

11.10 APPENDIX XI. DIRECTIONAL POLARIZING QUANTITIES FOR FAULTED NETWORKS

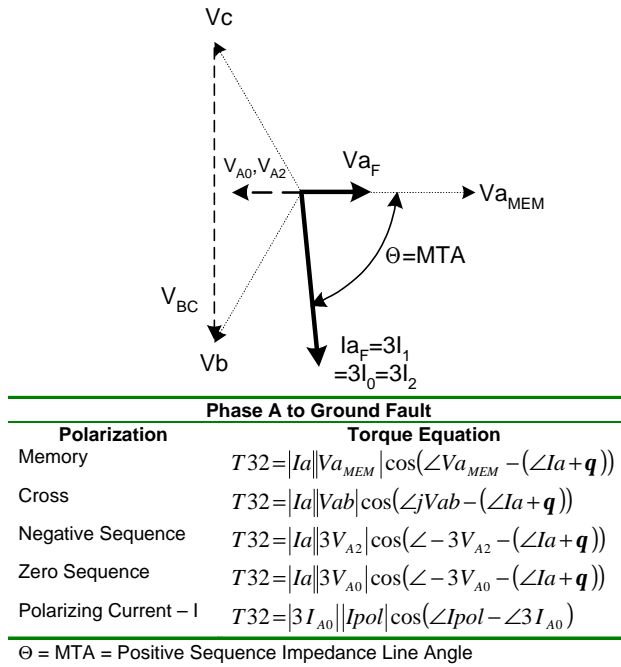


Figure Error! No text of specified style in document..1: Polarizing Quantities for Phase-A-to-Ground Faults

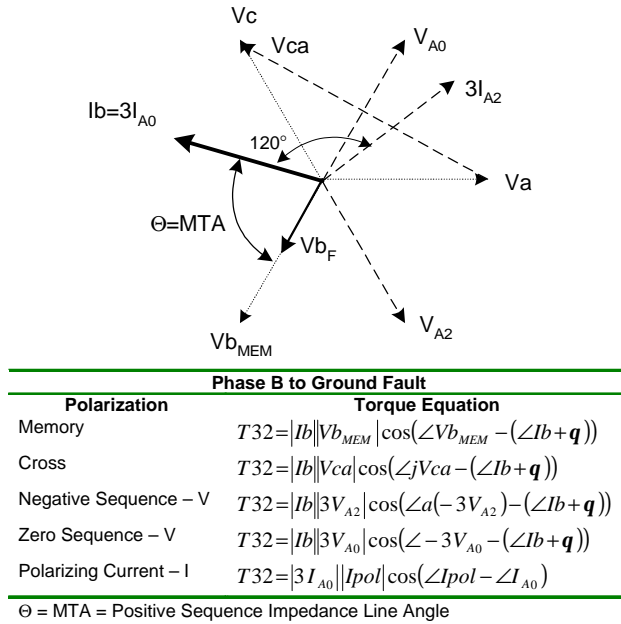
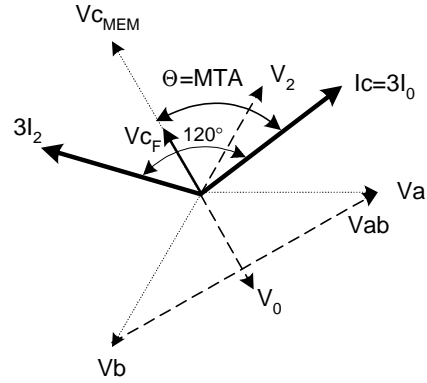


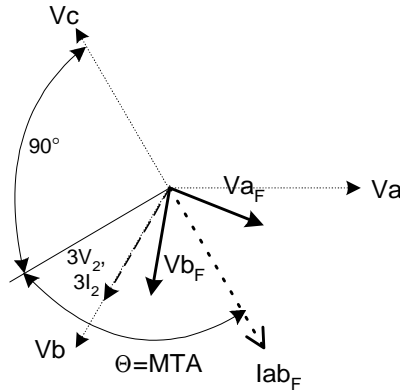
Figure Error! No text of specified style in document..2: Polarizing Quantities for Phase-B-to-Ground Faults



Phase C to Ground Fault	
Polarization	Torque Equation
Memory	$T_{32} = I_c V_{c_MEM} \cos(\angle V_{c_MEM} - (\angle I_c + q))$
Cross	$T_{32} = I_c V_{ab} \cos(\angle jV_{ca} - (\angle I_c + q))$
Negative Sequence - V	$T_{32} = I_c 3V_{A2} \cos(\angle a^2(-3V_{A2}) - (\angle I_c + q))$
Zero Sequence - V	$T_{32} = I_c 3V_{A0} \cos(\angle -3V_{A0} - (\angle I_c + q))$
Polarizing Current - I	$T_{32} = 3I_{A0} I_{pol} \cos(\angle I_{pol} - \angle 3I_{A0})$

$\Theta = MTA = \text{Positive Sequence Impedance Line Angle}$

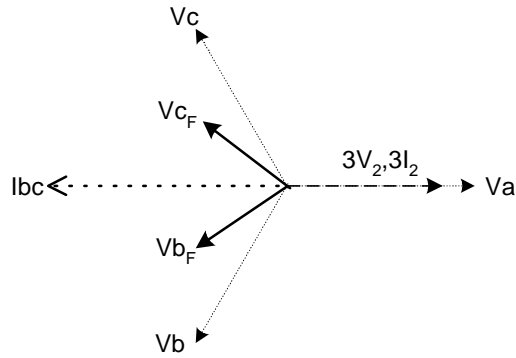
Figure Error! No text of specified style in document..3: Polarizing Quantities for Phase-C-to-Ground Faults



Phase AB and AB to Ground Fault	
Polarization	Torque Equation
Memory	$T_{32} = I_{ab} jV_{c_MEM} \cos(\angle jV_{c_MEM} - (\angle I_{ab} - q))$
Cross	$T_{32} = I_{ab} V_c \cos(\angle jV_c - (\angle I_{ab} - q))$
Negative Sequence - V	$T_{32} = I_{ab} 3V_{A2} \cos(-3a^2 V_{A2} - \angle I_{bc})$
Zero Sequence - V	None
Polarizing Current - I	None

$\Theta = MTA = \text{Positive Sequence Impedance Line Angle}$

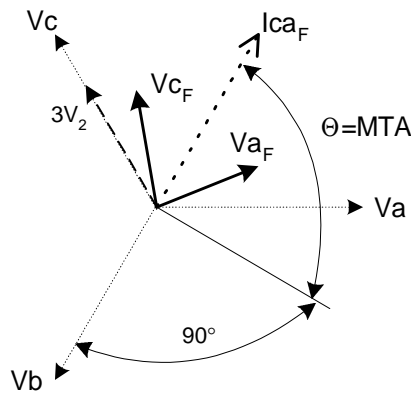
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Phase BC and BC to Ground Fault	
Polarization	Torque Equation
Memory	$T_{32} = Ibc jVa_{MEM} \cos(\angle jVa_{MEM} - (\angle Ibc + \mathbf{q}))$
Cross	$T_{32} = Ibc Va \cos(\angle jV_{A1} - (\angle Ibc - \mathbf{q}))$
Negative Sequence - V	$T_{32} = Ibc 3V_{A2} \cos(-3V_{A2} - \angle Ibc)$
Zero Sequence - V	None
Polarizing Current - I	None

$\Theta = \text{MTA} = \text{Positive Sequence Impedance Line Angle}$

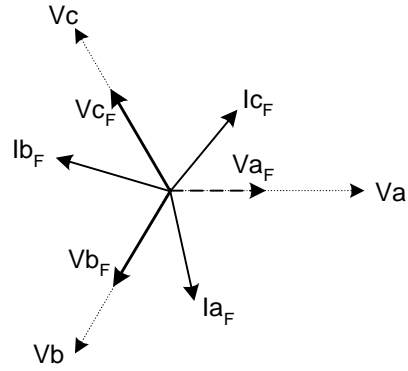
Figure Error! No text of specified style in document..5: Polarizing Quantities for Phase-BC and BC-to-Ground Faults



Phase CA and CA to Ground Fault	
Polarization	Torque Equation
Memory	$T_{32} = Ica jVb_{MEM} \cos(\angle jVb_{MEM} - (\angle Ica + \mathbf{q}))$
Cross	$T_{32} = Ica Vb \cos(\angle jV_{B1} - (\angle Ica - \mathbf{q}))$
Negative Sequence - V	$T_{32} = Ica 3V_{A2} \cos(-3aV_{A2} - \angle Ica)$
Zero Sequence - V	None
Polarizing Current - I	None

$\Theta = \text{MTA} = \text{Positive Sequence Impedance Line Angle}$

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Phase ABC and ABC to Ground Fault	
Polarization	Torque Equation
Memory – any of one of three equations	$T_{32} = Iab jVc_{MEM} \cos(\angle jVc_{MEM} - (\angle Iab + \mathbf{q}))$
	$T_{32} = Ibc jVa_{MEM} \cos(\angle jVa_{MEM} - (\angle Ibc + \mathbf{q}))$
	$T_{32} = Ica jVb_{MEM} \cos(\angle jVb_{MEM} - (\angle Ica + \mathbf{q}))$
Cross	<i>None</i>
Negative Sequence – V	<i>None</i>
Zero Sequence – V	<i>None</i>
Polarizing Current – I	<i>None</i>

$\Theta = \text{MTA} = \text{Positive Sequence Impedance Line Angle}$

Figure Error! No text of specified style in document..7: Polarizing Quantities for Phase-ABC and ABC-to-Ground Faults