



Open Conductor Fault Formulas

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List of 46 Open Conductor Fault Formulas

Open Conductor Fault &

One Conductor Open

1) A-Phase EMF using Positive Sequence Voltage (One Conductor Open)

$$\mathbf{E}_{\mathrm{a(oco)}} = \mathrm{V}_{\mathrm{1(oco)}} + \mathrm{I}_{\mathrm{1(oco)}} \cdot \mathrm{Z}_{\mathrm{1(oco)}}$$

Open Calculator 🗗

 $\texttt{ex} \ 29.38794 V = 13.5 V + 2.001 A \cdot 7.94 \Omega$

2) A-Phase EMF using Zero Sequence Impedance (One Conductor Open)

$$\mathbf{E}_{\mathrm{a(oco)}} = \mathrm{I}_{\mathrm{1(oco)}} \cdot \left(\mathrm{Z}_{\mathrm{1(oco)}} + \left(rac{\mathrm{Z}_{\mathrm{0(oco)}} \cdot \mathrm{Z}_{\mathrm{2(oco)}}}{\mathrm{Z}_{\mathrm{0(oco)}} + \mathrm{Z}_{\mathrm{2(oco)}}}
ight)
ight)$$

Open Calculator 🚰

 $\boxed{ 29.46126 \mathrm{V} = 2.001 \mathrm{A} \cdot \left(7.94 \Omega + \left(\frac{8 \Omega \cdot 44.6 \Omega}{8 \Omega + 44.6 \Omega} \right) \right) }$

3) B-Phase Current (One Conductor Open)

$$\mathrm{I_{b(oco)}} = 3 \cdot \mathrm{I_{0(oco)}} - \mathrm{I_{c(oco)}}$$

Open Calculator 🚰

 $2.7 \mathrm{A} = 3 \cdot 2.20 \mathrm{A} - 3.9 \mathrm{A}$

4) C-Phase Current (One Conductor Open)

$$I_{
m c(oco)} = 3 \cdot I_{
m 0(oco)} - I_{
m b(oco)}$$

Open Calculator 🗗

 $\mathbf{ex} \ 3.9 \mathbf{A} = 3 \cdot 2.20 \mathbf{A} - 2.7 \mathbf{A}$

5) Potential Difference between A-Phase and Neutral (One Conductor Open)

$$\boxed{ \mathbf{K} [V_{a(oco)} = V_{0(oco)} + V_{1(oco)} + V_{2(oco)}] }$$

Open Calculator

 $\mathbf{ex} \ 11.956 \mathrm{V} = -17.6 \mathrm{V} + 13.5 \mathrm{V} + 16.056 \mathrm{V}$





6) Potential Difference between A-Phase using Zero Sequence Potential Difference (One Conductor Open)

 $ag{Vaa'_{(ext{oco})}} = rac{ ext{Vaa'}_{0(ext{oco})}}{3}$

Open Calculator

$$= 1.223333 V = \frac{3.67 V}{3}$$

Negative Sequence

7) Negative Sequence Current using Negative Sequence Impedance (One Conductor Open)

 $I_{2(
m oco)} = -rac{V_{2(
m oco)}}{Z_{2(
m oco)}}$

Open Calculator

$$-0.36 ext{A} = -rac{16.056 ext{V}}{44.6 \Omega}$$

8) Negative Sequence Potential Difference using A-Phase Current (One Conductor Open)

8) Negative Sequen

Open Calculator

 $\mathrm{Vaa'}_{2(\mathrm{oco})} = \mathrm{I}_{\mathrm{a(oco)}} \cdot \left(\frac{\mathrm{Z}_{0(\mathrm{oco})} \cdot \mathrm{Z}_{1(\mathrm{oco})} \cdot \mathrm{Z}_{2(\mathrm{oco})}}{\left(\mathrm{Z}_{0(\mathrm{oco})} \cdot \mathrm{Z}_{1(\mathrm{oco})} \right) + \left(\mathrm{Z}_{1(\mathrm{oco})} \cdot \mathrm{Z}_{2(\mathrm{oco})} \right) + \left(\mathrm{Z}_{2(\mathrm{oco})} \cdot \mathrm{Z}_{0(\mathrm{oco})} \right)} \right)$

$$\boxed{ 7.791749 V = 2.13 A \cdot \left(\frac{8\Omega \cdot 7.94\Omega \cdot 44.6\Omega}{(8\Omega \cdot 7.94\Omega) + (7.94\Omega \cdot 44.6\Omega) + (44.6\Omega \cdot 8\Omega)} \right) }$$

9) Negative Sequence Voltage using Negative Sequence Impedance (One Conductor Open)

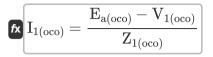
$$V_{2(
m oco)} = - Z_{2(
m oco)} \cdot I_{2(
m oco)}$$

$$= 16.056 \mathrm{V} = -44.6 \Omega \cdot -0.36 \mathrm{A}$$



Positive Sequence

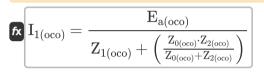
10) Positive Sequence Current using Positive Sequence Voltage (One Conductor Open)



Open Calculator

$${
m ex} \left[{2{
m A} = rac{{29.38{
m V} - 13.5{
m V}}}{{7.94\Omega }}}
ight]$$

11) Positive Sequence Current using Zero Sequence Impedance (One Conductor Open)



Open Calculator

12) Positive Sequence Impedance using Positive Sequence Voltage (One Conductor Open)

$$\mathbf{E} \mathbf{Z}_{1(ext{oco})} = rac{\mathbf{E}_{ ext{a(oco)}} - \mathbf{V}_{1(ext{oco})}}{\mathbf{I}_{1(ext{oco})}}$$

Open Calculator 🗗

$$= \frac{29.38 \mathrm{V} - 13.5 \mathrm{V}}{2.001 \mathrm{A}}$$

13) Positive Sequence Potential Difference using A-Phase Potential Difference (One Conductor Open)

$$extstyle extstyle ext$$

Open Calculator 🗗

14) Positive Sequence Voltage using Positive Sequence Impedance (One Conductor Open)

$$\mathbf{E} \left[\mathrm{V}_{1(\mathrm{oco})} = \mathrm{E}_{\mathrm{a(oco)}} - \mathrm{I}_{1(\mathrm{oco})} \cdot \mathrm{Z}_{1(\mathrm{oco})}
ight]$$

$$\mathbf{ex} \ 13.49206 \mathrm{V} = 29.38 \mathrm{V} - 2.001 \mathrm{A} \cdot 7.94 \Omega$$







Zero Sequence 🗗

15) Zero Sequence Current (One Conductor Open)

$$I_{0(ext{oco})} = rac{I_{b(ext{oco})} + I_{c(ext{oco})}}{3}$$

Open Calculator

$$\boxed{\textbf{ex}} 2.2 \textbf{A} = \frac{2.7 \textbf{A} + 3.9 \textbf{A}}{3}$$

16) Zero Sequence Current using Zero Sequence Voltage (One Conductor Open)

$$\boxed{\mathbf{x}} \mathbf{I}_{0(\mathrm{oco})} = (-1) \cdot \frac{V_{0(\mathrm{oco})}}{Z_{0(\mathrm{oco})}}$$

Open Calculator

$$2.2 \mathrm{A} = (-1) \cdot \frac{\text{-}17.6 \mathrm{V}}{8 \Omega}$$

17) Zero Sequence Impedance using Zero Sequence Voltage (One Conductor Open)

$$\mathbf{fx} egin{aligned} \mathbf{Z}_{0(\mathrm{oco})} = (-1) \cdot rac{\mathrm{V}_{0(\mathrm{oco})}}{\mathrm{I}_{0(\mathrm{oco})}} \end{aligned}$$

Open Calculator

$$\mathbf{ex} \ 8\Omega = (-1) \cdot \frac{\text{-}17.6\text{V}}{2.20\text{A}}$$

18) Zero Sequence Voltage using Zero Sequence Impedance (One Conductor Open)

$$ag{K} V_{0(ext{oco})} = - ext{Z}_{0(ext{oco})} \cdot ext{I}_{0(ext{oco})}$$

Open Calculator

$$-17.6 \mathrm{V} = -8\Omega \cdot 2.20 \mathrm{A}$$

Three Conductor Open 🖸

19) Potential Difference between A-Phase (Three Conductor Open)

$$ext{Vaa'}_{(ext{thco})} = 3 \cdot ext{Vaa'}_{0(ext{thco})} - ext{Vbb'}_{(ext{thco})} - ext{Vcc'}_{(ext{thco})}$$

$$\texttt{ex} \ 5.19 \texttt{V} = 3 \cdot 3.68 \texttt{V} - 2.96 \texttt{V} - 2.89 \texttt{V}$$





20) Potential Difference between B-Phase (Three Conductor Open)

 $\text{Ke} Vbb'_{(\text{thco})} = (3 \cdot Vaa'_{0(\text{thco})}) - Vaa'_{(\text{thco})} - Vcc'_{(\text{thco})}$

Open Calculator

Open Calculator

Open Calculator 2

Open Calculator G

Open Calculator 🚰

 $(2.96V = (3 \cdot 3.68V) - 5.19V - 2.89V)$

21) Potential Difference between C-Phase (Three Conductor Open)

Open Calculator 2 $\mathbf{K} | \mathrm{Vcc'}_{(\mathrm{thco})} = (3 \cdot \mathrm{Vaa'}_{0(\mathrm{thco})}) - \mathrm{Vaa'}_{(\mathrm{thco})} - \mathrm{Vbb'}_{(\mathrm{thco})}$

 $2.89V = (3 \cdot 3.68V) - 5.19V - 2.96V$

22) Zero Sequence Potential Differences (Three Conductor Open)

 $ext{Vaa'}_{0(ext{thco})} = rac{ ext{Vaa'}_{(ext{thco})} + ext{Vbb'}_{(ext{thco})} + ext{Vcc'}_{(ext{thco})}}{2}$

Two Conductor Open

23) A-Phase Current (Two Conductor Open)

fx $I_{a(tco)} = I_{1(tco)} + I_{2(tco)} + I_{0(tco)}$

|4.84A| = 2.01A + 0.64A + 2.19A

24) A-Phase EMF using Positive Sequence Current (Two Conductor Open)

fx $\mathrm{E_{a(tco)}} = \mathrm{I_{1(tco)}} \cdot \left(\mathrm{Z_{1(tco)}} + \mathrm{Z_{2(tco)}} + \mathrm{Z_{0(tco)}}
ight)$

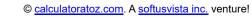
 $\mathbf{ex} \ 121.4241 V = 2.01 \mathbf{A} \cdot (7.95\Omega + 44.5\Omega + 7.96\Omega)$

25) A-Phase EMF using Positive Sequence Voltage (Two Conductor Open)

 $ext{E}_{ ext{a(tco)}} = ext{V}_{1 ext{(tco)}} + ext{I}_{1 ext{(tco)}} \cdot ext{Z}_{1 ext{(tco)}}$

 $ext{ex} \ 120.9795 ext{V} = 105 ext{V} + 2.01 ext{A} \cdot 7.95\Omega$







26) A-Phase Voltage using Sequence Voltages (Two Conductor Open) 🖸

fx $\left[V_{a(ext{tco})} = V_{1(ext{tco})} + V_{2(ext{tco})} + V_{0(ext{tco})}
ight]$

Open Calculator

= 59.02 V = 105 V + -28.48 V + -17.5 V

27) Potential Difference between B-Phase (Two Conductor Open)

 $ext{Nbb'}_{ ext{(tco)}} = 3 \cdot ext{Vaa'}_{0 ext{(tco)}} - ext{Vcc'}_{ ext{(tco)}}$

Open Calculator

$ext{ex} \ 8.1 ext{V} = 3 \cdot 3.66 ext{V} - 2.88 ext{V}$

28) Potential Difference between C-Phase (Two Conductor Open)

 $ag{Vcc'_{(tco)}} = \left(3 \cdot \mathrm{Vaa'_{0(tco)}}\right) - \mathrm{Vbb'_{(tco)}}$

Open Calculator 🖸

Negative Sequence

...gativo coquonico

29) Negative Sequence Current using A-Phase Current(Two Conductor Open) $I_{2(tco)} = I_{a(tco)} \cdot \left(\frac{Z_{1(tco)}}{Z_{0(tco)} + Z_{1(tco)} + Z_{2(tco)}} \right)$

Open Calculator

ex $0.636948 ext{A} = 4.84 ext{A} \cdot \left(\frac{7.95\Omega}{7.96\Omega + 7.95\Omega \pm 44.5\Omega} \right)$

30) Negative Sequence Current using Negative Sequence Voltage (Two Conductor Open)

 $I_{2(ext{tco})} = -rac{V_{2(ext{tco})}}{Z_{2(ext{tco})}}$

Open Calculator

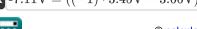
 $oxed{ex} 0.64 \mathrm{A} = -rac{ ext{-}28.48 \mathrm{V}}{44.5 \Omega}$

31) Negative Sequence Potential Difference (Two Conductor Open)

extstyle ext

Open Calculator 🚰

 $-7.11V = ((-1) \cdot 3.45V - 3.66V)$





32) Negative Sequence Voltage using A-Phase Current(Two Conductor Open)

 $\boxed{ V_{2(tco)} = -I_{a(tco)} \cdot \left(\frac{Z_{1(tco)} \cdot Z_{2(tco)}}{Z_{0(tco)} + Z_{1(tco)} + Z_{2(tco)}} \right) }$

Open Calculator 🗗

 $\begin{array}{c|c} \textbf{ex} & -28.344165 V = -4.84 \text{A} \cdot \left(\frac{7.95 \Omega \cdot 44.5 \Omega}{7.96 \Omega + 7.95 \Omega + 44.5 \Omega} \right) \end{array}$

33) Negative Sequence Voltage using Negative Sequence Current (Two Conductor Open)

 $V_{2(ext{tco})} = -ig(I_{2(ext{tco})} \cdot Z_{2(ext{tco})} ig)$

Open Calculator 🗗

 $-28.48 \mathrm{V} = -(0.64 \mathrm{A} \cdot 44.5 \Omega)$

Positive Sequence

34) Positive Sequence Current (Two Conductor Open)

 $I_{1(ext{tco})} = rac{I_{ ext{a(tco)}}}{3}$

Open Calculator 🗗

 $= 1.613333 A = \frac{4.84 A}{3}$

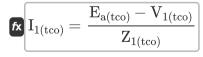
35) Positive Sequence Current using A-Phase EMF (Two Conductor Open)

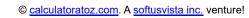
 $extbf{K} egin{aligned} I_{1(ext{tco})} &= rac{E_{a(ext{tco})}}{Z_{0(ext{tco})} + Z_{1(ext{tco})} + Z_{2(ext{tco})} \end{aligned}$

Open Calculator

 $oxed{ex} 2.00927 \mathrm{A} = rac{121.38 \mathrm{V}}{7.96 \Omega + 7.95 \Omega + 44.5 \Omega}$

36) Positive Sequence Current using Positive Sequence Voltage (Two Conductor Open)







37) Positive Sequence Impedance using A-Phase EMF (Two Conductor Open)

 $\mathbf{z}_{1(ext{tco})} = \left(rac{\mathrm{E}_{a(ext{tco})}}{\mathrm{I}_{1(ext{tco})}}
ight) - \mathrm{Z}_{0(ext{tco})} - \mathrm{Z}_{2(ext{tco})}$

Open Calculator 🚰

$$extbf{ex} 7.92806\Omega = \left(rac{121.38 ext{V}}{2.01 ext{A}}
ight) - 7.96\Omega - 44.5\Omega$$

38) Positive Sequence Impedance using Positive Sequence Voltage (Two Conductor Open)

 $\boxed{\mathbf{x}} Z_{1(tco)} = \frac{E_{a(tco)} - V_{1(tco)}}{I_{1(tco)}}$

Open Calculator 🗗

$$oxed{ex} 8.149254\Omega = rac{121.38 \mathrm{V} - 105 \mathrm{V}}{2.01 \mathrm{A}}$$

39) Positive Sequence Potential Difference (Two Conductor Open)

 $ext{Vaa'}_{1(ext{tco})} = \left((-1) \cdot ext{Vaa'}_{2(ext{tco})}
ight) - ext{Vaa'}_{0(ext{tco})}$

Open Calculator

$$\boxed{ 3.45 \text{V} = ((-1) \cdot -7.11 \text{V}) - 3.66 \text{V} }$$

40) Positive Sequence Voltage using Positive Sequence Current (Two Conductor Open)

fx $V_{1(ext{tco})} = \mathrm{E}_{\mathrm{a(tco)}} - \mathrm{I}_{1(ext{tco})} \cdot \mathrm{Z}_{1(ext{tco})}$

Open Calculator

 $= 105.4005 V = 121.38 V - 2.01 A \cdot 7.95 \Omega$

Zero Sequence 🗹

41) Zero Sequence Current using A-Phase Current(Two Conductor Open)

 $\boxed{\mathbf{fx}} \left[I_{0(tco)} = I_{a(tco)} \cdot \left(\frac{Z_{1(tco)}}{Z_{0(tco)} + Z_{1(tco)} + Z_{2(tco)}} \right) \right]$

$$oxed{ex} 0.636948 {
m A} = 4.84 {
m A} \cdot \left(rac{7.95 \Omega}{7.96 \Omega + 7.95 \Omega + 44.5 \Omega}
ight)$$





42) Zero Sequence Current using Zero Sequence Voltage (Two Conductor Open)

 $I_{0(ext{tco})} = (-1) \cdot rac{V_{0(ext{tco})}}{Z_{0(ext{tco})}}$

Open Calculator 🗗

43) Zero Sequence Impedance using Zero Sequence Voltage (Two Conductor Open)

 $\mathbf{Z}_{0(ext{tco})} = (-1) \cdot rac{\mathrm{V}_{0(ext{tco})}}{\mathrm{I}_{0(ext{tco})}}$

Open Calculator

 $ext{ex} 7.990868\Omega = (-1) \cdot rac{-17.5 ext{V}}{2.19 ext{A}}$

44) Zero Sequence Potential Difference (Two Conductor Open)

 $ext{Vaa'}_{0(ext{tco})} = \left((-1) \cdot ext{Vaa'}_{1(ext{tco})}
ight) - \left(ext{Vaa'}_{2(ext{tco})}
ight)$

Open Calculator

 $= 3.66 V = ((-1) \cdot 3.45 V) - (-7.11 V)$

45) Zero Sequence Potential Difference using Potential Difference between B-Phase(Two Conductor Open)

 $ag{Vaa'}_{0(ext{tco})} = rac{ ext{Vbb'}_{(ext{tco})} + ext{Vcc'}_{(ext{tco})}}{3}$

Open Calculator

 $= 3.66 V = \frac{8.1 V + 2.88 V}{3}$

46) Zero Sequence Voltage using Zero Sequence Current (Two Conductor Open)

 $V_{0(ext{tco})} = (-1) \cdot I_{0(ext{tco})} \cdot Z_{0(ext{tco})}$

Open Calculator

 $-17.4324V = (-1) \cdot 2.19A \cdot 7.96\Omega$



Variables Used

- Ea(oco) A Phase EMF in OCO (Volt)
- Ea(tco) A Phase EMF in TCO (Volt)
- I_{0(oco)} Zero Sequence Current in OCO (Ampere)
- I_{0(tco)} Zero Sequence Current in TCO (Ampere)
- I_{1(oco)} Positive Sequence Current in OCO (Ampere)
- I_{1(tco)} Positive Sequence Current in TCO (Ampere)
- I_{2(oco)} Negative Sequence Current in OCO (Ampere)
- I_{2(tco)} Negative Sequence Current in TCO (Ampere)
- I_{a(oco)} A-Phase Current in OCO (Ampere)
- I_{a(tco)} A-Phase Current in TCO (Ampere)
- Ib(oco) B Phase Current in OCO (Ampere)
- I_{c(oco)} C Phase Current in OCO (Ampere)
- V_{0(oco)} Zero Sequence Voltage in OCO (Volt)
- V_{0(tco)} Zero Sequence Voltage in TCO (Volt)
- V_{1(oco)} Positive Sequence Voltage in OCO (Volt)
- V_{1(tco)} Positive Sequence Voltage in TCO (Volt)
- V2(oco) Negative Sequence Voltage in OCO (Volt)
- V_{2(tco)} Negative Sequence Voltage in TCO (Volt)
- V_{a(oco)} A Phase Voltage in OCO (Volt)
- V_{a(tco)} A Phase Voltage in TCO (Volt)
- Vaa'(oco) Potential Difference Between A Phase in OCO (Volt)
- Vaa'_(thco) Potential Difference Between A Phase in THCO (Volt)
- Vaa'_{0(oco)} Zero Sequence Potential Difference in OCO (Volt)
- Vaa'_{0(tco)} Zero Sequence Potential Difference in TCO (Volt)
- Vaa'_{0(thco)} Zero Sequence Potential Difference in THCO (Volt)
- Vaa'_{1(oco)} Positive Sequence Potential Difference in OCO (Volt)
- Vaa'_{1(tco)} Positive Sequence Potential Difference in TCO (Volt)





- Vaa'2(oco) Negative Sequence Potential Difference in OCO (Volt)
- Vaa'2(tco) Negative Sequence Potential Difference in TCO (Volt)
- Vbb'(tco) Potential Difference between B Phase in TCO (Volt)
- Vbb'_(thco) Potential Difference between B Phase in THCO (Volt)
- Vcc'(tco) Potential Difference between C Phase in TCO (Volt)
- Vcc'(thco) Potential Difference between C Phase in THCO (Volt)
- Z_{0(oco)} Zero Sequence Impedance in OCO (Ohm)
- Z_{0(tco)} Zero Sequence Impedance in TCO (Ohm)
- Z_{1(oco)} Positive Sequence Impedance in OCO (Ohm)
- Z_{1(tco)} Positive Sequence Impedance in TCO (Ohm)
- Z_{2(oco)} Negative Sequence Impedance in OCO (Ohm)
- Z_{2(tco)} Negative Sequence Impedance in TCO (Ohm)





Constants, Functions, Measurements used

- Measurement: Electric Current in Ampere (A)
 Electric Current Unit Conversion
- Measurement: Electric Resistance in Ohm (Ω)
 Electric Resistance Unit Conversion
- Measurement: Electric Potential in Volt (V)

 Electric Potential Unit Conversion





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