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ECE 525

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Lab 1 Report

# Purpose:

This lab was designed to cover the basics of applying standard instantaneous overcurrent elements (ANSI 50) for protection of a small power system. This shows the application of three types of instantaneous overcurrent elements; phase, ground, and negative sequence.

The goal of using all this lab is to understand which elements assert when a fault of various types occurs, and how we can accurately set them so that they only assert for faults that are “in zone” to prevent overreaching. This is an important concept as it ensures that the relay doesn’t trip for faults that should be cleared by another coordinated protective device.

# Lab Procedure:

The procedure for this lab followed the basic application of settings for 50P1, 50G1, and 50Q1; the phase, ground, and negative sequence components, respectively. After applying these settings to an SEL-351S-7 relay, faults were induced at a point “in zone” where the relay was responsible for tripping and protecting the line. Unsurprisingly, we saw that the relay responded for each fault type appropriately and saw assertion in each of the respective protective relay WordBits.

The next step was to apply faults that were “out of zone”, or in a region that normally would be protected by another (downstream) device. However, in this case, we did not have a downstream device configured, and as a result, we wanted to ensure that this 351S that we were configuring would trip as appropriate for such faults. Confirming that the relay responded as expected the lab was completed.

# Event Record Analysis:

As is common with most modern microprocessor based protective relays, the SEL-351S supports event recording and Sequential Events Recorder (SER) timestamping. To validate that faults induced were appropriately picked up by the elements we expected, it was necessary to examine the fault records. Doing so was a simple manner of retrieving the faults and examining the logical record analysis in conjunction with the analog waveform data.

For each of these respective events, we see that the relay made accurate decisions and asserted the related bits to cause a tripping operation.

# Conclusion:

This lab was very useful in understanding the basics of relay settings application and validation. Throughout the lab experience, there were several times where having an understanding of how the CTR was applied and how the relay calculated fault currents, fault location, line impedance, and other values was very useful. It was very nice to apply logic and see it working in a model system instead of just a simple single-relay, single-simulator system. Being able to visualize the faults, and relay’s response was very useful.