2019 PLS-CADD Advanced Training and User Group

Circuits and Electrical Calculations

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Power Line Systems

Introduction

- Circuits
  - Defining Circuits
  - Assigning Circuits
- Full Line Constants Calculator
  - Positive and Zero Sequence Impedance and Susceptance with Mutual Coupling
  - Using Circuits for Focused Analysis and Reporting

Circuits

- Benefits of Circuits
  - Visualization
  - Focused Reporting
  - Document Phasing
  - Electrical Analysis
- Legacy Options
  - Section Notes
  - Section Coloring

Defining Circuit Labels

- Sections/Electric/Define Circuits and Phases/Labels…
  - Project Wide
  - Unlimited Number
  - Unique Labels for Each Circuit
  - Labels for 1, 2, or 3 Phases
  - Color and Line Style per Circuit and per Phase
  - Select Line Style of None to Hide Circuit in All Views

Assigning Circuits

- Sections/Electric/Define Circuits and Phases/Table…
  - Line Specific
  - Tracks Every Phase of Every Section
  - Uses Jumpers If Modeled
  - Linking Sections and Assigning Labels
- Graphical Commands
  - Sections/Electric/Define Circuits and Phases/Graphical
  - Sections/Electric/Set Circuit Label

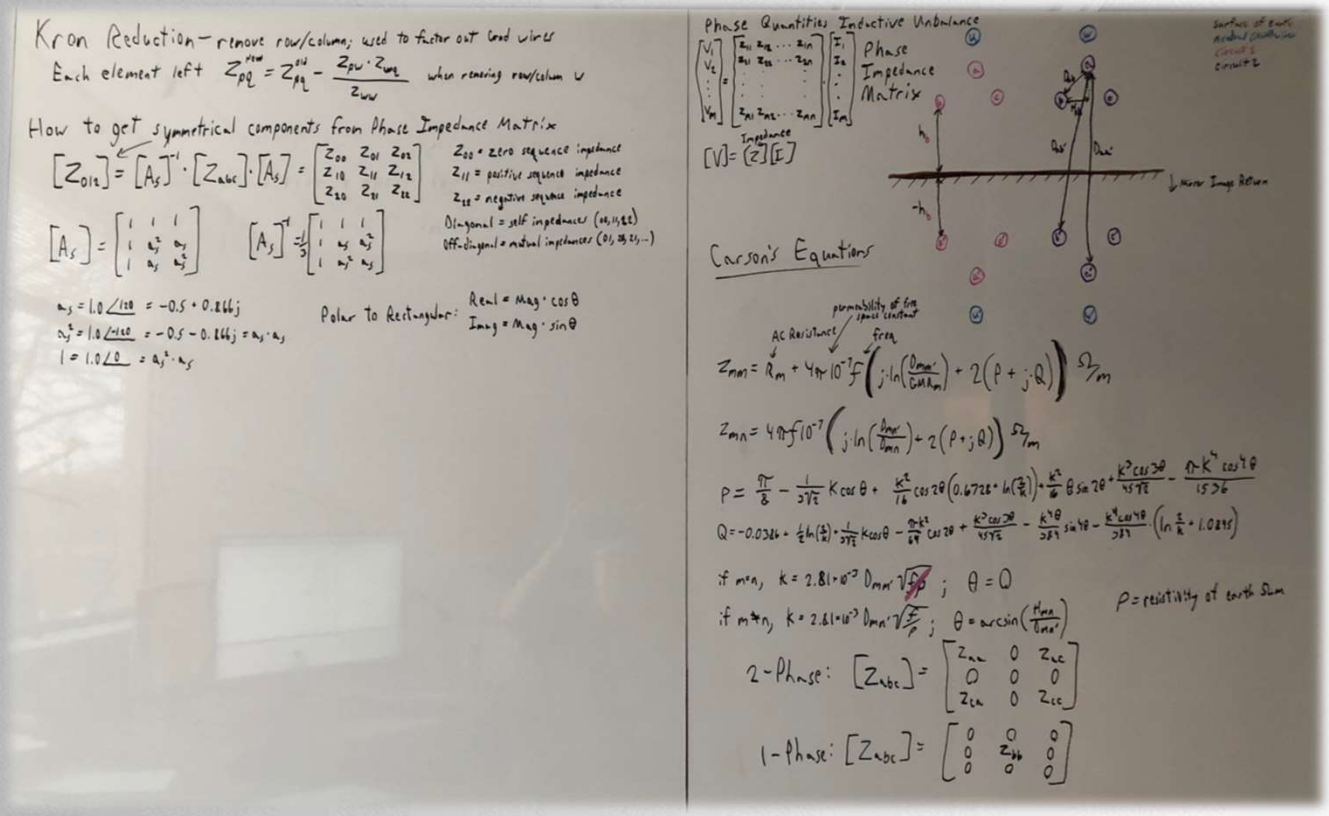
Linking Sections

- Jumpers
  - Section Links Are Like Virtual Jumpers
  - Modeled Jumpers are Fixed Links
  - Supports Transposition
- Rules
  - Must Have Common Structure, Same # Phases, Same Voltage
  - No Loops, No Branches
  - Same Circuit Label For All Linked Sections

Circuit Visualization

- Display Wire Color and Line Style by Circuit or Phase
- Entity Info in Status Bar
- Wire Text Labeling in Drafting and Profile Views
- Section Labeling in Drafting
- Phase Labeling
- Structure Phase Diagrams
- Can Show/Hide Individual Circuits
- Circuit Labels in Reports

Line Constants Overview



PLS Line Constants History

- Simple Line Constants Calculator in v14.00
  - Positive Sequence Only
- Full Line Constants Calculator in v15.50
  - Positive and Zero Sequence
  - Mutual Coupling per Span in Phase Domain Only
- Update in v15.61 (beta) and v16.00
  - Zero Sequence Mutual Impedance Summary

PLS Advantages

- Ease of Use
  - Automatically Determines Wire Positions and Height
  - Can Calculate Several Circuits at Once
  - Changing Operating and Weather Conditions
- Accuracy
  - Resistance Calculated per Section Using Weather Case
  - Wire Positions Calculated Using Weather Case and Condition
  - Height Calculated Using Ground TIN
  - Several Measurements per Span

Full Line Constants Requirements

- Modeled Line with Circuit Labels Assigned
  - Correct cables, voltage, weather case
  - If bundled conductors, must have total bundle diameter
- Cable Files Updated
  - Must have diameter, AC resistance, GMR
- Ground TIN
  - Must cover entire line being analyzed

Full Line Constants Calculator

- Standard Report
  - Effective Resistance, Radius, and GMR of Every Cable
  - Positive and Zero Sequence Impedance and Susceptance
  - Average Per Distance, Total, and Per-Unit
  - By Span and Summarized by Circuit
- Zero Sequence Mutual Impedance
  - Per Coupled Circuit on Common Spans
  - Results Per Span and Per Overlapping Region

Report Options

- Whole Circuit Matrices
  - Impedance in Phase or Sequence
  - Capacitance/Susceptance in Phase or Sequence
- Span Matrices
  - Combined (with Optional Ground Wires) or Per Circuit
  - Impedance in Phase or Sequence
  - Capacitance/Susceptance in Phase or Sequence
  - Mutual Couple in Phase or Sequence
  - Average Heights and Distances Per Wire

PLS Resources

- Website: www.powerlinesystems.com
- Videos
  - "Defining and Labeling Circuits and Electrical Phasing"
  - "Creating Phasing Diagrams"
- Tech Notes
  - "Defining and Labeling Circuits and Electrical Phasing"
  - "Full Line Constants Feature"

Future Improvements

- Mutual Impedance Across Adjacent Spans
- Improved EMF
- Improved Lightning Protection
- Improved Performance

Power Line Systems

IT'S ALL ABOUT YOUR POWER LINES

Advanced Sag & Tension
IEC
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CSA
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