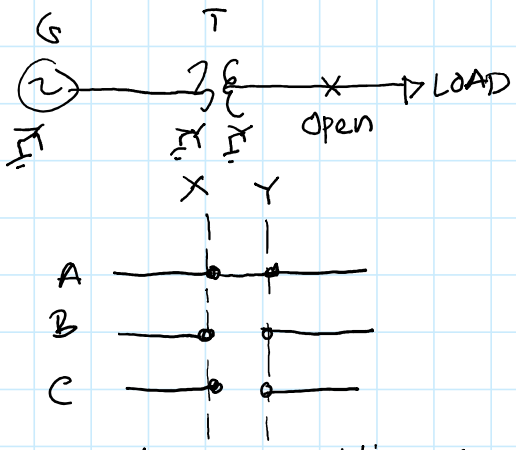
One Phase Open Wye-Delta Transformer:







Series Fault Two-Phase Open

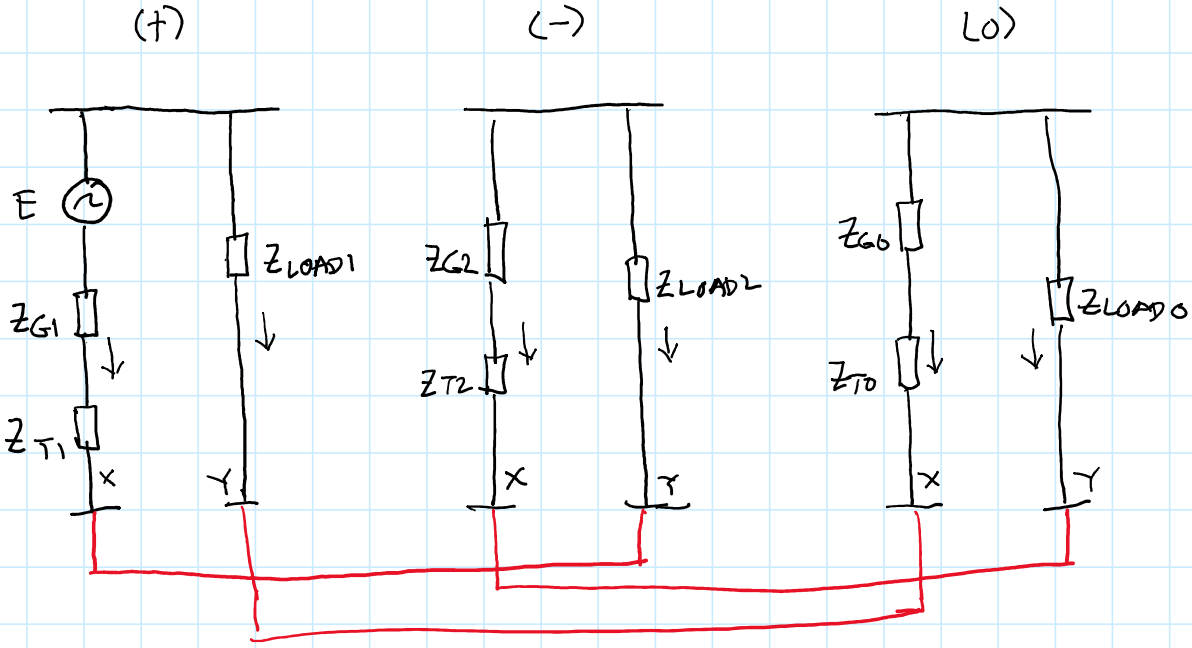


Boundary Conditions:

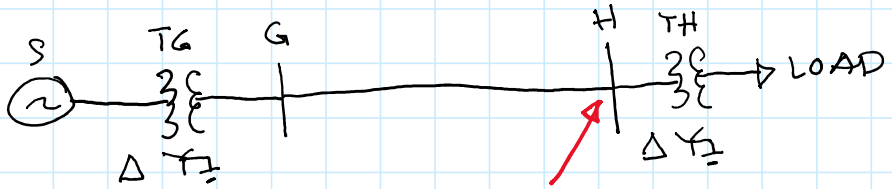
$I_B = I_C = 0$

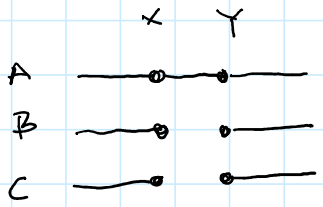
$V_{AXY} = 0$

$$3I_0 = I_A + I_B + I_C = I_A$$
$$3I_1 = I_A + aI_B + a^2I_C = I_A$$
$$3I_2 = I_A + a^2I_B + aI_C = I_A$$
$$I_0 = I_1 = I_2 = \tfrac{1}{3}I_A$$

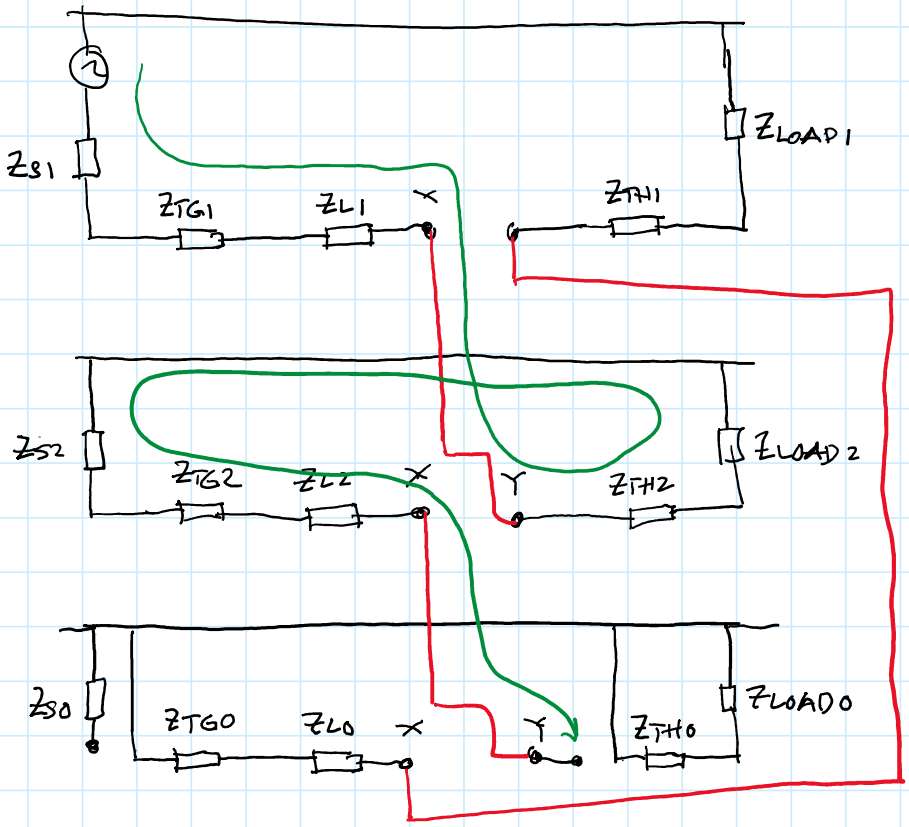


Two Phase Open Delta-Wye Transformer:

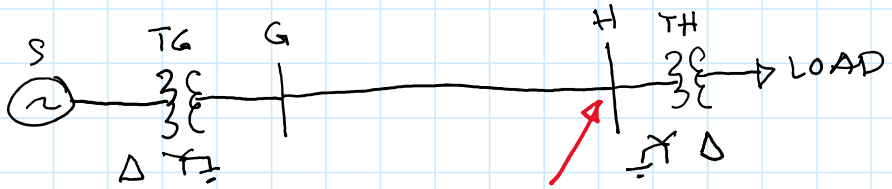


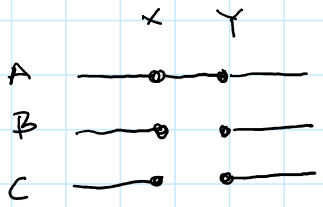


$I_{1G} = I_{2G} = I_{0G} = 0$



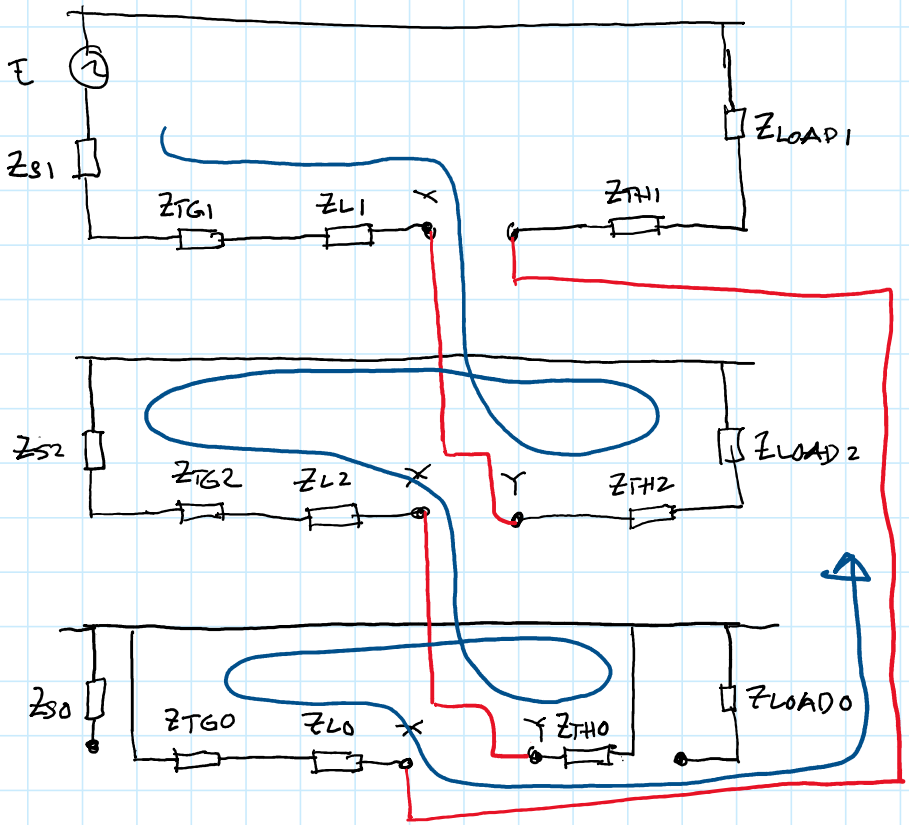
Two Phase Open Wye-Delta Transformer:





$$I_{1G} = \frac{E}{Z_1 + Z_2 + Z_0}$$

$$I_{1G} = I_{2G} = I_{0G}$$



Symmetrical Components Present During Faults

	Both Sides Grounded	one side Grounded
One phase open	1, 2, 0	1, 2
Two phases open	1, 2, 0	None