

Defining and Labeling Circuits and Electrical Phasing in PLS-CADD

Starting with version 15.21 PLS-CADD has the ability to define and label wires for circuits and electrical phases. These labels are now part of the UI, integrated into certain reports, can be part of plan and profile drawing sheets, or used for phasing diagrams.

For purposes of this document a circuit is a collection of wires across one or more sections grouped together for display or analysis. They do not necessarily represent conductors with voltage.

The first step is to define the circuit and phase labels you want to use for this project. Note that these defined labels are saved with the project and shared across all lines within that project.

Sections/Electric/Define Circuits and Phases/Labels...

Circuit and Phase Labels

Define the labels for the circuit and phases in this project.

	Circuit Label	Circuit Color	Circuit Line Style	First Phase Label	First Phase Color	First Phase Line Style	First Phase Angle (deg)	Second Phase Label	Second Phase Color	Second Phase Line Style	Second Phase Angle (deg)	Third Phase Label	Third Phase Color	Third Phase Line Style	Third Phase Angle (deg)
1	Overhead Ground Wires		Solid	OGW		Dot	0.00	OGW		Dot	0.00	OGW		Dot	0.00
2	Communication Wires		Solid	Comm		Dot	0.00	Comm		Dot	0.00	Comm		Dot	0.00
3	Circuit 1		Solid	A1		Dash	0.00	B1		Dash	120.00	C1		Dash	-120.00
4	Circuit 2		Solid	A2		Dash-Dot	0.00	B2		Dash-Dot	120.00	C2		Dash-Dot	-120.00
5			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
6			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
7			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
8			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
9			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
10			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
11			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
12			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
13			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
14			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
15			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
16			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
17			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
18			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
19			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
20			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00
21			Solid	A		Dash	0.00	B		Dash	120.00	C		Dash	-120.00

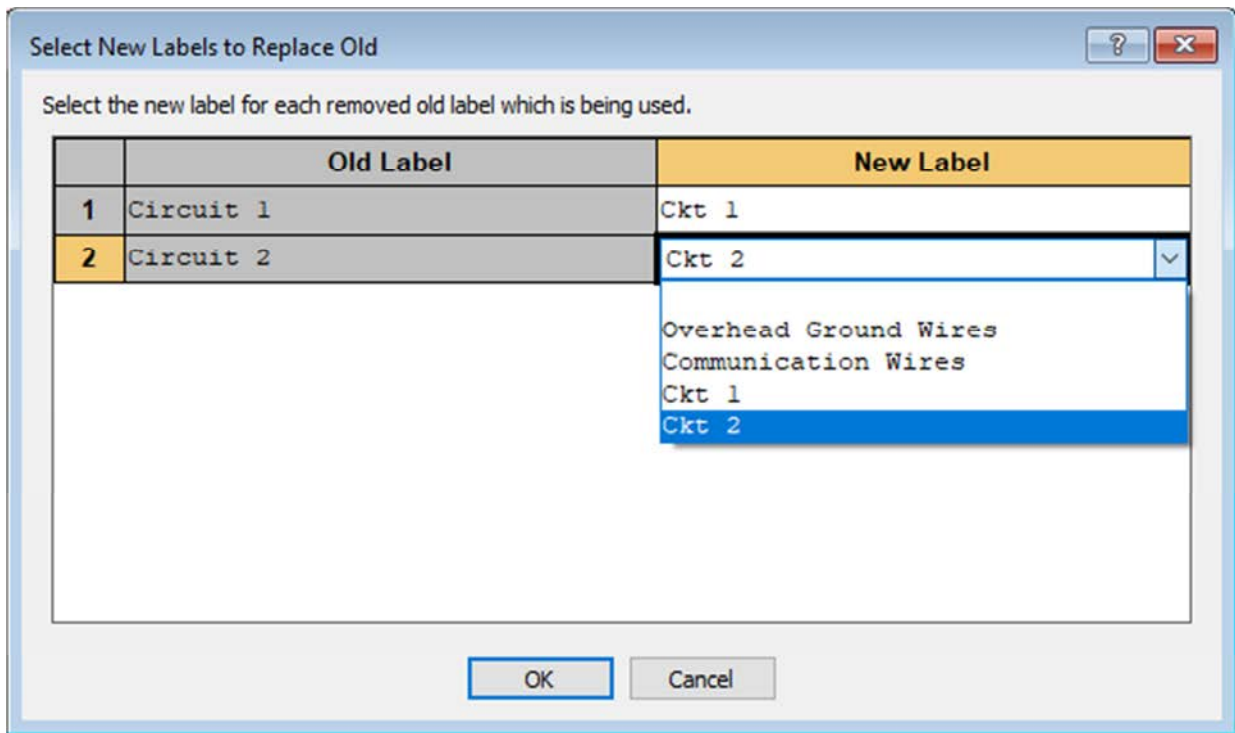
OK Cancel

Each row in this table represents a different circuit. You can define as many circuits as you want (each time the table opens, there will be 20 blank rows available, growing as needed). Each circuit has a text label, a display color, and a display line style. In addition, each circuit can have up to 3 phases defined where each phase has a label, color, line style and phase angle. If you want to have fewer than 3 phases available for a given circuit, leave the label blank or repeat the label. The program will ignore blank labels and consolidate repeat labels. Circuit labels should all be unique.

Note that the phase angle is currently not used by PLS-CADD. It is planned to be incorporated in an updated EMF function in a future release.

The color and line style are used when drawing wires if you have chosen to display wires based on circuit or phase labels (see Display Options below).

If you modify or remove a circuit label that is already in use, when you close the table, you will be given an option to map all instances where that old label was used to any one of the current or new labels. Phase labels are updated automatically based on “first”, “second”, and “third” positions in the table, so if you change the first phase label for a circuit, all wires assigned to the old first phase label for that circuit will get that new label.



Assigning Circuits

Once the circuit labels are defined, you can start using them in your model. There are two parts to these circuits: assigning labels and linking sections. Circuits in PLS-CADD are based on the wire sections.

Each section can only be assigned a single circuit label at a time, but several sections can share the same circuit label whether or not they are linked or next to each other. All sections which are linked must have the same circuit label. Each phase within a section can be assigned a phase label. The same phase label can be used for multiple phases within a section, but only phase labels defined for the circuit assigned to that section are available for the phases within that section.

Circuits consist of one or more sections linked together. The chain of linked sections in a circuit must have a distinct start and a distinct end with a simple path from that start to the end. Each section can link to at most one other section and each section can be linked to by at most one other section. In other words, no branches and no loops. Sections can only be linked if they have the same number of phases and the same voltage.

In addition to linking sections, the individual phases are linked as well. The default link has phase 1 connecting to phase 1 of the other section and phase 2 connecting to phase 2 of the other section. You can change those links to any combination as long as each phase connects to exactly one other phase in the linked section. For example you can have phase 1 connect to the other section's phase 3, phase 2 connect to phase 1, and phase 3 connect to phase 2.

If the project contains jumpers, PLS-CADD will automatically link the jumpered sections together including how each phase in one section link to the phases in the other section. You can not use the circuit commands to override or change how jumpers link sections. If you want to change that link, you need to update the jumpers.

While the label definitions are shared between all lines in your project, the label assignments and section links belong to the line, so you can define the circuits differently for each line of your project.

These label assignments and section links can be defined through a table or through graphical commands.

Sections/Electric/Define Circuits and Phases/Table...

Circuit and Phase Definitions and Labels

Use this table to assign circuit and phase labels to sections and wires and define the connections between sections and phases.

Sections with jumpers are automatically connected. To change them, edit the jumpers using Structures/Modify. The Break Link column can also be used to partition circuits or to ignore jumpered links. Only sections with the same voltage and the same number of phases can be connected. Use the Connected Backwards column to connect from a section's start structure to a section's end structure. Each section can only connect to one other section and only have up to one section connected to it, and there can not be any loops. The Break Link column will be used automatically to resolve those issues when they are found.

Section Number	Section Note	Section Voltage (KV)	Start Structure	Start Set #	Start Phase #	End Structure	End Set #	End Phase #	Jumpers Modeled	Connected Backwards	Connected Set #	Connected Phase #	Connected Section #	Circuit Label	Phase Label	Break Link	Notes
1	1	0	Substation	1	1,3	1	1,3	0	No	1 ahead	1	1	2	Overhead Ground Wires	OSGW	No	
2	2	0	0	1	1,6	2	1,3	0	No	1 ahead	1	1	4	Overhead Ground Wires	OSGW	No	
3	3	12	Dlat	1	1,Dlat	1	1,3	0	No			0	0			No	
4	4	0	0	1	1,10	2	1,3	0	No			0	0	Overhead Ground Wires	OSGW	No	
5	5	0	Substation	2	1,3	2	1,3	0	No	2 ahead	1	1	4	Communication Wires	Comm	No	
6	6	0	0	2	1,6	1	1,3	0	No	2 ahead	1	1	7	Communication Wires	Comm	No	
7	7	0	0	2	1,10	1	1,3	0	No			0	0	Communication Wires	Comm	No	
8	8	345	Tap	3	1,3	15	1,3	0	Yes			1	0	Circuit 1	A1	No	
9	9	345	Tap	3	2,3	15	2,3	0	Yes			2	0	Circuit 1	B1	No	
10	10	345	Tap	5	3,3	15	3,3	0	Yes			3	0	Circuit 1	C1	No	
11	11	345	3	5	1,6	15	1,3	0	Yes	15 back	3	3	8	Circuit 1	C1	No	
12	12	345	3	5	2,6	15	2,3	0	Yes	15 back	1	1	8	Circuit 1	A1	No	
13	13	345	3	5	3,6	15	3,3	0	Yes	15 back	2	2	8	Circuit 1	B1	No	
14	14	345	4	5	1,10	15	1,3	0	Yes	16 back	1	1	12	Circuit 2	C2	No	
15	15	345	4	5	2,10	15	2,3	0	Yes	16 back	2	2	12	Circuit 2	B2	No	
16	16	345	4	5	3,10	15	3,3	0	Yes	16 back	3	3	12	Circuit 2	A2	No	
17	17	345	Substation	6	1,3	14	1,3	0	Yes			0	0	Circuit 2	C2	No	
18	18	345	Substation	6	2,3	14	2,3	0	Yes			0	0	Circuit 2	B2	No	
19	19	345	Substation	6	3,3	14	3,3	0	Yes			0	0	Circuit 2	A2	No	
20	20	345	3	6	1,6	14	1,3	0	Yes	16 back	1	1	11	Circuit 2	C2	No	
21	21	345	3	6	2,6	14	2,3	0	Yes	16 back	2	2	11	Circuit 2	B2	No	
22	22	345	3	6	3,6	14	3,3	0	Yes	16 back	3	3	11	Circuit 2	A2	No	
23	23	345	6	6	1,10	14	1,3	0	Yes	15 back	1	1	9	Circuit 1	C1	No	
24	24	345	6	6	2,10	14	2,3	0	Yes	15 back	2	2	9	Circuit 1	A1	No	
25	25	345	6	6	3,10	14	3,3	0	Yes	15 back	3	3	9	Circuit 1	B1	No	

This table contains one row for every phase of every section in the line.

Jumpers Modeled – Will be set to 'Yes' if there are any jumpers defining the connection for this section. If 'Yes', you will not be able to change either the **Connected Set #** or the **Connected Phase #**, but you can still change the other columns including flipping the section using **Connected Backwards** or setting **Break Link** to 'Yes' to ignore the jumper so you can assign different labels (see notes on this column below).

Connected Backwards – Like stringing direction for sections, there is a direction for circuits which will affect how sections are reported for some future electrical functions. By default, links

connecting circuit sections go from the end structure of one section to the start structure of the next section (note that the structure will be the same). If you want to connect from the start structure of a section, you need to “flip” that section (for circuit purposes only, this does not affect stringing direction).

Connected Set # – You select which other set on the structure this section is linked to. The structure is the current section’s **End Structure** if **Connected Backwards** is ‘No’ or it is the **Start Structure** if **Connected Backwards** is ‘Yes’. The only options available are valid sections for this one to connect to (they must have matching voltage and number of phases). If this section is jumpered on this structure, there will be only one valid option which is the set that the section is jumpered to. Note that there could be up to two different sections at the same set number on the structure, an ahead span and a back span.

Connected Phase # – The structure phase number on the **Connected Set #** that this phase of the section connects to. This will default to match the phase number of the current section, but you can change it if the section has multiple phases. Note that each phase can connect to only one other phase, so when changing it for one phase, the table will automatically update the other phase to resolve any conflict.

Connected Section # – This shows which other section this section links to. This is determined by the **Connected Backwards** and **Connected Set #** columns and is shown to help you trace the section links that are defined.

Circuit Label – This is where you select the circuit label for this section and all sections linked to this one. If you change the label for this section, all other linked sections (unless a section has its **Break Link** column set to ‘Yes’) will also change to the newly selected circuit label. You can select from any of the circuits in the **Circuit and Phase Label** table described above. Note that the **Phase Label** options depend on which circuit is selected here, so if you change the circuit label, you may see the **Phase Label** for all phases in this and connected sections change as well.

Phase Label – This is where you select the phase label for this phase. The options available depend on which **Circuit Label** was selected and you must select a **Circuit Label** before you can select the **Phase Label**.

Break Link – This column is used to disable a link between sections. The default value for this column is ‘No’, but it could be set to ‘Yes’ for a variety of reasons. PLS-CADD will automatically set this column to ‘Yes’ if you create a link that would violate one of the rules for linking sections, usually if that link would create a loop or you are linking to a section that already has another section linking to it (a branch). In either case, the program will set the **Break Link** of some other section to ‘Yes’ so that your newly created link is valid. You may also want to set this column to ‘Yes’ to ignore a section link that is defined by some modeled jumpers. Usually this would be done so that you can assign different circuit labels to these sections (either for display or reporting). You may also want to do this to partition a circuit for electrical analysis. Note that **Connected Set #** and **Connected Phase #** columns are not

changed when this column is set to 'Yes', so the link can easily be restored simply by setting this column back to 'No'. Note that if this column was set to 'Yes' automatically to resolve a link chain conflict (loop or branch), if you set this column to 'No', it will likely result in another section having its **Break Link** set to 'Yes' to resolve the conflict at a different point along the chain.

Notes – This column tells you when any other row has been updated because of some recent change. If any sections were modified or created, then there will be new rows and this column will identify them. If you change the **Circuit Label** in one row, all other sections linked to this one will have their label changed as well and this column will be updated for those rows. If you set a link that creates a conflict that was resolved by using the **Break Link** for some other section, then that row will be updated in this column.

If you create a link between two sections or chains of sections which have different **Circuit Label** selections, you will see a dialog asking you which label you would like to use. PLS-CADD will then update all the newly linked sections to the same label. Note that if you want different labels for sections which are linked, you will need to use the **Break Link** column to partition the chain before assigning different labels.

By navigating to **Sections/Electric/Define Circuits and Phases/Graphical** allows you to define the circuit links between sections graphically. When you use this command, click on the section you want to start with and then click on each subsequent section you want to add to the chain of sections for this circuit. When you are done, middle click or hit <Enter> and you will see the vertical table view of a single row from the **Circuit and Phase Definitions and Labels** table described above. From this you can assign labels or use the Transpose button to get to the full table.

Circuit and Phase Definitions and Labels

Use this table to assign circuit and phase labels to sections and wires and define the connections between sections and phases.

Sections with jumpers are automatically connected. To change them, edit the jumpers using Structures/Modify. The Break Link column can also be used to partition circuits or to ignore jumpered

Only sections with the same voltage and the same number of phases can be connected. Use the Connect Backwards column to connect from a section's start structure or to a section's end

Each section can only connect to one other section and only have up to one section connected to it, and there can not be any loops. The Break Link column will be used automatically to resolve

Section Number		13
Section Note		
Section Voltage (kV)		345
Start Structure	6	
Start Set #		6
Start Phase #		3
End Structure	10	
End Set #		16
End Phase #		3
Jumpers Modeled	No	
Connected Backwards	No	
Connected Set #		
Connected Phase #		3
Connected Section #		0
Circuit Label		Circuit 2
Phase Label		
Break Link	No	
Notes		

OK

Cancel

Like in the table, this command will only allow you to create links between valid sections (matching voltage and number of phases). If the mouse is snapping to an invalid section, the cursor will change to the invalid symbol.

While in this command the status bar will give you information on the section the mouse is snapping to so you know which section you are about to link.

Sections/Electric/Edit Circuit Connection

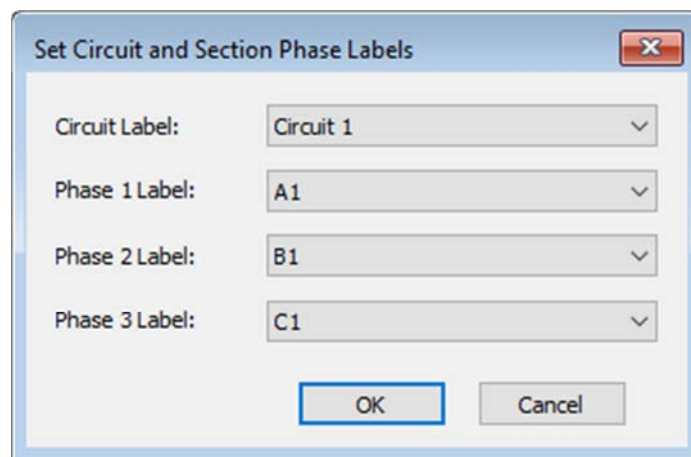
This graphical command will bring up the vertical table view of the **Circuit and Phase Definitions and Labels** table showing you only the information for the section and phase that the mouse is snapped to when you click. You can use the Transpose button in the upper right corner to see the full table with rows for all sections and phases.

Sections/Electric/Remove Circuit Connection

This command allows you to graphically remove circuit links that you have defined. Click on one section and then click on the other section of the link you want to remove. Note that this is equivalent to clearing the entry in the **Connected Set #** column. It is not the same as using the **Break Link** column as described above. Even though the link has been removed, both sections will retain their **Circuit Label** assignments.

Sections/Electric/Set Circuit Label

With this command you can graphically select a section with the mouse and a simplified dialog will come up asking you to pick both circuit and phase labels for that section. Any changes you make will be propagated to all other linked sections.

A screenshot of a software dialog box titled "Set Circuit and Section Phase Labels". The dialog has a standard Windows-style title bar with a close button (X) in the top right corner. Inside the dialog, there are four rows of labels and dropdown menus: "Circuit Label:" with a dropdown showing "Circuit 1", "Phase 1 Label:" with a dropdown showing "A1", "Phase 2 Label:" with a dropdown showing "B1", and "Phase 3 Label:" with a dropdown showing "C1". At the bottom of the dialog, there are two buttons: "OK" and "Cancel". The "OK" button is highlighted with a blue border.

Note on Changing Sections After Circuits Are Assigned

Circuits depend on the sections defined in your line. The sections are identified by their start structure and set and their end structure and set. If you create new sections or modify any existing section by changing their start or end structure or set, the circuit logic in the program will treat those sections as new sections without any circuit assignments until you assign circuit labels or links to them. If you make such a change to a section in the middle of a circuit section chain, then the chain will be

broken into two (but both using the same label they had before) and the modified section will appear as a new unlinked section without any labels assigned.

Display Options

The circuit and phase labels are integrated into the PLS-CADD user interface in several different ways.

Status Bar

The Entity Info text in the status bar, when snapped to a wire, will display both the circuit and phase label for that wire if they are assigned.

Sections/Display Options...

In the **Line Display Options** dialog, there are two new options under Section Color to display wires using the line style and color for either the assigned circuit or the assigned phase. If you have selected to draw wires based on phase label, but no phase label was assigned to that wire, it will use the circuit label's line style and color, if a circuit label was assigned. If you are displaying either by circuit or by phase, but no circuit label was assigned, the wire will be drawn using the color specified for that section in **Section/Modify** (the first Section Color option in the **Line Display Options** dialog).

Line Display Options

Line Name and Display Information

Name: ORIGINAL

14 Structures, 13 Sections, Cost=0
Automatic spotting data: Suboptimals=0, Interval=50.000, Main loop time=20.487

Line Type

☒ Solid ☐ Dash ☐ Dot

Section and Structure Display Options

Section | Structure

Section Color

☐ Draw each section with the color specified in Section/Modify

☐ Draw all sections using the section color to the right (override Section/Modify display color) Section Color

☐ Draw each section with the color specified in the cable file

☐ Draw each section with the color and line type specified by its circuit label

☒ Draw each section with the color and line type specified by its phase label

Phases Displayed

☐ Draw only the phase selected in the Section/Modify

☒ Draw all phases (override Section/Modify display phase)

Display Weather Case

☒ Display each section as selected in Section/Modify (each section can be at different weather case)

☐ Display all sections for weather case below (override Section/Modify weather case or catenary)

Display parameters will be updated to reflect current ruling spans and weather cases selected in the section modify dialog box.

Show Cables

☐ Plan View ☒ Profile View ☒ 3-D View ☐ Sheet-Plan View ☒ Sheet-Profile View

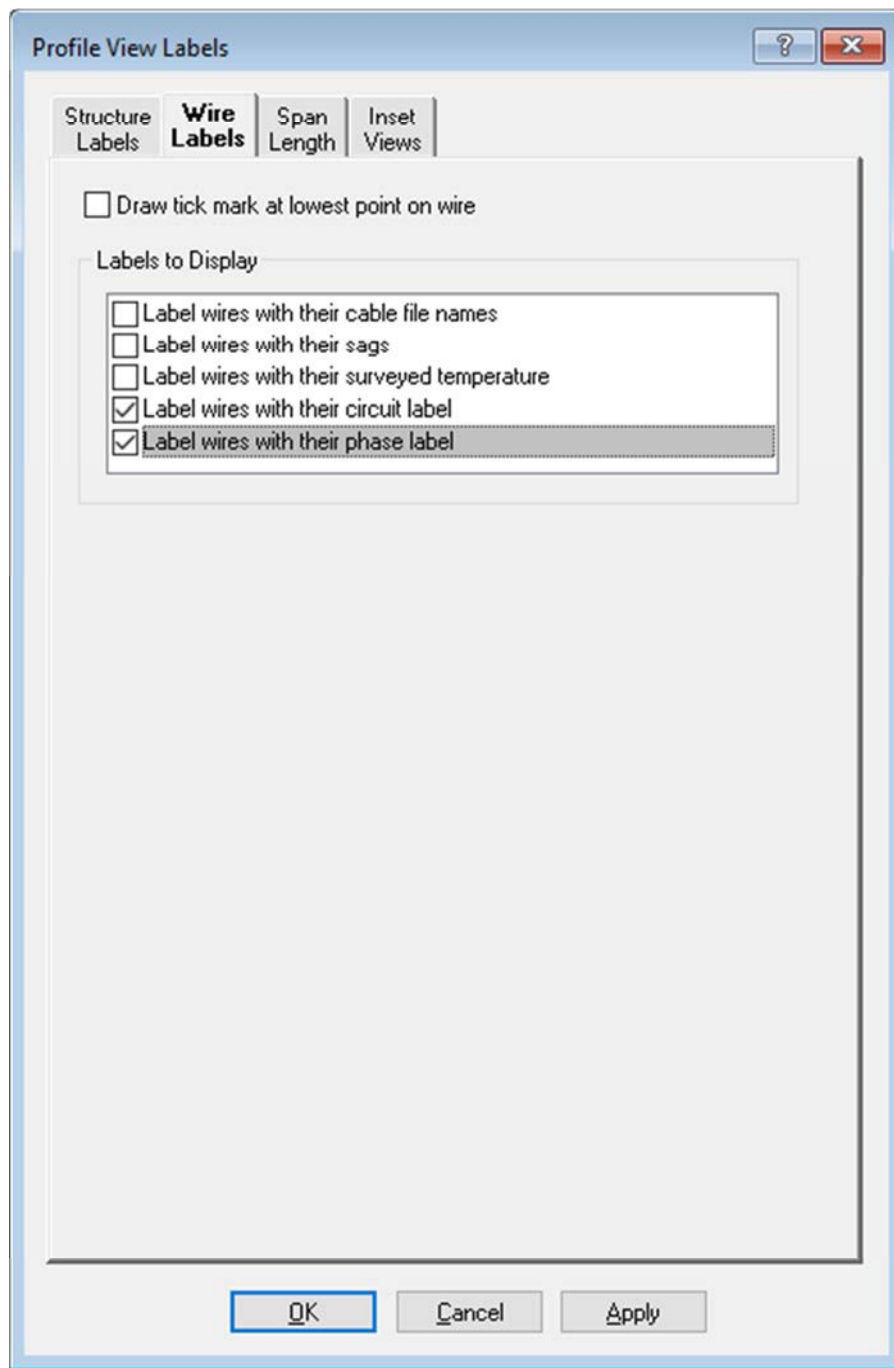
OK Cancel

Drafting/Show Circuit and Phase Labels in 3D Views

This option, when enabled, will draw the circuit and phase labels on structure attachment points in the 3D View window and on structure Inset Views in the Profile View window if those are being shown.

Drafting/Structure and Section Labeling/Profile View...

In the Wire Labels tab of this dialog, you can now turn on either the circuit or phase labels. When enabled, those labels are drawn for each wire in each span in the Profile View window using the currently selected display color for that wire.



How to Hide Circuits

It is possible to hide all wires assigned to a particular circuit label in all views. Go to **Sections/Electric/Define Circuits and Phases/Labels...** and for each circuit you want to hide, set the **Circuit Line Style** to None. Once that is done, any section assigned to that circuit label will no longer be drawn in any of the views. The section is hidden regardless of which display option is chosen in **Sections/Display Options...** In addition, any labels associated with those sections will also not be drawn. This includes the section label block for Plan and Profile Sheets. This is useful if you want to print out sheets or create images of other views focusing on only certain circuits in the line without having to

remove the other sections. To restore the hidden sections, simply go back into the **Circuit and Phase Labels** table and set the **Circuit Line Style** to some value other than None.

It is important to remember that even though the sections are not being displayed, they are still there and will still be included in any processing or analysis that would normally include them (for example clearance and loading).

Note that you can also choose None for the **Phase Line Style**, but this option will only hide those wires if those wires are being drawn with the phase label option selected as the Section Color in the **Line Display Options** dialog and does not otherwise affect section labeling.

Reports

Certain reports within PLS-CADD have been updated to allow you to select which sections are included based on the circuit labels assigned to them.

Lines/Reports/Summary...

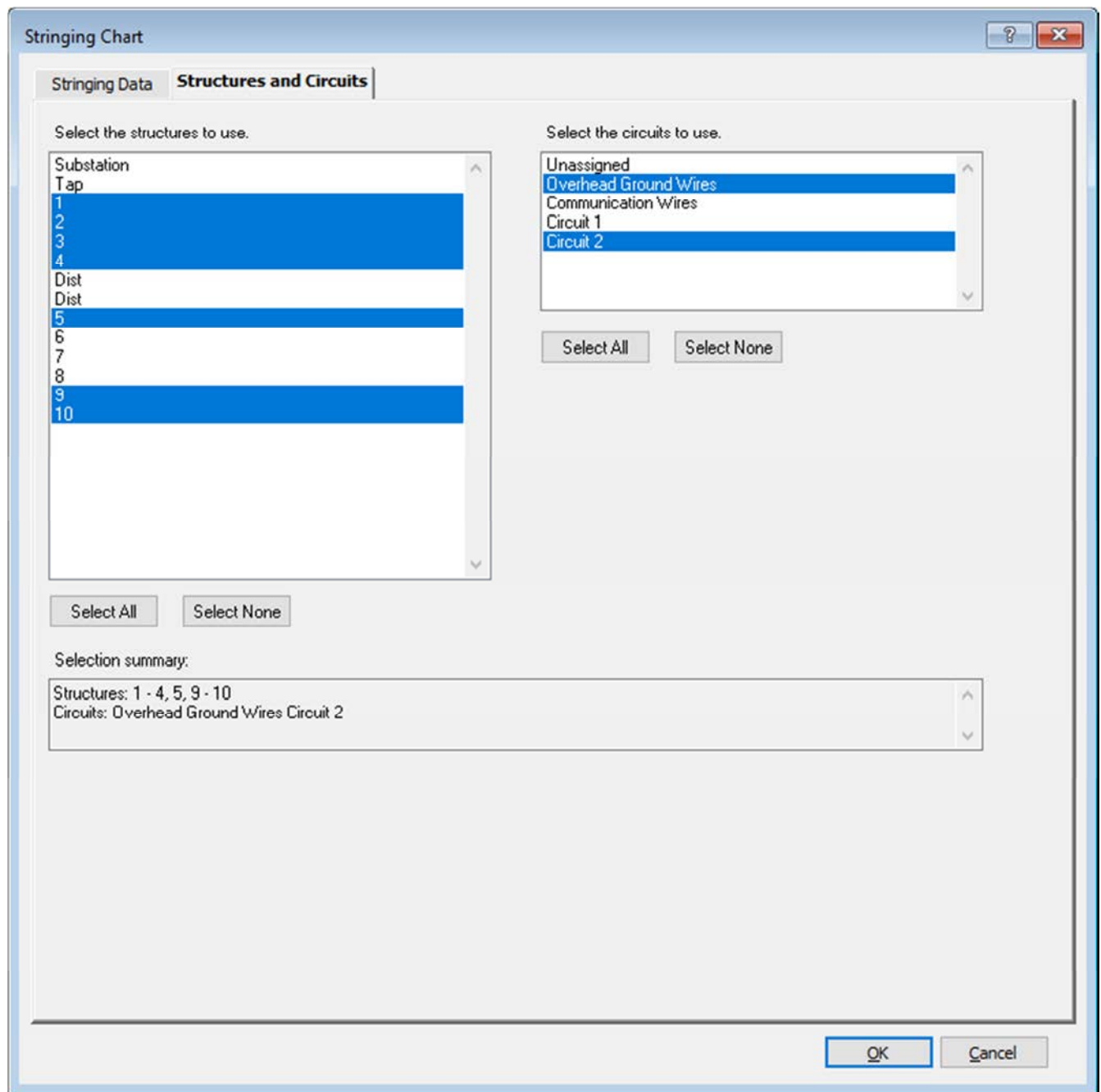
The Line Summary Report now includes the **Circuit and Phase Definitions and Labels** table which is a report of the same information you get when you use the **Sections/Electric/Define Circuits and Phases/Table...** command.

File/Export/XML...

The XML output also includes the **Circuit and Phase Definitions and Labels** table.

Sections/Stringing Chart/Multiple Sections...

The **Stringing Chart** dialog now has two tabs. Instead of selecting a range of structures to determine which sections are included in the report, you now go to the **Structures and Circuits** tab where you can select any number of structures (they no longer have to be a contiguous range) and which circuit labels you want to include. Any section which includes a span which has one of the selected structures as its back structure and also has a circuit label assigned that is selected will be included in the report.



Note that the first option in the circuit label list is "Unassigned". Use this option to include all sections which have no circuit label assigned to them, or deselect it if you do not want to include sections which do not have circuit labels assigned.

In the **Stringing Data** tab, the set selection list is still available to support projects which are not using circuit labels. If you are using circuit labels, it is best to leave all sets selected in this list. Any set not selected will not be included in the report regardless of the circuit label assigned and the circuit selections.

In the report the circuit labels are included, if assigned, for each section. In addition, the phase labels are included for each row in the Stringing Chart Summary.

Lines/Reports/Survey Point Clearances...

This dialog is now divided into three tabs. All of the old content is available in either the **Points and Clearances** tab or the **Report and Markers** tab. The **Structures and Circuits** tab functions the same as described above for **Sections/Stringing Chart/Multiple Sections...**

The screenshot shows the 'Survey Point Clearances Report' dialog box with three tabs: 'Points and Clearances' (selected), 'Structures and Circuits', and 'Report and Markers'. The 'Points and Clearances' tab contains the following sections:

- Points to be Considered**
 - Feature codes to include: All feature codes...
 - Horizontal distance from wire beyond which survey points and centerline points should be ignored (ft) 89
 - Station interval for clearance check to interpolated points on centerline ground (0 to disable) (ft) 0
 - Station and offset interval at which to check clearance to TIN (0 to disable) (ft) 0
 - Maximum offset from wire for checking clearance to TIN (0 to limit check to directly below wire) (ft) 0
 - Warning: non zero values can greatly increase run time.
- Wind, Ice and Required Clearance Options**
 - Clearances checked for weather cases in Criteria/Survey Point Clearances (button: Edit Survey Point Clearance Criteria)
 - Required horizontal and vertical clearances are defined in the feature code table (button: Edit Feature Code Table)
 - (button: Edit Feature Code for Ground or TIN)
 - ☐ Add optional concentrated load or ice to the span under consideration
- Type of clearance requirement**
 - ☒ Rectangular: Must violate both horizontal and vertical clearance requirements (from feature code table) to be a violation
 - ☐ Radial: Is violation if total distance to wire is less than 'Req. Vert. Clear' from the feature code table.

At the bottom right are 'OK' and 'Cancel' buttons.

Note that the 'Feature codes to include' button now defaults to include 'All feature codes' instead of none so if you forget to check it, you will likely still get some results instead of none.

The clearances are only evaluated for the selected sections, so if you have a double circuit span, you can now easily evaluate the clearances for each circuit separately by running this report twice: first selecting one circuit and the next time running with the other circuit.

Lines/Reports/Danger Tree Locator...

This command used to consist of a sequence of dialogs which have now all been combined into a single tabbed dialog. The **Vegetation Check** tab is for specifying which checks to perform and the criteria to check. The **Structures and Circuits** tab replaces the structure range selection and functions the same as described above for **Sections/Stringing Chart/Multiple Sections...** The **Report and Markers** tab is for specifying how to report and display results. The **Work Site** tab is where the work site feature can be enabled and configured.

The screenshot shows the 'Danger Tree Locator' dialog box with the 'Vegetation Check' tab selected. The dialog has four tabs: 'Vegetation Check', 'Structures and Circuits', 'Report and Markers', and 'Work Site'. The 'Vegetation Check' tab contains the following sections:

- Grow-In**:
 - ☒ Check vegetation grow-in (violations displayed with square markers). A color picker for 'Color for grow-in violation marker' is set to red.
 - Type of clearance requirement for Grow-In violations:
 - ☐ Rectangular: Must violate both horizontal and vertical clearance requirements to be a violation
 - ☒ Radial: Is violation if total distance to wire is less than 'Req. Vert. Clear' from the feature code table.
 - Required horizontal and vertical or radial clearances are specified in the feature code table (edit using button at bottom of dialog). Required clearances should include grow-in allowances PLUS required electrical clearances.
- Falling Tree**:
 - ☒ Check clearance to falling trees (violations displayed with circular markers). A color picker for 'Color for falling tree marker' is set to blue.
 - Tree base assumed to have same X and Y as tree point with Z derived from TIN or closest ground point. Tree pivots about root ball edge which is the tree base shifted horizontally towards the wire by the root ball radius.
 - Violations are indicated when the arc swept by the falling tree contacts a wire.
 - Root ball radius (% of tree height): 10
 - Clearance allowance (growth allowance PLUS electrical clearance): (ft) 10
 - Tree height is based on height above ground. Ground elevation is computed from TIN. If tree is off edge of TIN then ground elevation is that of the closest ground XYZ point within the maximum horizontal distance below.
 - If program can't get ground elevation from TIN or closest ground point then falling tree will be reported as a questionable violation ('??') and marked with the color to the right. A color picker for 'Color for falling tree with unknown ground' is set to yellow.
 - Maximum horizontal distance between tree base and ground point for ground interpolation: (ft) 10
- Vegetation Feature Codes**:
 - Vegetation feature codes (other codes ignored): 9999...
 - Buttons: 'Edit Feature Code Table (required clearances)' and 'Edit Criteria (weather cases considered)'.
 - Horizontal distance from wire beyond which points should be ignored: (ft) 25
 - Note: This command will consider all points within specified horizontal distance to wires. Points no longer need to be within the maximum profile offset defined in Terrain/Terrain Widths to be considered.
 - ☐ Add optional concentrated load or ice to the span under consideration

At the bottom right are 'OK' and 'Cancel' buttons.

Note that in the **Vegetation Analysis Report** there are new hidden columns (which can be displayed by customizing the report) for the circuit and phase labels for both Grow-In and Falling Tree Closest Wires.

Lines/Reports/Section Sag-Tension Report...

This dialog is now tabbed with an additional Structures and Circuits tab which functions the same as described above for **Sections/Stringing Chart/Multiple Sections...**

Span Range for Section Sag-Tension

Section Sag-Tension | Structures and Circuits

Select structures and circuits in the other tab to determine which sections are included in the report.

Report Type

- ☒ Separate report for each section
- ☐ Single report with separate row for each span of each section

Sag-Tension Type

Note: Selection below is saved in CRI file and will determine if you get RS or FE sag-tension results for sag-tension reports exported to XML.

- ☒ Ruling Span (single horiz. tension applies throughout all spans in section)
- ☐ Finite Element (horiz. tension can vary from one span to next)

OK Cancel

Lines/Reports/Thermal Rating Report...

This dialog is now tabbed with an additional Structures and Circuits tab which functions the same as described above for **Sections/Stringing Chart/Multiple Sections...** In addition to selecting by circuit label, you can also select specific phase labels to include or exclude. Note that both the circuit label and the phase label need to be selected for the wire to be included in the report.

The screenshot shows the 'Thermal Rating Report' dialog box with the 'Structures and Circuits' tab selected. The dialog is divided into several sections:

- Thermal Rating Options**: A sub-tab at the top left.
- Options**: A list of checkboxes for various settings:
 - ☒ Check vertical clearances to survey points
 - ☒ Check vertical clearances to TIN when available, otherwise to profile constructed under wire
 - ☒ Draw markers at locations that controlled rating
 - ☒ Draw markers at locations where clearances checked
 - Blue 'x' for survey points
 - Purple 'x' for ground level interpolated from TIN
 - Yellow 'x' for ground elev. interpolated from survey points
 - ☒ Erase existing markers
 - ☐ Save rated temperature in structure comment for use elsewhere
- Set and Temperature Range**:
 - Select structures and circuits in the other tab. (List of sets: Set 53, Set 54, Set 55, Set 56, Set 57, Set 58, Set 59, Set 60)
 - Condition: Creep RS (dropdown)
 - Select desired attachment sets and phases to the right. (List of phases: Phase 1, Phase 2, Phase 3)
 - Minimum wire temperature to consider (deg F): 32.00
 - Maximum wire temperature to consider (deg F): 500.00
- Feature Codes for Survey Point Checks**:
 - List of feature codes to consider: All feature codes...
- Maximum Offset for Survey Points and TIN Model**:
 - Maximum offset from wire for survey points and TIN model. Entities outside this offset will be ignored. (ft) 10
 - Note: Normal centerline clearances may not be checked in this report.
- Profile under wire- Only used when can't get elevations under wire from TIN model**:
 - If the program is unable to determine the ground elevation below a wire from the TIN model then it will try to construct a profile below the wire. This profile consists of line segments created by connecting survey points with known ground elevations within a specified offset of the wire in order of increasing station. A maximum segment length field is provided to prevent interpolation between points which are too far apart.
 - Maximum offset from wire for ground points to be included in profile below wire (ft) 3
 - Maximum length of line segment for inclusion in profile below wire (ft) 30
- Display of Cross Section and Profile Images in Report**:
 - ☐ Do not display for any spans
 - ☐ Display only for spans with rating below Max. wire temperature (memory intensive)
 - ☒ Display for all spans (very memory intensive)
 - Profile: 600 x 400 pixels. Color
 - Cross Section: 300 x 400 pixels. Color
- Sort Results by**:
 - ☒ Temperature
 - ☐ Critical Station

At the bottom right are 'OK' and 'Cancel' buttons.

Note that the Set and Phase selection lists in the **Thermal Rating Options** tab are still there to support projects which are not using circuit labels. If you are using circuit labels, you should leave all

sets and phases selected in these lists. Any set or phase numbers not selected will not be included regardless of what labels they are assigned.

The circuit and phase labels are included in each row of both the **Thermal Rating Summary** and the **Thermal Rating Detail**.

Persistent Selections

Note that the **Structures and Circuits** tabs used in most of these reports remember the selections you have made. So the selections you have made for one report will be the defaults for the other reports as well. These selections will be forgotten when you close the project. The next time you open this or another project the initial selections will include everything.

Plan & Profile Drawing Sheets

The Sheets View has also been updated to support circuit and phase labels. As described in **How to Hide Circuits** in the **Display Options** section above, you can selectively show or hide sections based on their assigned circuit label. In addition there are a couple more options for the sheet profile view.

Drafting/Structure and Section Labeling/Sheet Profile View...

The **Section Labels** tab now has an additional option to include the circuit label for the text describing each section. If selected, the label will be added to beginning of the line for sections with circuits assigned. The **Wire Labels** tab also has the same addition described above for **Drafting/Structure and Section Labeling/Profile View...** which allows you to display the circuit and phase labels assigned for each wire in the sheet's profile view.

P&P Sheet Profile View Labels

Structure Labels **Section Labels** Wire Labels Span Length Inset Views

☒ One block of horizontal section labels per P&P sheet.
☐ One block of vertical section labels per P&P sheet
☐ Horizontal section label at mid point of each section

Section Label Block Position

Horiz. position as % of page width
 Vertical position as % of page height

☒ Do not display duplicate information

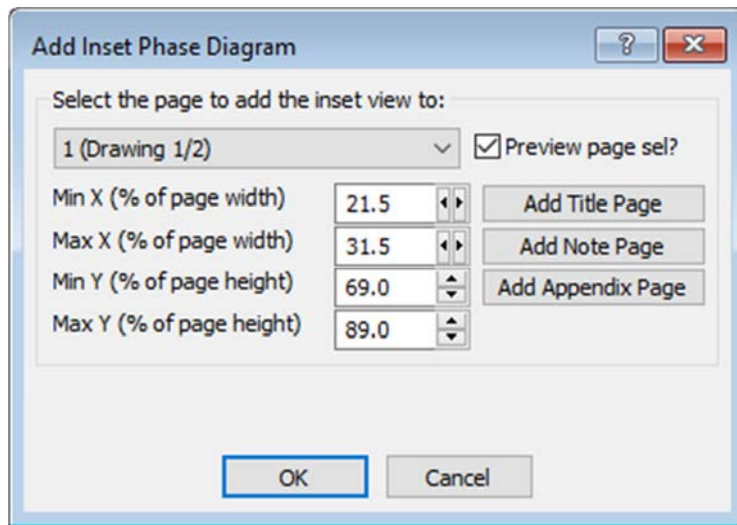
Labels to Display

☒ Structure range
☒ Circuit label
☒ Voltage
☒ Cable file name
☐ Cable file description
☒ Ruling span
☐ Number of phases and wires in bundle
☐ Design tension
☒ Displayed weather case, condition and tension
☒ Legend showing line color and style
☐ Section notes

OK Cancel Apply

Phasing Diagrams

This is a new type of inset view that can be added to your Sheets View. It is a cross-sectional view of a particular structure in the line with phase labels for each attachment. There are two ways to create this view. The first way is to snap the cursor to a structure in any view, left click, and select **Add Phasing Diagram for Structure** from the context menu. The other way is to use the **Drafting/Inset Views/Add/Inset Phasing Diagram...** command and then select one of the structures from the list.



With either method, you will then be shown the dialog for positioning the inset view on a sheet page. This dialog functions the same as it does for other inset views. It will default the inset view's position to be under the structure in the profile portion of the sheet where the structure is located. Once you click OK on the **Add Inset Phase Diagram** dialog, the view will be created and you will see the Sheet Inset Plan View dialog. The Phasing Diagram is a specific configuration of Inset Plan View with one new option. The new option is **Cable Attachment Label**.

Name	1
Sheet Page Number	1 (Drawing 1/2)
Inset View Xmin % Page Width	21.500
Inset View Ymin % Page Height	69.000
Inset View Xmax % Page Width	31.500
Inset View Ymax % Page Height	89.000
Draw Order	4
Inset View Annotations	
X (ft)	801.709
Y (ft)	
Z (ft)	1573.758
Depth Of Field Limit (ft)	30.800
Longitude (deg)	-90
Latitude (deg)	
Scale (ft/in)	37.5
Note	
Show Structure Geometry	Yes
Cable Attachment Label	Phase ▾
Show Wires	None
Show Guy Anchors	Circuit
Show Structure Annotation	Phase
Show DXF and Shape- files	Both
Show Attached Images	No
Show TIN	No
Show Survey Point Symbols	Yes
Draw Inset View Border	No
Draw Inset View Name	Yes
Transparent Background	No
Show PI Labels	No
Show Structure Labels	No
Show Plan Annotation	Yes
Automatic Longitude Rotation	No
Index Map	No
Draw North Arrow	NA
Show Scale	NA

OK

Cancel

Apply

This option allows you to select if you want attachments on the structure described with their circuit label, phase label, or both. The default for views created with these commands is to use the phase label.

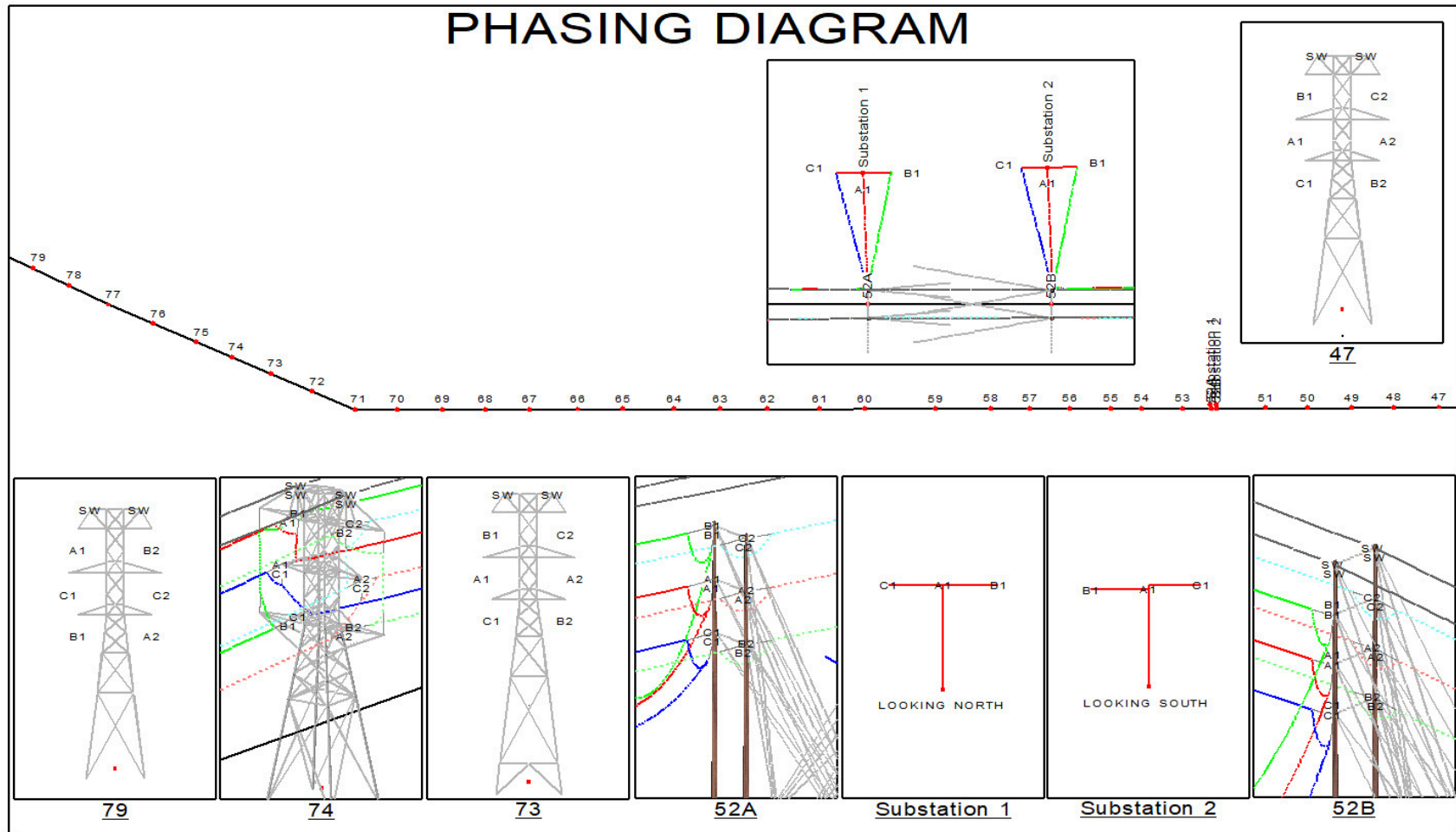
These views are inset plan views where PLS-CADD has automatically configured them to be a cross-sectional view centered on the structure with an appropriate scale and depth of field to show the entire structure. You can manipulate these views just like any other inset plan view including adjusting the scale, location, or viewing angle. Note that if you select 'Yes' for **Show Wires**, the insulators and jumpers will be drawn, but they won't be if you select 'No' for that option.

There is an additional new command that can be very useful for these (or any other) inset views. That command is **Drafting/Inset Views/Pan, Rotate, or Zoom Inset View** (also available in the context menu if you are snapping to an inset view). With this command you can use the <Shift> key to pan the view, the <Control> key to rotate the view, and the scroll wheel to zoom in or out just the way those options function with the 3D View window. When applied to inset views, these functions update the **X, Y, Z, Longitude, Latitude, and Scale** fields of the inset view.

Note that depending on how you manipulate the inset view after it is created, the **Depth of Field** that was first calculated for the original cross-section orientation may not be large enough to show all of the structure. If it appears part of the structure is being cut off, you may need to increase the **Depth of Field**.

See the next page for an example phasing diagram that can be seen in the example file that ships with the software, wpl_demo.xyz.

PHASING DIAGRAM



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C:\Users\Public\Documents\PLS\PLS_CADD\EXAMPLES\PROJECTS\WPL_DEMO

A 57/27/14 Updated Project to Illustrate WMS Imagery Capabilities

POWER LINE
SYSTEMS, INC.
O.J.L. PLS-CADD
O.J.L. 07/27/91

Plymouth to Sheboygan
138 kV Transmission Line
Modeled using PLS-CADD
Demonstration Model

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