Important Open Conductor Fault Formulas PDF

Formulas
Examples
with Units

List of 46
Important Open Conductor Fault Formulas

1) One Conductor Open Formulas

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

Evaluate Formula

Formula

$$E_{a(oco)} = V_{1(oco)} + I_{1(oco)} \cdot Z_{1(oco)}$$

Example with Units

$$29.3879\,\text{V} = 13.5\,\text{V} + 2.001\,\text{A} \cdot 7.94\,\Omega$$

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

Evaluate Formula

Formula

$$E_{a(oco)} = I_{1(oco)} \cdot \left(Z_{1(oco)} + \left(\frac{Z_{0(oco)} \cdot Z_{2(oco)}}{Z_{0(oco)} + Z_{2(oco)}} \right) \right)$$

Example with Units

$$29.4613\,\text{V} = 2.001\,\text{A} \cdot \left(7.94\,\Omega + \left(\frac{8\,\Omega \cdot 44.6\,\Omega}{8\,\Omega + 44.6\,\Omega} \right) \right)$$

1.3) B-Phase Current (One Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

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

1.4) C-Phase Current (One Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

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

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

Evaluate Formula

Formula

$$V_{a(oco)} = V_{0(oco)} + V_{1(oco)} + V_{2(oco)}$$

Example with Units

$$11.956\,\text{V} = -17.6\,\text{V} + 13.5\,\text{V} + 16.056\,\text{V}$$

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

Evaluate Formula

Formula

$$Vaa'_{(oco)} = \frac{Vaa'_{0(oco)}}{3}$$

Example with Units

$$1.2233\,\text{V} = \frac{3.67\,\text{V}}{3}$$

1.7) Negative Sequence Formulas

1.7.1) Negative Sequence Current using Negative Sequence Impedance (One Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$-0.36\,\text{A} = -\frac{16.056\,\text{V}}{44.6\,\Omega}$$

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

Evaluate Formula

Formula

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

Example with Units

$$7.7917\,\text{V} = 2.13\,\text{A} \cdot \left(\frac{8\,\Omega \cdot 7.94\,\Omega \cdot 44.6\,\Omega}{\left(8\,\Omega \cdot 7.94\,\Omega\right) + \left(7.94\,\Omega \cdot 44.6\,\Omega\right) + \left(44.6\,\Omega \cdot 8\,\Omega\right)} \right)$$

1.7.3) Negative Sequence Voltage using Negative Sequence Impedance (One Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

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

1.8) Positive Sequence Formulas

1.8.1) Positive Sequence Current using Positive Sequence Voltage (One Conductor Open) Formula

Evaluate Formula

Formula

$$I_{1(oco)} = \frac{E_{a(oco)} - V_{1(oco)}}{Z_{1(oco)}}$$

Example with Units

$$2\,\text{A} = \frac{29.38\,\text{V} - 13.5\,\text{V}}{7.94\,\Omega}$$

1.8.2) Positive Sequence Current using Zero Sequence Impedance (One Conductor Open) Formula

Evaluate Formula

Formula

$$I_{1(oco)} = \frac{E_{a(oco)}}{Z_{1(oco)} + \left(\frac{Z_{0(oco)} \cdot Z_{2(oco)}}{Z_{0(oco)} + Z_{2(oco)}}\right)}$$

Example with Units

$$1.9955\,\text{A} = \frac{29.38\,\text{V}}{7.94\,\Omega + \left(\frac{8\,\Omega \cdot 44.6\,\Omega}{8\,\Omega + 44.6\,\Omega}\right)}$$

1.8.3) Positive Sequence Impedance using Positive Sequence Voltage (One Conductor Open) Formula

Evaluate Formula

Formula

$$Z_{1(oco)} = \frac{E_{a(oco)} - V_{1(oco)}}{I_{1(oco)}}$$

Example with Units

$$7.936\,\Omega = \frac{29.38\,\text{V} - 13.5\,\text{V}}{2.001\,\text{A}}$$

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

Evaluate Formula

Formula

$$Vaa'_{1(oco)} = \frac{Vaa'_{(oco)}}{3}$$

Example with Units

$$0.4067\,\text{V} = \frac{1.22\,\text{V}}{3}$$

1.8.5) Positive Sequence Voltage using Positive Sequence Impedance (One Conductor Open) Formula

Evaluate Formula

Formula

$$V_{1(oco)} = E_{a(oco)} - I_{1(oco)} \cdot Z_{1(oco)}$$

Example with Units

$$13.4921\,\text{V} = 29.38\,\text{V} - 2.001\,\text{A} \cdot 7.94\,\Omega$$

1.9) Zero Sequence Formulas

1.9.1) Zero Sequence Current (One Conductor Open) Formula

Evaluate Formula

Formula

$$I_{0(oco)} = \frac{I_{b(oco)} + I_{c(oco)}}{3}$$

Example with Units

$$2.2\,\text{A} = \frac{2.7\,\text{A} + 3.9\,\text{A}}{3}$$

1.9.2) Zero Sequence Current using Zero Sequence Voltage (One Conductor Open) Formula

Evaluate Formula

Formula

$$I_{0(oco)} = (-1) \cdot \frac{V_{0(oco)}}{Z_{0(oco)}}$$

Example with Units

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

1.9.3) Zero Sequence Impedance using Zero Sequence Voltage (One Conductor Open) Formula

Evaluate Formula

Formula

$$Z_{0(oco)} = (-1) \cdot \frac{V_{0(oco)}}{I_{0(oco)}}$$

Example with Units

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

1.9.4) Zero Sequence Voltage using Zero Sequence Impedance (One Conductor Open) Formula

Evaluate Formula

Formula

$$V_{0(oco)} = - Z_{0(oco)} \cdot I_{0(oco)}$$

Example with Units

$$-17.6\,V = - 8\,\Omega \cdot 2.20\,A$$

2) Three Conductor Open Formulas

2.1) Potential Difference between A-Phase (Three Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$5.19\,V = 3 \cdot 3.68\,V - 2.96\,V - 2.89\,V$$

2.2) Potential Difference between B-Phase (Three Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

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

2.3) Potential Difference between C-Phase (Three Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

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

2.4) Zero Sequence Potential Differences (Three Conductor Open) Formula

Evaluate Formula

Formula

$$Vaa'_{0(thco)} = \frac{Vaa'_{(thco)} + Vbb'_{(thco)} + Vcc'_{(thco)}}{3}$$

Example with Units

$$3.68\,V = \frac{5.19\,V + 2.96\,V + 2.89\,V}{3}$$

3) Two Conductor Open Formulas

3.1) A-Phase Current (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$4.84\,\text{A} = 2.01\,\text{A} + 0.64\,\text{A} + 2.19\,\text{A}$$

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

Evaluate Formula

Formula

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

Example with Units

$$121.4241\,\text{V} = 2.01\,\text{A} \cdot \left(7.95\,\Omega + 44.5\,\Omega + 7.96\,\Omega \right)$$

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

Evaluate Formula

Formula

$$E_{a(tco)} = V_{1(tco)} + I_{1(tco)} \cdot Z_{1(tco)}$$

Example with Units

$$120.9795\,\text{V} = 105\,\text{V} + 2.01\,\text{A} \cdot 7.95\,\Omega$$

3.4) A-Phase Voltage using Sequence Voltages (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$59.02\,\text{V} = 105\,\text{V} + -28.48\,\text{V} + -17.5\,\text{V}$$

3.5) Potential Difference between B-Phase (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$8.1\,\text{V} = 3 \cdot 3.66\,\text{V} - 2.88\,\text{V}$$

3.6) Potential Difference between C-Phase (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$2.88\,\text{V} = \left(3 \cdot 3.66\,\text{V} \right) - 8.1\,\text{V}$$

3.7) Negative Sequence Formulas

3.7.1) Negative Sequence Current using A-Phase Current(Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$0.6369\,\text{A} = 4.84\,\text{A} \cdot \left(\frac{7.95\,\Omega}{7.96\,\Omega + 7.95\,\Omega + 44.5\,\Omega} \right)$$

3.7.2) Negative Sequence Current using Negative Sequence Voltage (Two Conductor Open) Formula

Evaluate Formula

Formula

$$I_{2(tco)} = -\frac{V_{2(tco)}}{Z_{2(tco)}}$$

Example with Units

$$0.64\,A = -\frac{-28.48\,V}{44.5\,\Omega}$$

3.7.3) Negative Sequence Potential Difference (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

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

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

Evaluate Formula

Formula

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

Example with Units

$$-28.3442\,V = -4.84\,A \cdot \left(\frac{7.95\,\Omega \cdot 44.5\,\Omega}{7.96\,\Omega + 7.95\,\Omega + 44.5\,\Omega} \right)$$

3.7.5) Negative Sequence Voltage using Negative Sequence Current (Two Conductor Open) Formula

Evaluate Formula

Formula

$$V_{2(tco)} = -\left(I_{2(tco)} \cdot Z_{2(tco)} \right)$$

Example with Units

$$-28.48\,V = -\left(0.64\,A \cdot 44.5\,\Omega \right)$$

3.8) Positive Sequence Formulas

3.8.1) Positive Sequence Current (Two Conductor Open) Formula

Evaluate Formula

Formula

$$I_{1(tco)} = \frac{I_{a(tco)}}{3}$$

Example with Units

$$1.6133\,A = \frac{4.84\,A}{3}$$

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

Evaluate Formula

Formula

$$I_{1(tco)} = \frac{E_{a(tco)}}{Z_{0(tco)} + Z_{1(tco)} + Z_{2(tco)}}$$

Example with Units

$$2.0093\,A = \frac{121.38\,V}{7.96\,\Omega + 7.95\,\Omega + 44.5\,\Omega}$$

3.8.3) Positive Sequence Current using Positive Sequence Voltage (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$2.0604\,\text{A} = \frac{121.38\,\text{V} - 105\,\text{V}}{7.95\,\Omega}$$

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

Evaluate Formula

Formula

$$Z_{1(tco)} = \left(\frac{E_{a(tco)}}{I_{1(tco)}}\right) - Z_{0(tco)} - Z_{2(tco)}$$

Example with Units

$$7.9281\,\Omega = \left(\frac{121.38\,\text{V}}{2.01\,\text{A}}\right) - 7.96\,\Omega - 44.5\,\Omega$$

3.8.5) Positive Sequence Impedance using Positive Sequence Voltage (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$8.1493\,\Omega = \frac{121.38\,\text{V} - 105\,\text{V}}{2.01\,\text{A}}$$

3.8.6) Positive Sequence Potential Difference (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$3.45\,\text{V} = \left((-1) \cdot -7.11\,\text{V} \right) - 3.66\,\text{V}$$

3.8.7) Positive Sequence Voltage using Positive Sequence Current (Two Conductor Open) Formula

Evaluate Formula

Formula

$$V_{1(tco)} = E_{a(tco)} - I_{1(tco)} \cdot Z_{1(tco)}$$

Example with Units

$$105.4005\,\text{V} = 121.38\,\text{V} - 2.01\,\text{A} \cdot 7.95\,\Omega$$

3.9) Zero Sequence Formulas

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

Evaluate Formula

Formula

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

Example with Units

$$0.6369\,\text{A} = 4.84\,\text{A} \cdot \left(\frac{7.95\,\Omega}{7.96\,\Omega + 7.95\,\Omega + 44.5\,\Omega}\right)$$

3.9.2) Zero Sequence Current using Zero Sequence Voltage (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$2.1985\,\text{A} = (-1) \cdot \frac{-17.5\,\text{V}}{7.96\,\Omega}$$

3.9.3) Zero Sequence Impedance using Zero Sequence Voltage (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$7.9909\,\Omega = (-1) \cdot \frac{-17.5\,\text{V}}{2.19\,\text{A}}$$

3.9.4) Zero Sequence Potential Difference (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$3.66\,\text{V} = \left((-1) \cdot 3.45\,\text{V} \right) - \left(-7.11\,\text{V} \right)$$

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

Evaluate Formula

Formula

$$Vaa'_{0(tco)} = \frac{Vbb'_{(tco)} + Vcc'_{(tco)}}{3}$$

Example with Units

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

3.9.6) Zero Sequence Voltage using Zero Sequence Current (Two Conductor Open) Formula

Evaluate Formula

Formula

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

Example with Units

$$-17.4324\,\text{V} = (-1) \cdot 2.19\,\text{A} \cdot 7.96\,\Omega$$

Variables used in list of Open Conductor Fault Formulas above

- $E_{a(oco)}$ A Phase EMF in OCO *(Volt)*
- $E_{a(tco)}$ 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)*
- $I_{b(oco)}$ 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)*
- $V_{2(oco)}$ 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)*

Constants, Functions, Measurements used in list of Open Conductor Fault Formulas above

- 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

- $Vaa'_{0(thco)}$ 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)*

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