

Building Your Array Tree in the Array Navigator

The Solmetric PV Analyzer is widely used to commission and maintain commercial/industrial and utility PV systems. It is optimized to measure a large number of strings per hour, and one of the features that makes this possible is the ability to save your measurements by just touching the string under test in the 'array tree'. The array tree pictures all of the levels of the PV system, allowing the user to confidently navigate to a particular circuit. The array tree is constructed using the Array Navigator feature during setup of the software, prior to going onsite to do the measurements.

Large PV plants typically have more 'layers' of hardware than small PV systems. For example, a residential system may have just strings and an inverter, but a utility plant may have blocks, skids, inverters, re-combiners, combiners, harnesses, and strings. To unambiguously locate every circuit in the system, you want your array tree to display the same layers *and the same layer names* as the one-line drawing.

Version 3.7 of the PVA software expands the capabilities of the Array Navigator, allowing the user to create array trees with more layers and with custom layer names. An example is shown in Figure 1.

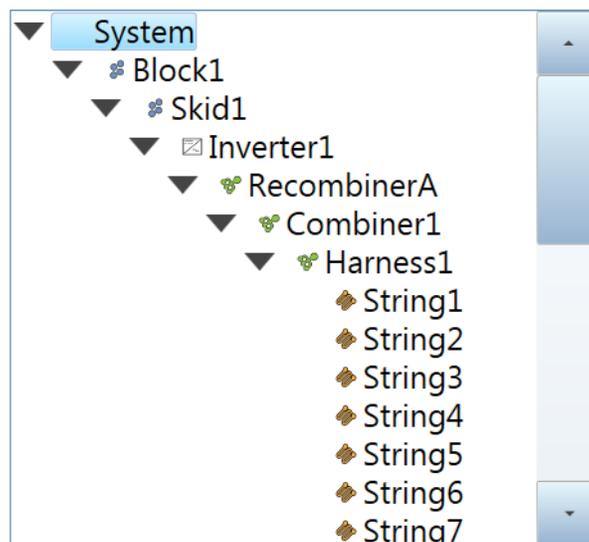


Figure 1. Array tree of a utility PV plant.

When the measurements are complete and the data is exported for analysis, the location of each measurement is saved along with the data, allowing the final report to list exactly where each I-V curve was measured.

The process of building your array tree is simple. When the New Project Wizard comes to the step of creating your array tree, the screen shown in Figure 2 appears.

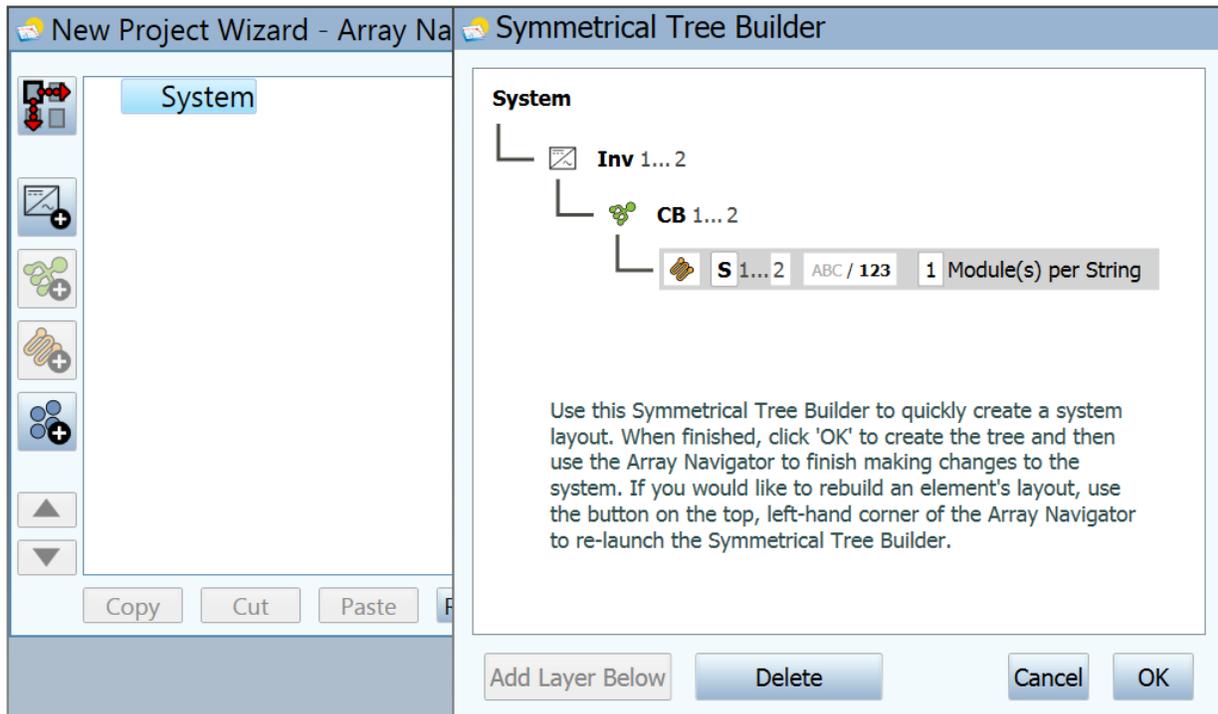


Figure 2. Using the Symmetrical Tree Builder you can create a tree with as many layers as needed, and name them to match the one-line drawing. Once the basic tree is created, the symmetrical tree builder is closed and the tree can be modified as needed in the Array Navigator screen.

The first step is to create a tree that represents the ‘symmetrical’ part of your system. To take a simple example, a symmetrical system is one where each inverter has the same number of combiners, which in turn have the same number of strings, which in turn have the same number of modules. It’s the symmetrical part of your system that you want to describe in the Symmetrical Tree Builder. Many large PV plants are entirely symmetrical.

You add layers to the tree by just highlighting the next highest layer and clicking Add Layer Below. In each layer there are editable fields (see the white windows) to customize the type of layer and enter names and numbers. A layer can be an inverter, a group, a combiner, or a string. Add a ‘combiner’ layer to represent anything that combines electrical circuits (re-combiner, combiner, or harness). Add a ‘group’ layer to represent other organizational levels: blocks, parking lots, skids, pads, tracking motor groups, and so on.

After closing the Symmetrical Tree Builder, you can use the editing features of the Array Navigator to add or delete items, copy and paste, move up and down, and so on. Often a project includes a smaller PV system to use up remaining space, and you can add easily build that system in Array Navigator.

Example – Bipolar System

In a bipolar system, the inverter sees twice the voltage of the circuits outside of the inverter itself. This allows for more efficient inverter design while maintaining a relatively low voltage externally. Figure 3 shows a basic system diagram.

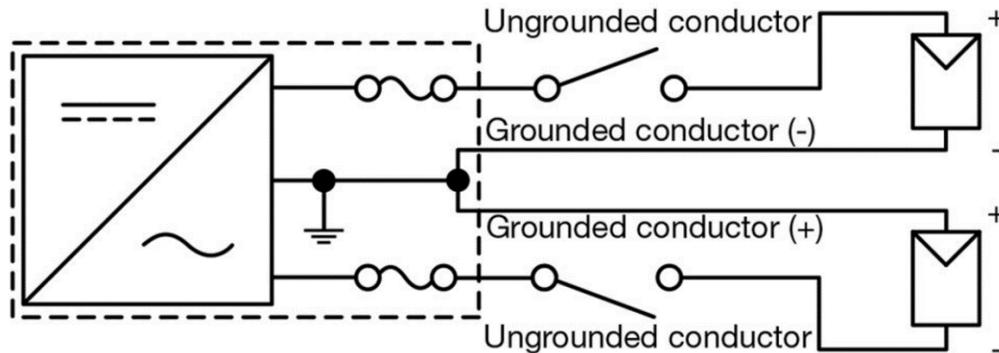


Figure 3. Simplified schematic for a 4-wire bipolar PV system, which consists of a negatively grounded monopole subarray (top) and a positively grounded monopole subarray (bottom). Courtesy SolarPro magazine, August/September 2013, issue SP6.5.

Strings in a bipolar system can be tested between the outer poles, or between each outer pole and the grounded conductor (half the voltage). If the open circuit voltage between the outer poles of the strings is lower than the maximum dc voltage of the I-V curve tracer, you can measure them pole to pole. However, if your curve tracer limits you to one monopole at a time, or if you just want better resolution to see performance issues in the monopoles, then you should measure the monopoles separately. Of course this doubles the measurement time. The rest of this discussion focuses on measuring the monopoles.

The difference between building an array tree for a normal PV system and a bipolar system (assuming testing of monopoles) is that you'll need to provide locations for conveniently saving the positive and negative monopole measurements. The simplest way to do this is to nest two combiners in the tree. The upper combiner represents the combiner box. The lower combiner is renamed "String", and you will set up two strings beneath each "String" (combiner) to represent the positive and negative monopoles. A simple array tree of this type is shown in Figure 4.

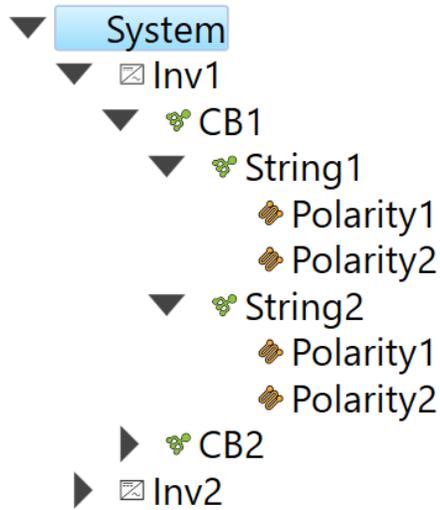


Figure 4. Simple array tree showing the use of a second combiner box level to contain the measurements of positive and negative monopoles.

Building an array tree for harnessed arrays

See the separate application note [Measuring I-V Curves of Harnessed Strings](#)

Software updates

The PVA software is updated from time to time. Always check for new updates at www.Solmetric.com, in the Downloads page under the Support tab. **This is the only way to find out if there is an available software update.** To see which software version you are currently running, start the PVA software and click the Help tab and then About. The version will have the format x.x.xxxx.