



VEBKO ONLINE HELP

Introducing “Distance” Room, Part 1

Category	tester
Section	AMT Distance Module
Language	English
Generated	2026-10-18

Contents

1. "System Settings" Tab 3
2. "Grounding Factor" Section: 7
3. "Impedance in Primary Values" Option 9
4. "LL Fault Group Exclude L1L2L3 Fault Type" Option 9

The relays impedance characteristic test is performed in "AMT Distance" room. The most important use of this room is to test distance relays and "Under Excitation". Distance relays and "Under Excitation" are used to protect the transmission lines and generators respectively. For example in this video two "Mho" zones are drawn which are displayed in "Impedance View" window. Distance room consists of 4 main windows including "Test View", "Impedance View", "Z-T Diagram" and "Medium Detail View". "Shot Test", "Check Test" and "Search Test" are performed in "Test-View" window. In "Impedance View" window the impedance characteristic of the relay is displayed according to the information entered in "Test Object" in terms of "X" and "R" and based on "CT" and "PT" secondary values. This is why in this window the horizontal and vertical axes are named "Secondary R" and "Secondary X". To view the impedance characteristic based on the primary you can select "Primary Values" from the toolbar. In "Z-T Diagram" the time-impedance curve is displayed. If this window is open along with "Impedance View" and "Test View" windows, by adding a shot on the curve or selecting a point from the table, the location of that point is displayed on "ZT" curve. In "Medium Detail View" window the characteristics of the shot point and protective zones are displayed.

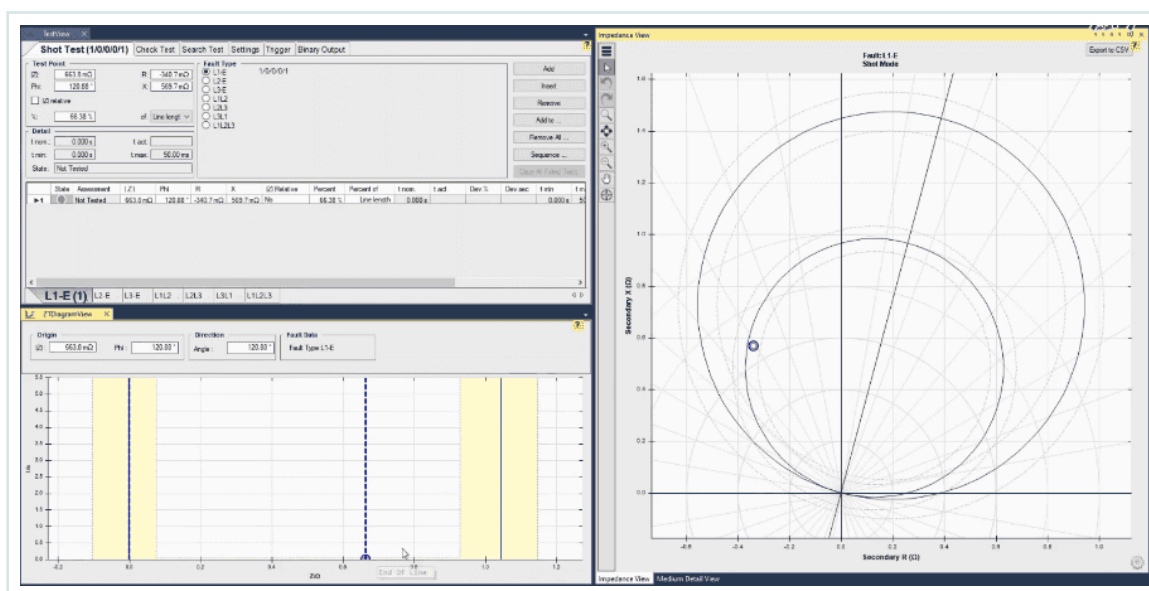


Figure 1

As mentioned before, to test the relay first it is necessary to enter its information in "Test Object" window. Information such as nominal information of the relay, serial number, operation location of the

relay, "CT" and "PT" characteristics are entered in "Device" block. This section has been thoroughly explained in previous videos. But the main block in this room is "Distance" by double-clicking on which, the "Distance Protection Parameters" window opens. Two tabs of "System Settings" and "Zone Settings" where the settings is entered are available in this window.

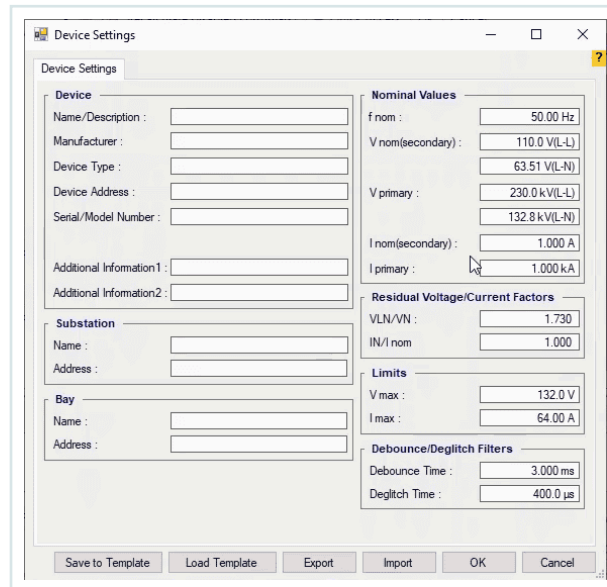


Figure 2

1 "System Settings" Tab

The characteristics of the power system are entered in "System Settings" tab. In "System Parameters" section, the length of the line is entered in terms of ohm in "Line Length" field while the angle of the line is entered in "Line Angle" field. In "PT Connection" field, the installation method of the voltage transformer is selected from among "at line" and "at Busbar" states. The installation method of the (PT) Voltage transformer specifies whether the voltage exists in "PostFault" which refers to the time after the fault. If "at Line" option is selected, after switching the circuit breaker, the input voltage line of the relay equals zero and the "AMT" device will not make any voltage into the relay in "PostFault". But by selecting "at Busbar" option, after switching the circuit breaker, the input voltage line of the relay keeps its nominal value and consequently, the "AMT" device injects the relay with nominal voltage in "PostFault".

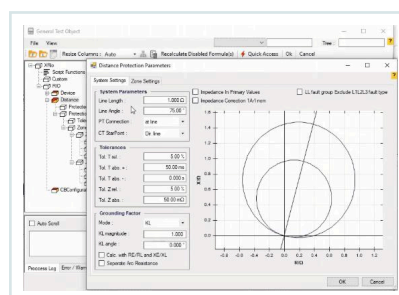


Figure 3

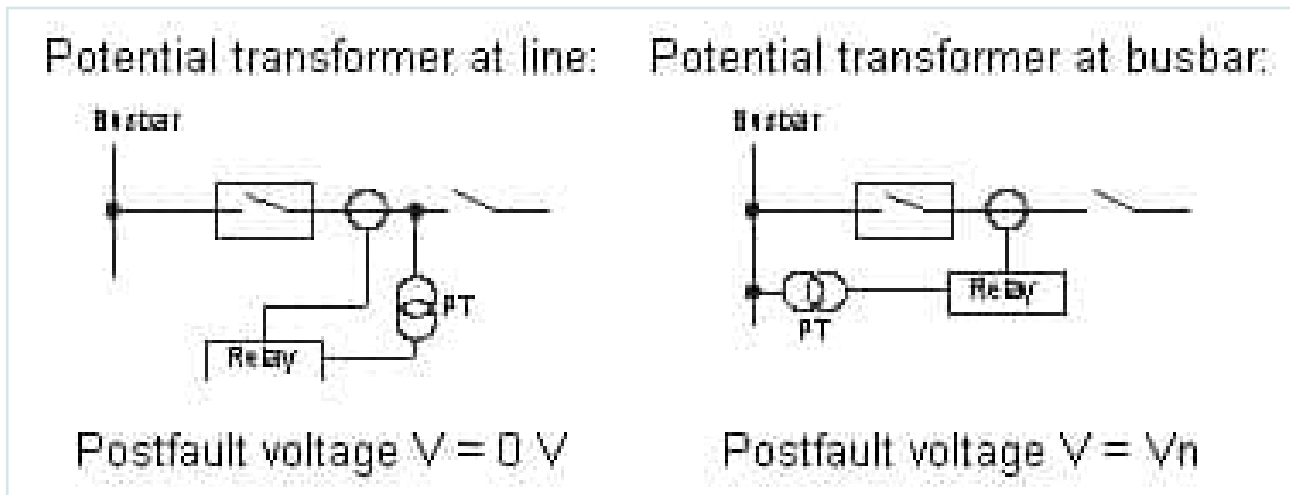


Figure 4

In "CT StarPoint" field, the direction of the connection is selected from among "Dir. Line" and "Dir. Busbar" states. If the connection is "Dir. Line", the current flows from device to the relay. If the relay connection is "Dir. Busbar", it is only enough that the current angle is changed as much as 180 degrees.

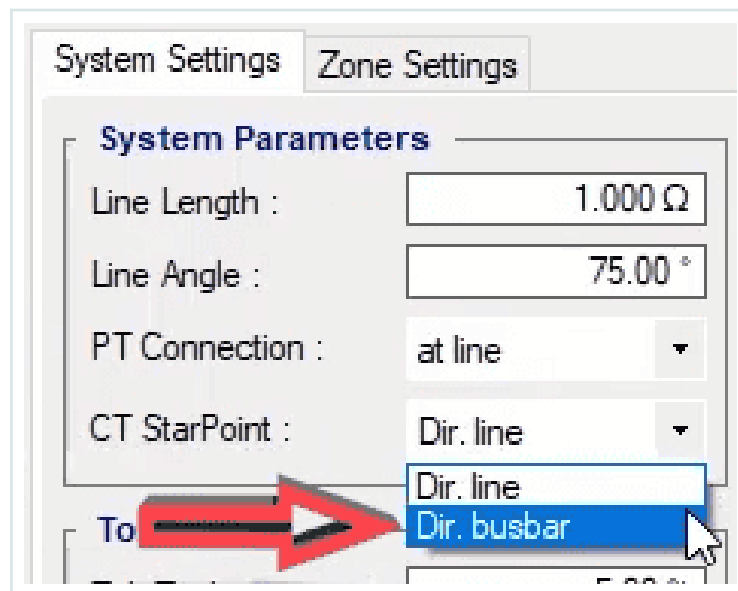


Figure 5

Then, in "Tolerance" section, time and impedance tolerances are specified. In this field, first the time tolerances are entered in terms of percentage and time in "Tol.T rel" and "Tol.T abs" respectively. Then impedance tolerances are entered in "Tol.Z rel" and "Tol.Z abs" fields in terms of percentage and ohm respectively.

"Grounding Factor" Section:

In this section, the grounding factor for phase-to-ground fault is specified. In phase-to-ground faults, specifying this number in accordance with the relay algorithm is so important. If this factor is wrong, the calculations of the phase-to-ground fault will be wrong as well. So, one of the methods mentioned in this section should be selected in accordance with the algorithm used by the relay to calculate the single phase-to-ground fault. The output voltage and current fault of the device will change in accordance with the selected checkbox in the "Mode" field. Any of these options should be selected considering the type of the relay being tested. The used algorithms can be divided into three groups of "Type A", "Type B" and "Type C" in accordance with the different types of relays and algorithms used to calculate the fault impedance. If none of the checkboxes is selected, "Type A" is selected by default. If you do not know the type of algorithm being used by the relay you are testing, it is better to use trial and error method.

"Mode" Field

There are various modes to enter the grounding factor values in this section. It is only necessary to select a mode and enter the values accordingly. By entering the grounding factor in this section, the software calculates the impedance for phase-to-ground fault. If in the relay being tested, the grounding factor is indicated by "KL", the "KL" value should be entered in "KL Magnitude" cell and its angle should be entered in "KL Angle" cell. But if the grounding factor is indicated by "RE/RL" and "XE/XL", you can select this mode and enter the required values in "RE/RL" and "XE/XL" fields. "RE" and "XE" stand for true and imaginary values of the ground impedance from the relay location to the fault and "RL" and "XL" stand for the true and imaginary values of line impedance from the relay location to the fault. If in the relay being tested the ground factor values are indicated by "Z0/Z1", you can select this mode and enter the "Z0/Z1" value and its angle in "Z0/Z1 Magnitude" and "Z0/Z1 Angle" fields respectively. "Z0" indicates the zero sequence impedance while "Z1" is an indicator of the positive sequence impedance of the faulty line.

"Calc. With RE/RL and XE/XL" Option

If this option is checked, "Type B" formulae are used to calculate the ground factor and its effect on the current and voltage produced by the device. In these relays, to calculate the impedance in phase-to-ground fault, "Kr" and "Kx" factors are used which are "Kr=RE/RL" and "Kx=XE/XL".

"Separate Arc Resistance" Option

"Impedance in Primary Values" Option

In some relays, the characteristic is based on the primary values. But since it is necessary to enter the characteristics in the software based on secondary values so that the device can apply the voltage and current in accordance with the relay characteristic, you should enter the primary values in the

software and check "Impedance in Primary Values" option. By doing so, the values are multiplied by the turns ratio of current and voltage transformers.

"LL Fault Group Exclude L1L2L3 Fault Type" Option

This option is used to separate two-phase fault from three-phase fault. Generally, because of "Grounding Factor" in relays, there is difference between the characteristic curves of "L-E" and "LL" faults. But it is possible that in some relays there is also difference between two-phase and three-phase faults in which case, this option should be used. By checking this option, it is necessary to specify the three-phase fault zones in "Fault Loop" column. More explanation on this section will be provided in future videos. "Impedance Correction 1A/1nom" option is used when the relay's "CT" is "5 amps" but in the calculations a "1 amp" "CT" is used for it. By checking this option, you can use the new turns ratio.

[jg1]Introducing_Distance_room_Part1

© 2021 Vebko. All rights reserved.

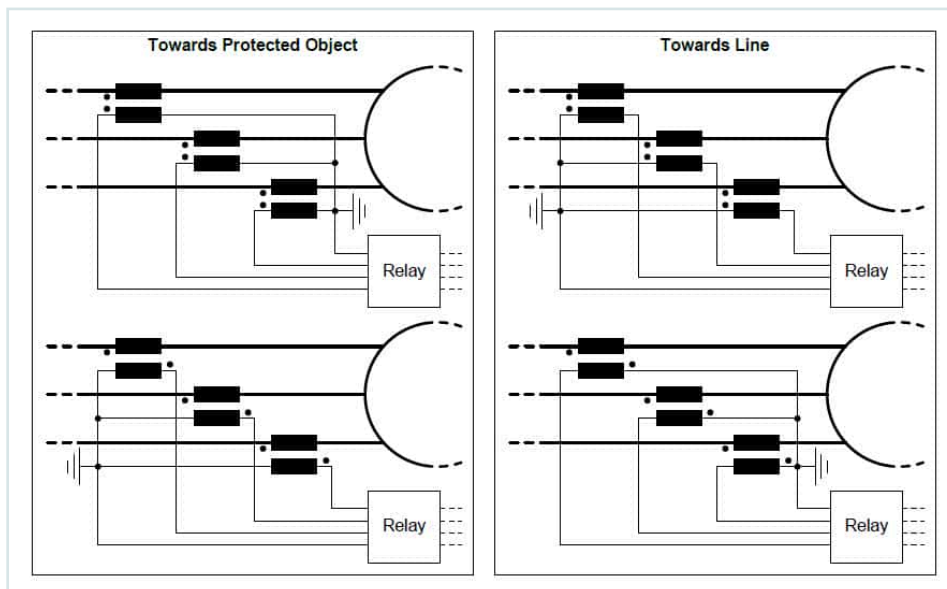
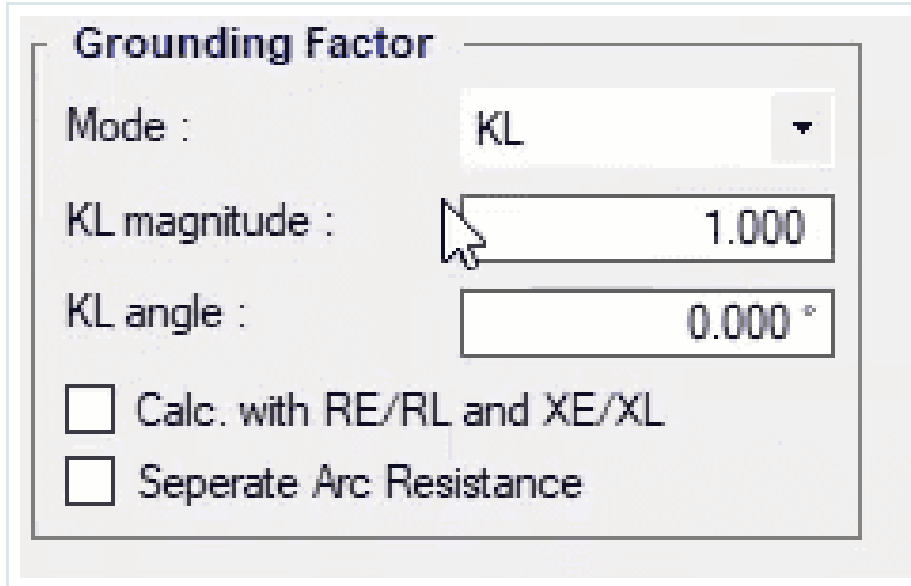


Figure 6

Tolerances	
Tol. T rel. :	5.00 %
Tol. T abs. + :	50.00 ms
Tol. T abs. - :	0.000 s
Tol. Z rel. :	5.00 %
Tol. Z abs. :	50.00 mΩ

Figure 7

2 "Grounding Factor" Section:



Grounding Factor

Mode : KL

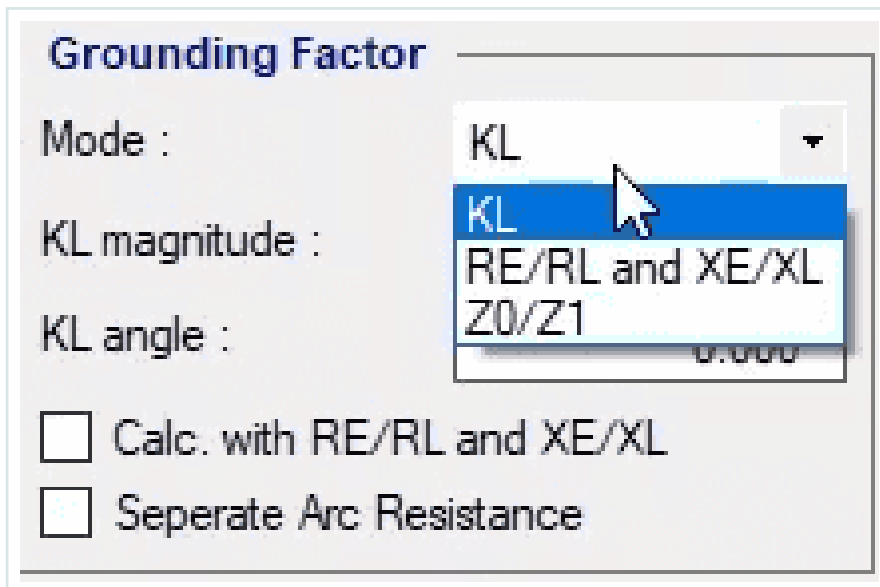
KL magnitude : 1.000

KL angle : 0.000 °

☐ Calc. with RE/RL and XE/XL

☐ Seperate Arc Resistance

Figure 8



Grounding Factor

Mode : KL

KL magnitude : 1.000

KL angle : 0.000 °

☐ Calc. with RE/RL and XE/XL

☐ Seperate Arc Resistance

Figure 9

	$X_{series} =$	$R_{series} =$
Type A	$\text{Im} \left\{ \frac{U/I}{1+K_L} \right\}$	$\text{Re} \left\{ \frac{U/I}{1+K_L} \right\}$
Type B	$\frac{\text{Im}(U/I)}{1+K_r}$	$\frac{\text{Re}(U/I)}{1+K_r}$
Type C	$\frac{\text{Im}(U/I)}{1+K_r}$	$\text{Re}(U/I) - X_{typeC} \cdot \arctan(\phi_r) \cdot K_r$

Figure 10

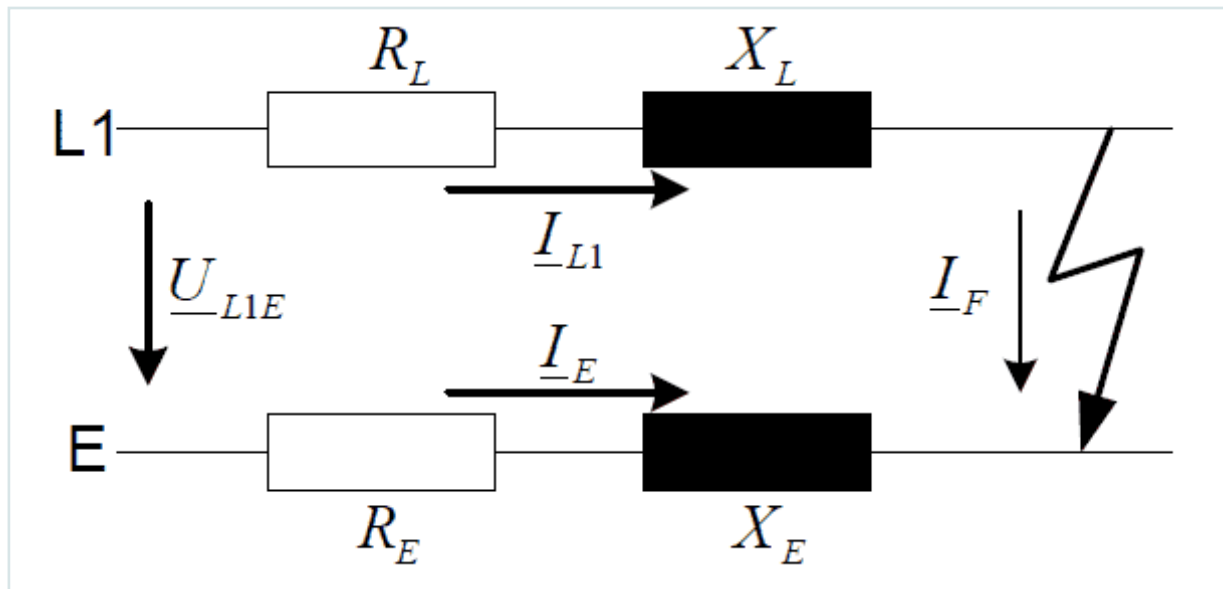


Figure 11

Grounding Factor

Mode : Z0/Z1

Z0/Z1 magnitude : 4.000

Z0/Z1 angle : 0.000 °

☒ Calc. with RE/RL and XE/XL

☐ Seperate Arc Resistance

Figure 12

Grounding Factor

Mode : Z0/Z1

Z0/Z1 magnitude : 4.000

Z0/Z1 angle : 0.000 °

☐ Calc. with RE/RL and XE/XL

☒ Seperate Arc Resistance

Figure 13

3 "Impedance in Primary Values" Option

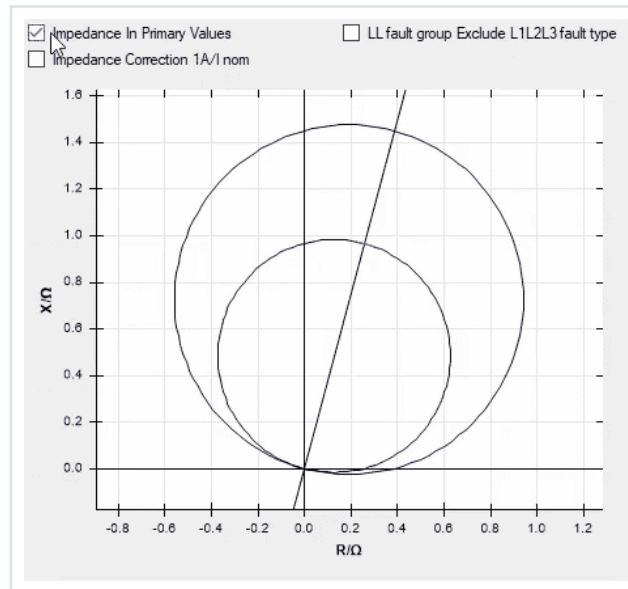


Figure 14

4 "LL Fault Group Exclude L1L2L3 Fault Type" Option

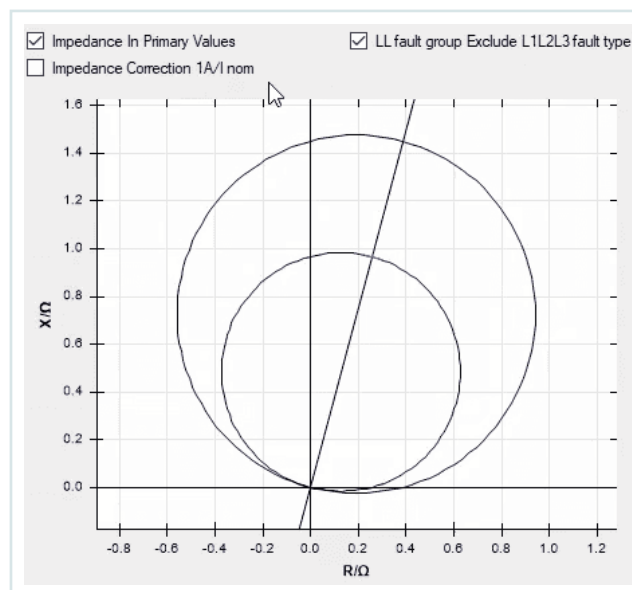


Figure 15