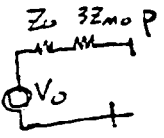
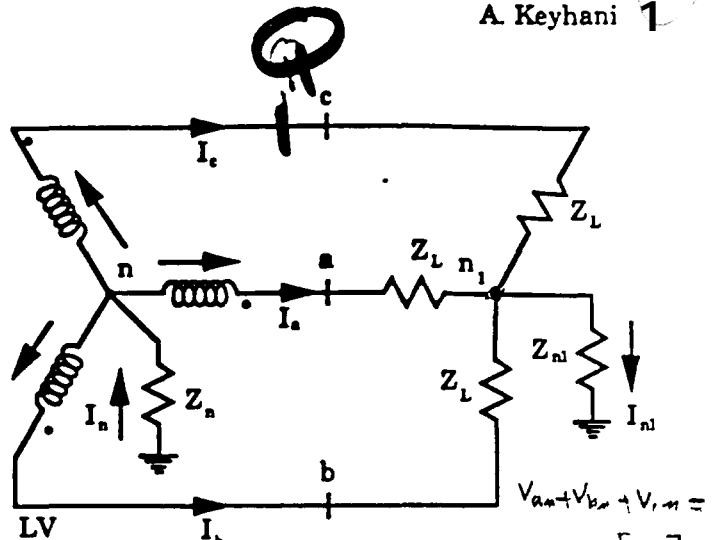
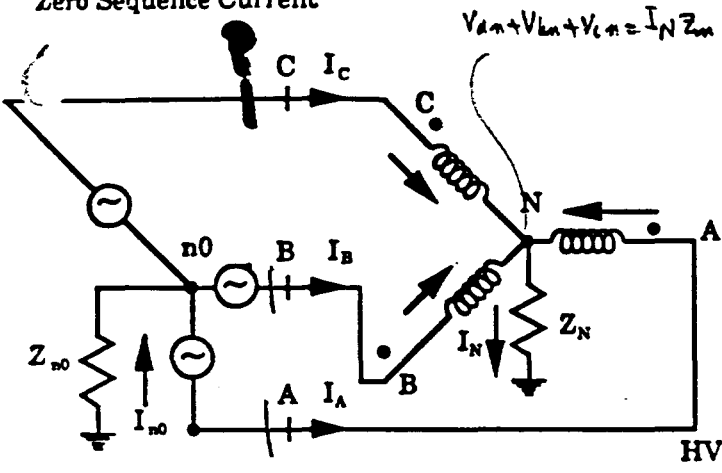


Zero Sequence Current



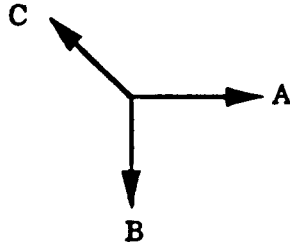
$I_{n0} = I_N$ why?

$V_{an} + V_{bn} + V_{cn} = I_{n1} Z_{n1}$ $I_{n1} = I_n$ why?

Assume supply voltages are unbalanced

$$V_m = V_{a_m} + V_{b_m} + V_{c_m}$$

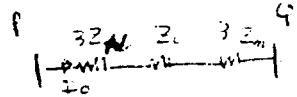
$$V_0 = \frac{1}{3} (V_{a_m} + V_{b_m} + V_{c_m})$$



$$I_0 = \frac{1}{3} [I_a + I_b + I_c] = \frac{1}{3} I_N$$

$$I_1 = \frac{1}{3} [I_a + a I_b + a^2 I_c]$$

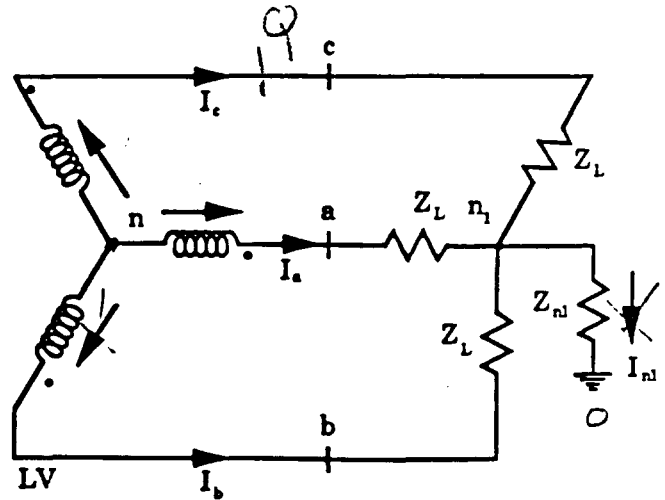
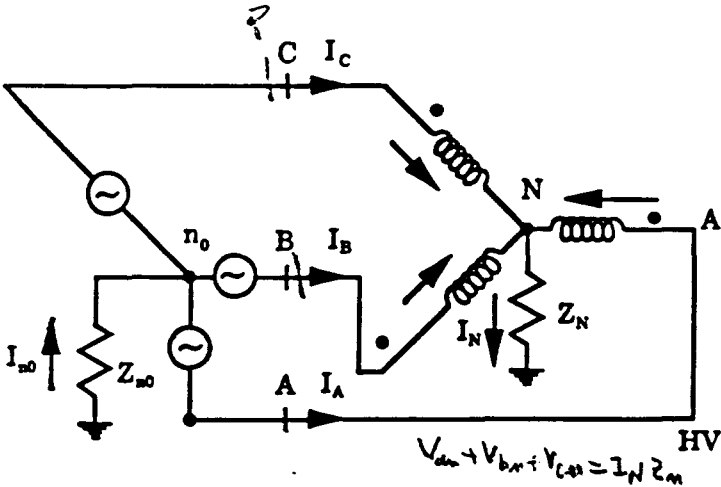
$$I_2 = \frac{1}{3} [I_a + a^2 I_b + a I_c]$$



$I_m = \frac{1}{3} I_0$

Then $I_a + I_b + I_c = I_N$

$I_a + I_b + I_c = I_n$



Assume supply voltages are unbalanced

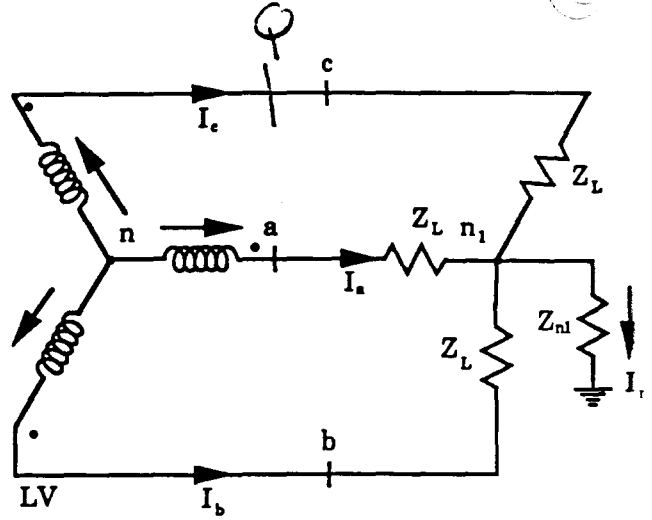
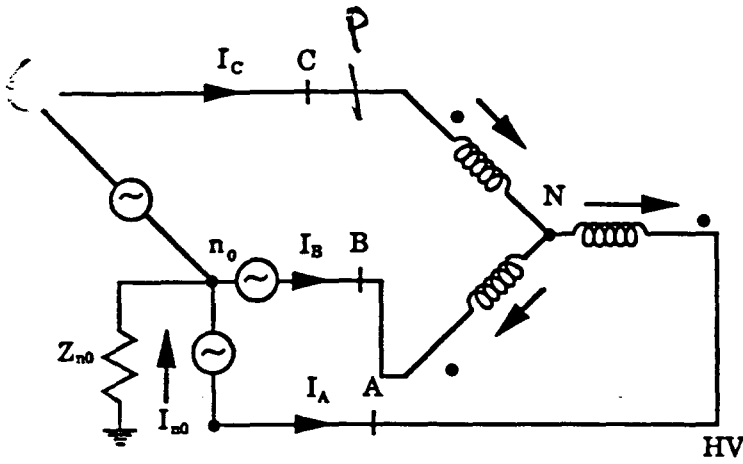
$V_{an} + V_{bn} + V_{cn} = V_{n1}$

for HV side

for LV side

- $I_0 = 0$ why?
- $I_{n0} = 0, I_N = 0$ why?
- $I_1 \neq 0$
- $I_2 \neq 0$

- $I_0 = 0, I_{n1} = 0$ why?
- $I_1 \neq 0$
- $I_2 \neq 0$



Assume supply voltages are unbalanced

for HV side:

$I_0 = 0$ why?

$I_1 \neq 0, I_2 \neq 0$

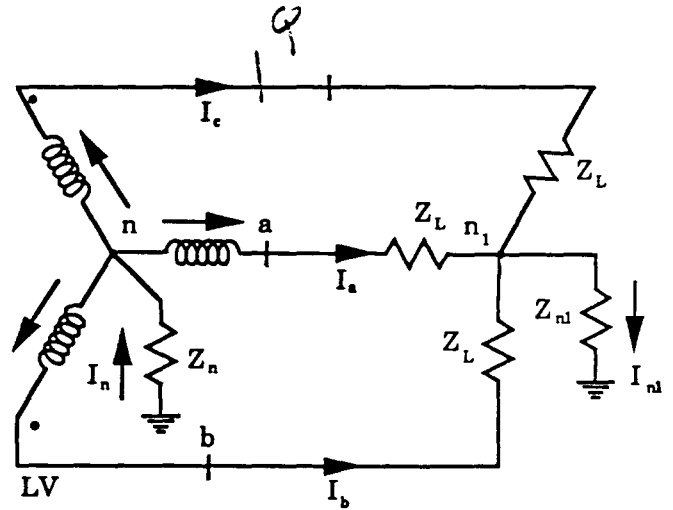
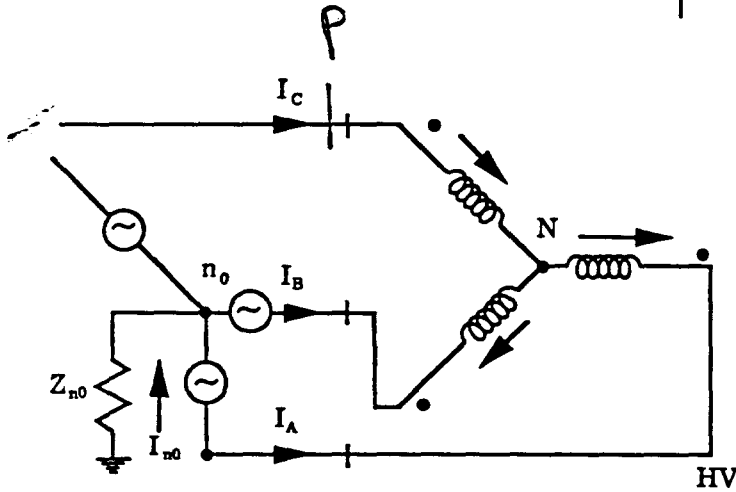
$I_{n0} = 0$ why?

for LV side:

$I_0 = 0$ why?

$I_1 \neq 0, I_2 \neq 0$

$I_{n0} = 0$ why?



for HV side:

$I_0 = 0$ why?

$I_1 \neq 0, I_2 \neq 0$

$I_{n0} = 0$ why?

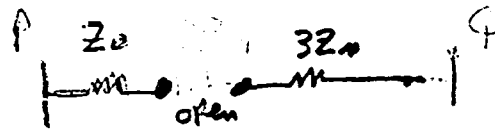
for LV side:

$I_0 = 0$ why?

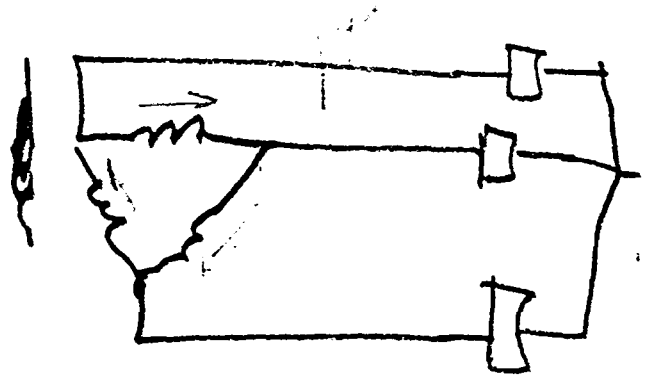
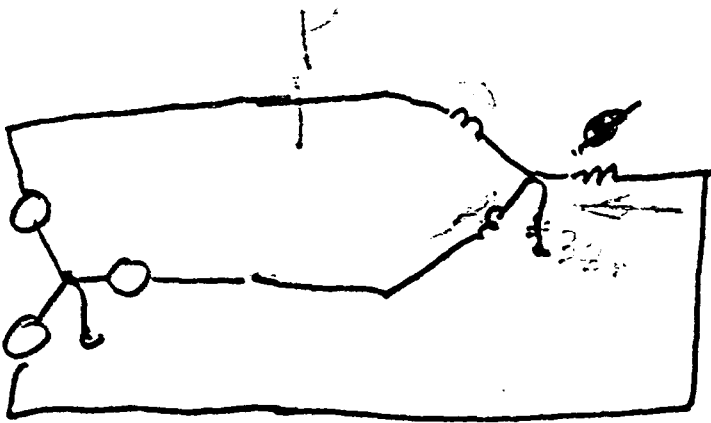
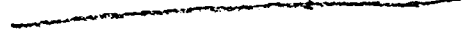
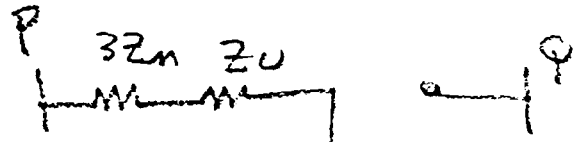
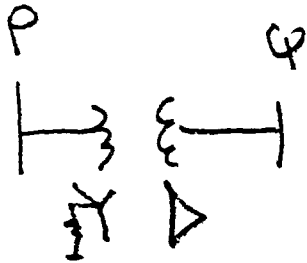
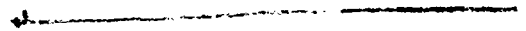
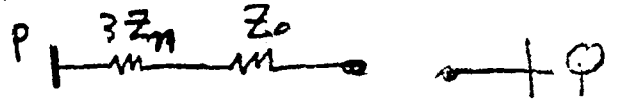
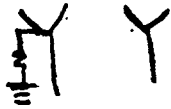
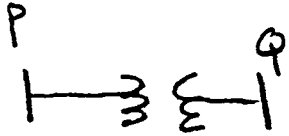
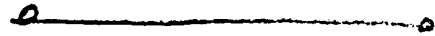
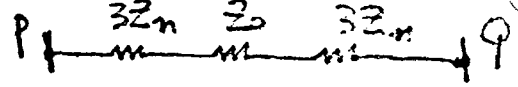
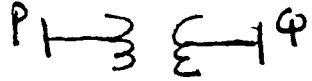
$I_1 \neq 0, I_2 \neq 0$

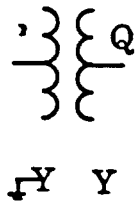
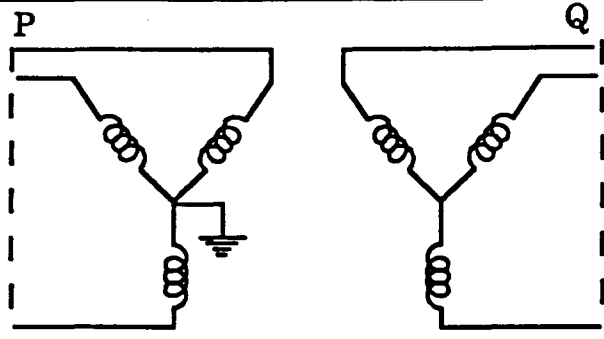
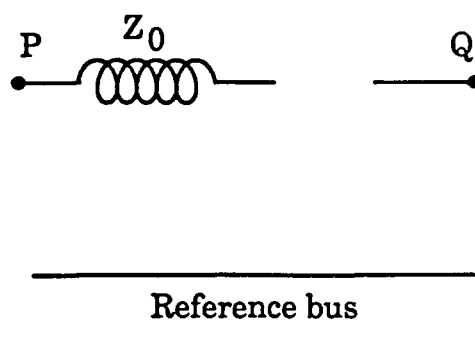
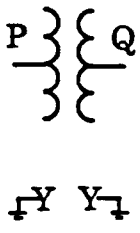
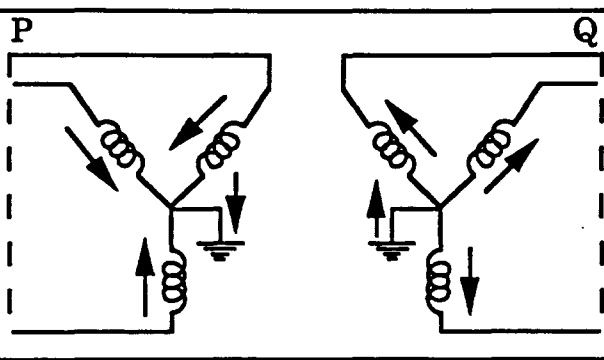
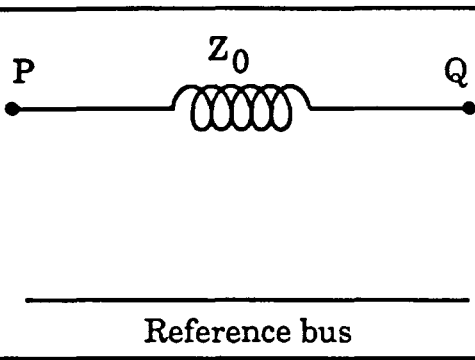
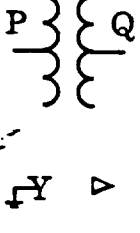
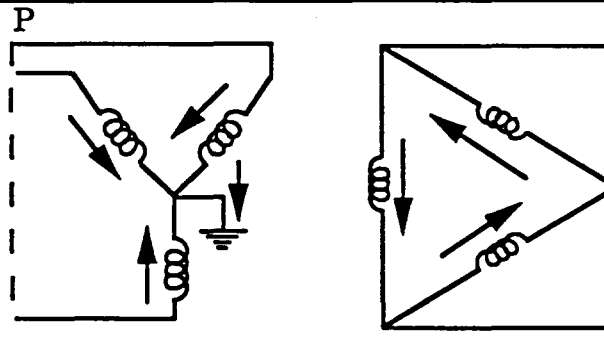
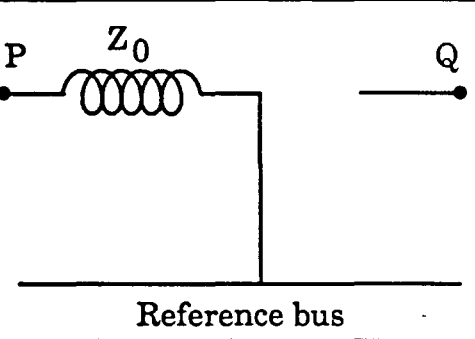
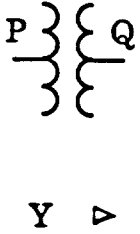
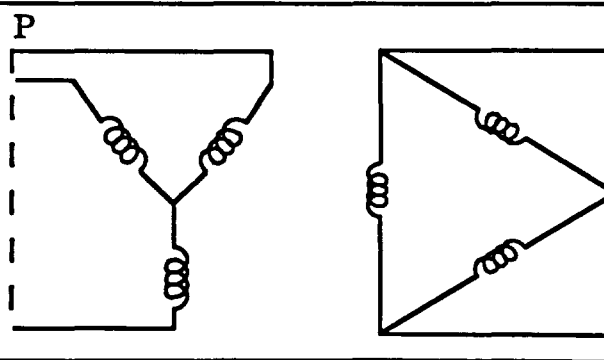
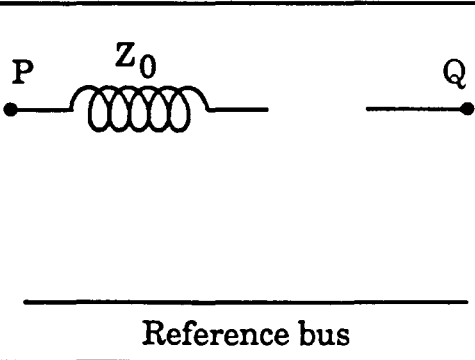
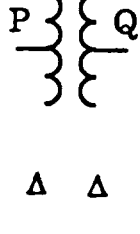
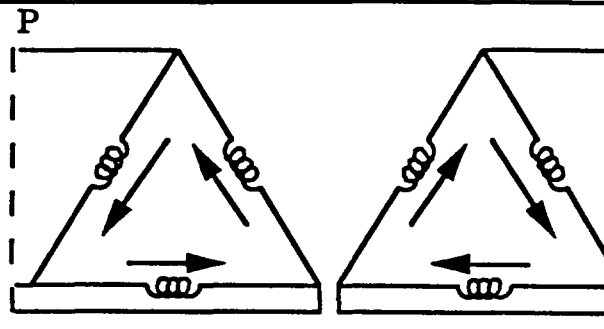
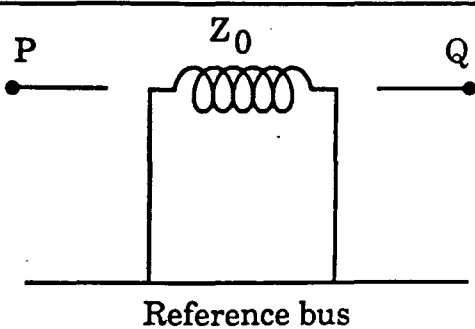
$I_n = 0$ why?

$I_{n1} = 0$ why?

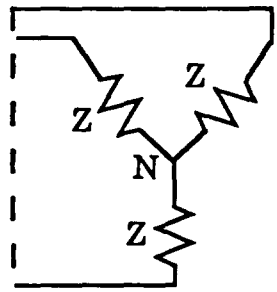


Transformer Zero Sequence Network

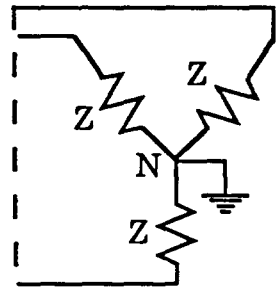
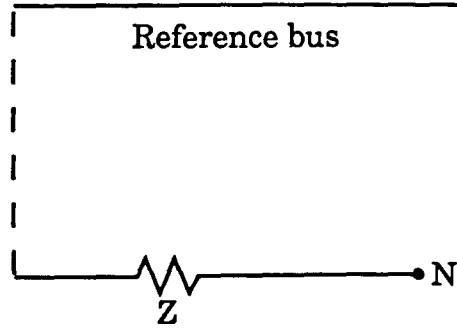


Symbols	Connection Diagrams	Zero-Sequence Equivalent Circuits
 <p>Y Y</p>		 <p>Reference bus</p>
 <p>Y Y</p>		 <p>Reference bus</p>
 <p>Y Δ</p>		 <p>Reference bus</p>
 <p>Y Δ</p>		 <p>Reference bus</p>
 <p>Δ Δ</p>		 <p>Reference bus</p>

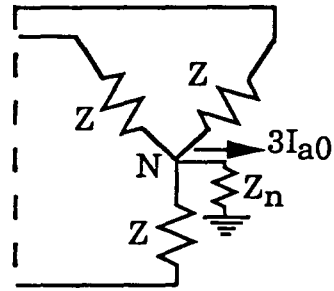
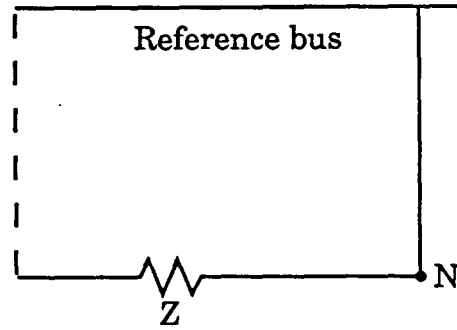
Zero-sequence equivalent circuits of three-phase transformer banks, together with diagrams of connections and the symbols for one-line diagrams.



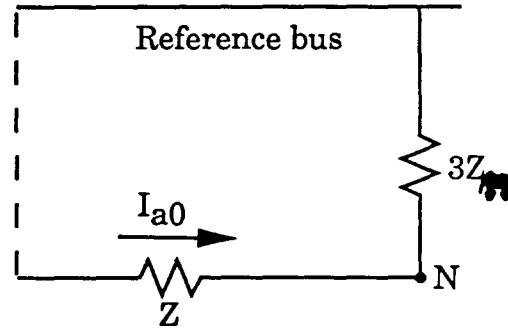
(a)



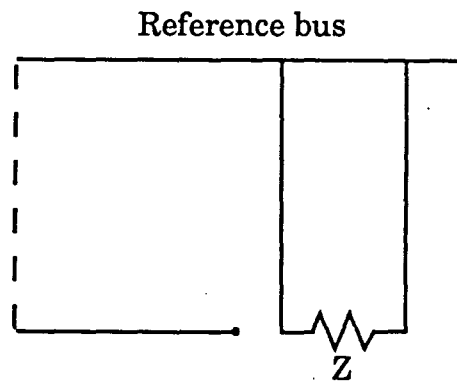
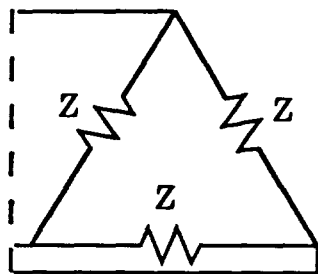
(b)



(c)



Zero-sequence networks for Y-connected loads.



Δ -connected load and its zero-sequence network.