



Transformer Event Analysis

Exercise 1: SEL-787 Trips on Load

Introduction

A utility installed a new 30 MVA, 69/12.47 kV, DABY distribution transformer and slowly transferred feeder load onto it. A week after the initial energization, the SEL-787 Transformer Protection Relay tripped when no fault was on the system. The utility decided to raise the minimum operate current setting from 0.2 pu to 0.25 pu. Another week later, the relay tripped again. See Figure 1 for a drawing of the installation.

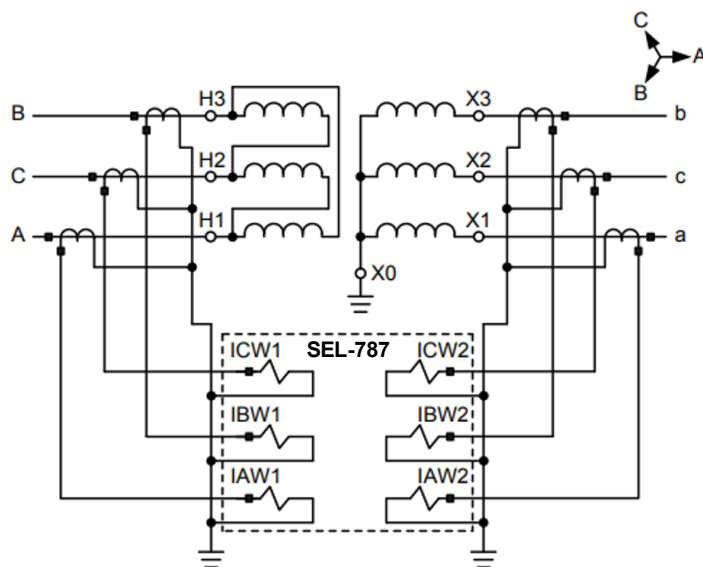


Figure 1 Transformer Installation

Resources available for this example:

- Event reports (Exercise 1 Filtered.CEV and Exercise 1 Differential.CEV)
- SEL-5601-2 SYNCHROWAVE® Event Software
- SEL-787 instruction manual
- “Using Custom Calculations in SYNCHROWAVE Event to Apply Transformer Compensation Matrices” (AG2015-26) application guide
- “Beyond the Nameplate – Selecting Transformer Compensation Settings for Secure Differential Protection” technical paper

Questions

1. Open Exercise 1 Filtered.CEV. Is this a fault? Did the relay trip?

2. What operating characteristic does the 87R element use in the SEL-787? What signals are necessary to determine if the relay operated correctly based on this characteristic? What settings will we need, and what are they set to in the relay?

3. Notice that the OP and RT quantities are not available in the filtered (winding) event report. Open the Exercise 1 Differential.CEV file to obtain the necessary quantities. Based on the RT quantities, what slope was the relay using?

4. Plot and compare the operate and restraint quantities for each phase. Does the operation of 87R make sense?

5. Do the OP and RT quantities look correct for load conditions?

6. The customer is unsure if their winding compensation settings are correct for their installation. What compensation settings were in the relay at the time of the event? Are they correct? If not, what do you propose they should be?

7. Use the custom calculations in AG2015-26 to verify your answer. The calculations use the filtered (winding) event report signals and calculate new OP and RT quantities using your selected compensation settings. Are your proposed compensation settings correct?

8. Other than proving incorrect compensation settings, can you think of any other uses for the calculations in AG2015-26?