

What is the application of 2-W Transformer INST Protection?

The 2-Winding Transformer component in PTW v6.5 has a new feature for fast and easy modeling of the transformer differential protection for Arc Flash Evaluation. The following provides a brief description of its use and application in the Arc Flash Evaluation study module.

1. The one-line diagram, TX3 2-Winding Transformer subview, and Arc Flash study results for the line-side of the B-SWBD1 breaker are displayed in Figures 1, 2 and 3, respectively.

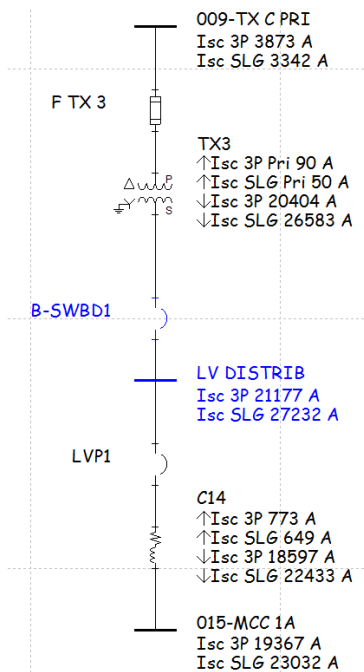


Figure 1

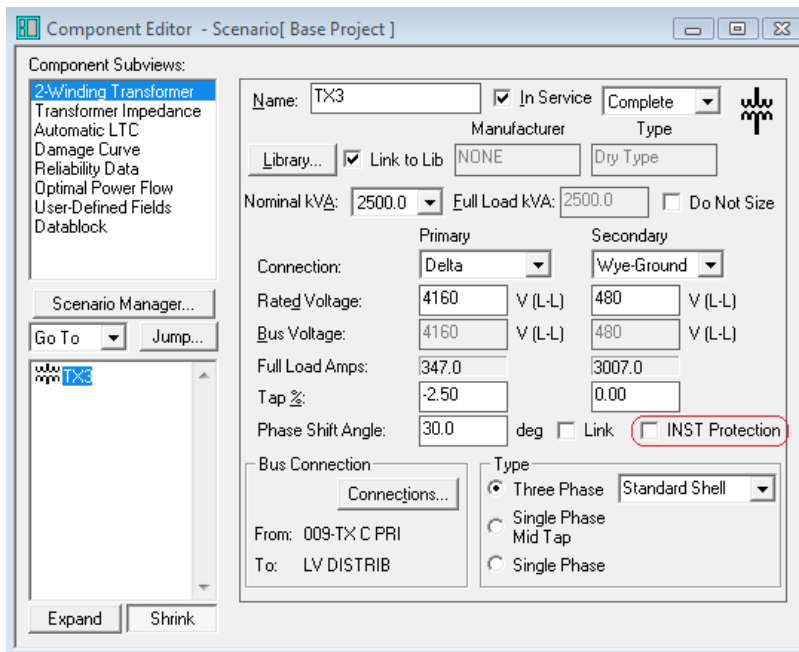


Figure 2

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground	Equip Type	Gap (mm)	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm ²)	Required Protective FR Clothing Category
LV DISTRIB (B-SWBD1)	B-SWBD1	0.48	21.18	12.45	0.77	0.45	0.083	0.000	Yes	PNL	25	35	18	3.5	Category 1
LV DISTRIB (B-SWBD1)	F TX 3	0.48	21.18	12.45	20.40	10.19	0.157	0.000	Yes	PNL	25	44	18	5.3	Category 2 (*N3)

Figure 3

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- As shown in Figure 2, the check box for the INST Protection of 2-Winding Transformer represents the transformer differential protection in Arc Flash. For this example, the box is left unchecked before running the Arc Flash Evaluation with the Line Side option selected in the Study Options menu (Figure 4).

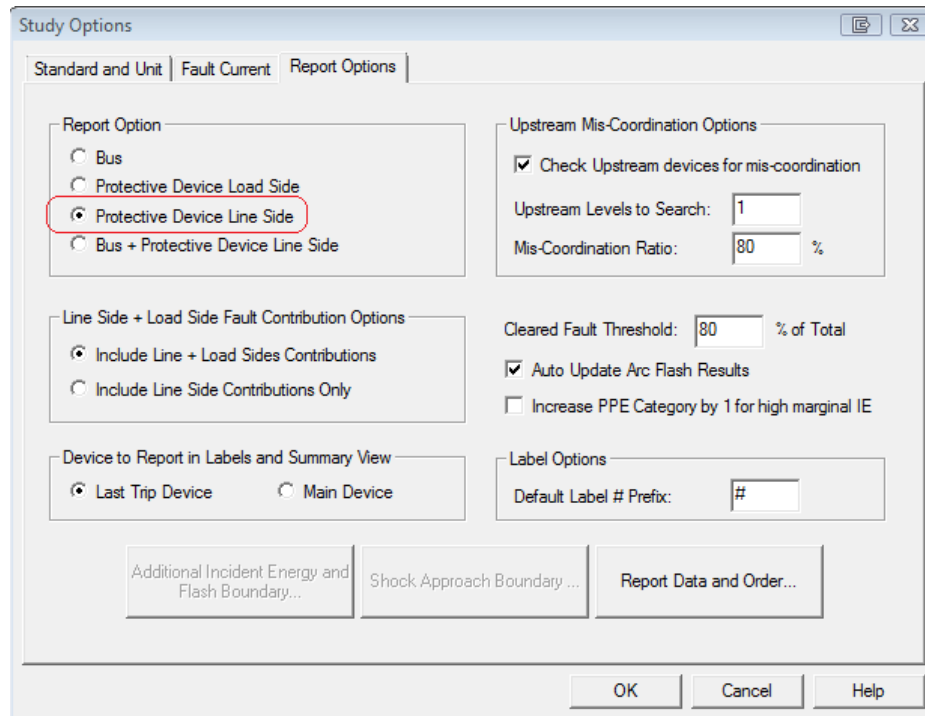


Figure 4

- The Arc Flash study result shows that the B-SWBD1 and LVP1 breakers interrupted the arcing fault current – leading to a 5.3 cal/cm² incident energy.
- If the INST Protection checkbox is checked in the 2-Winding Transformer Subview (Figure 5) and the arc flash study is completed for the line side of the same breaker, then the Trip Delay Time data field color will turn white. This means that this field can be edited by the user (Figure 5). The protective device name from the transformer contribution branch will include “INST Protection” in parenthesis.
- If the total trip time of differential relay plus the opening time of respective breakers is entered into the Trip Delay Time data field and the Arc Flash study is re-ran, then the entered time will be used for the calculation of the incident energy (figure 6). The (*N6) – Special Instantaneous Protection note indicates that this protection function has been used instead of the original device for interrupting of the arcing fault current.

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Arc Flash Evaluation - Base Project - IEEE 1584 - 2002/2004a Edition

Detail View Summary View Scenarios... Custom Label... Work Permit... Re-Run Study Options... PPE Table... All Go To/Query

	Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground	Equip Type	Gap (mm)	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Required Protective FR Clothing Category
1	LV DISTRIB (B-SWBD1)	TX3 (INST Protection)	0.48	21.18	12.45	20.40	11.99	2	0.000	Yes	PNL	25	225	18	75	Dangerous! (*N6) (*N9)
2	LV DISTRIB (B-SWBD1)	B-SWBD1	0.48	21.18	12.45	0.77	0.45	0.083	0.000	Yes	PNL	25	35	18	3.5	Category 1
3																
4	Category 0: Nonmelting, Flammable Materials with Weight >= 4.5 oz/sq yd															
5	Category 1: Arc-rated FR Shirt & Pants															

Figure 5

Arc Flash Evaluation - Base Project - IEEE 1584 - 2002/2004a Edition

Detail View Summary View Scenarios... Custom Label... Work Permit... Re-Run Study Options... PPE Table... All Go To/Query

	Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground	Equip Type	Gap (mm)	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Required Protective FR Clothing Category
1	LV DISTRIB (B-SWBD1)	B-SWBD1	0.48	21.18	12.45	0.77	0.45	0.083	0.000	Yes	PNL	25	35	18	3.5	Category 1
2	LV DISTRIB (B-SWBD1)	TX3 (INST Protection)	0.48	21.18	12.45	20.40	11.99	0.1	0.000	Yes	PNL	25	38	18	4.1	Category 2 (*N6)
3																
4	Category 0: Nonmelting, Flammable Materials with Weight >= 4.5 oz/sq yd															

Figure 6

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