

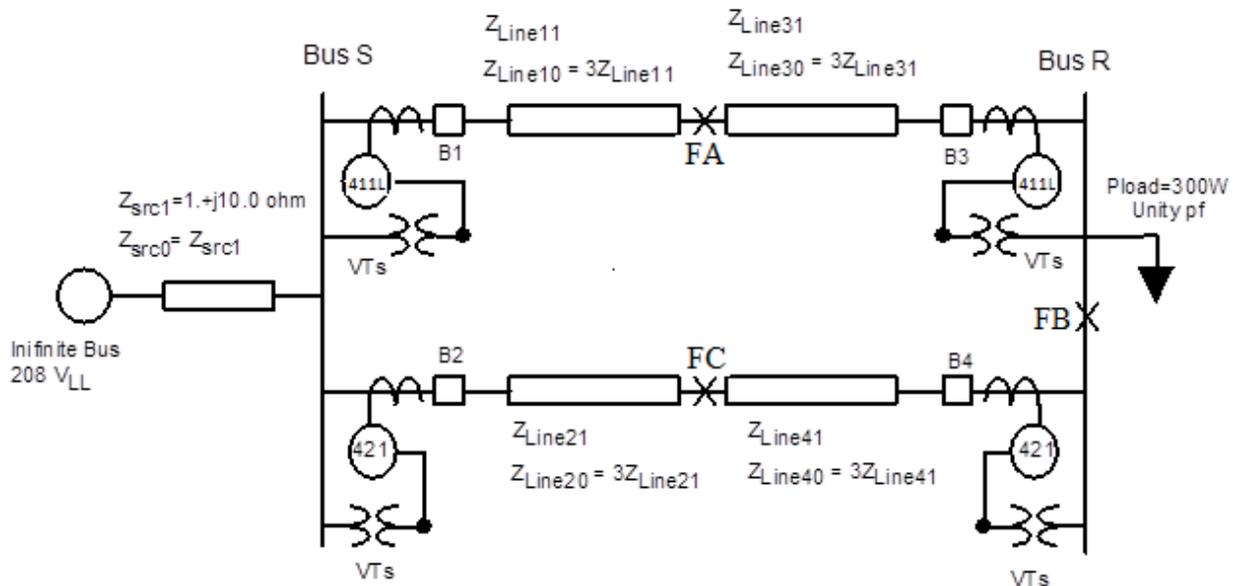
## ECE 526: Lab 2

### Due: March 28

#### Lab Objective

- Experimental explore the effect of Fault Resistance on Quadrilateral distance elements
- Apply the principles of distance protection in distance relays and Communication aided POTT scheme
- Perform relay co-ordination by properly setting relay parameters (impedance, time-delay)

#### Lab Tasks



- MPS Setup (All breakers closed.)

#### Task 1: Set Quadrilateral ground distance elements

Set SEL 411L relays at Bus S and Bus R to provide protection to line L1 and L3. Set Zone 1 of the line and time delayed back up Zone 2 of this line. Also set a reverse looking Zone 3. Consider this a relatively short line for resistive reach setting purposes.

-For the setting of CT ratio and PT ratio: they are set as CTR = 200.0 and PTR = 173.2

#### Part A

- Test your settings for SLG faults at FA (30%, 70%, and 90%), FB and FC.

Set line impedances as follows

	m	$Z_{line1}$	$Z_{line3}$	$Z_{line4}$	$Z_{line2}$
FA	30%	(0.3+j3.0) ohm	(0.7+j7.0) ohm	(0.5+j5.0) ohm	(0.5+j5.0) ohm
FA	70%	(0.7+j7.0) ohm	(0.3+j3.0) ohm	(0.5+j5.0) ohm	(0.5+j5.0) ohm
FA	90%	(0.9+j9.0) ohm	(0.1+1.0) ohm	(0.5+j5.0) ohm	(0.5+j5.0) ohm
FB	100%	(0.8+j8.0) ohm	(0.2+j2.0) ohm	(0.5+j5.0) ohm	(0.5+j5.0) ohm
FC	130%	(0.8+j8.0) ohm	(0.2+j2.0) ohm	(0.3+j3.0) ohm	(0.7+j7.0) ohm

Note:  $Z_{line1} + Z_{line3} = (1.0+j10.0)$  ohm,  $Z_{line2} + Z_{line4} = (1.0+j10.0)$  ohm,  $Z_{src} = (1.0+j10.0)$  ohm

### **Part B**

- Connect a single phase resistor bank in fault matrix loop
- Test your settings fault resistance coverage for SLG faults at 70% of the line by varying fault resistance on resistor bank.

Set the following elements in this task

1. Quadrilateral Ground Distance Reactance Reach : **XG1, XG2, XG3**
2. Quadrilateral Ground Distance Resistance Reach : **RG1, RG2, RG3**
3. Quadrilateral Ground Polarizing Quantity : **I2 or IG**
4. Non-homogeneous Correction Angle (tilt angle)
5. Trip Logic : **TR**

### **Task 2: Set POTT Protection Scheme**

Now add the POTT scheme to the line protection and repeat **Task 1** (parts A and B). Use fiber optic cable for communication with other relay. Compare the fault resistance coverage to the case with Quadrilateral ground distance elements in this lab and to the case with Mho elements in Lab 1 for a SLG faults at 70% of the line.

Set the following elements in this task

1. General Permissive Trip Received : **PT1**
2. Channel B Mirrored bit communication to remote SEL411L relay : **TMB1B**
3. Communication Assisted Trip Logic : **TRCOMM**
4. Reverse Zone 3

### **Report:**

1. Your report should list your relay settings
2. Show summaries demonstrating that the relay settings operate correctly. Show the plots with the response of the trip equation as well as the pick-up of the relay elements.