Solis UL 3741 Installation Requirements for Residential Inverters

The Solis UL 3741 system is composed of an inverter, a PLC signal transmitter, rapid shutdown devices, PV modules, and PV racking. Please see the Solis Compatibility Sheet for model number specifics. This document is a guide for how to properly install a UL 3741-compliant system.

UL 3741 allows the voltages within the array boundary to be up to 600V maximum. The **PV array boundary** is defined as no more than 1 foot from the edge of the PV modules and racking. The array-level (or string-level) PV isolation switch is a PLC signal receiver that initiates rapid shutdown once it stops receiving the heartbeat signal from the PLC signal transmitter inside of the inverter. This ensures the voltages outside of the array boundaries are within 30VDC or less in 30 seconds once rapid shutdown has been initiated.

A **contiguous array** can have 1 or more PV strings, but they must all be contained within the same PV array boundary. In Example 1 below, there is a single contiguous array with two strings. This array will require two RSD devices.

Contiguous Arrays

Maximum Voltages After Rapid Shutdown Initiation:
Outside Array Boundary: ≤ 30V (30 seconds)
Inside Array Boundary: ≤ 600V

Where one or more PV strings are connected within a single contiguous array RSD devices shall be installed as follows:

1. One RSD device per PV array regardless of the number of PV modules in the array.

2. If the array consists of a single string, then one RSD device will be installed in it.

3. If there are multiple strings, then each string will get one RSD device.

The transmitter is integrated into the inverter wire box.

Example 1: Contiguous Arrays (strings are within the same PV array boundary)

A **non-contiguous array** has physical separations between PV modules greater than 2 feet. When the gap between PV modules is greater than 2 feet, one RSD device must be installed for each PV array regardless of the number of PV modules. If the inverter has multiple MPPTs, the number of PV modules per PV string can vary up to 600V max.

The PV string must have no more or less than one RSD device. Each PV array will have a minimum of one RSD device. In Example 2 shown below, Roofs 1 and 2 are non-contiguous arrays. They each have one PV array consisting of one string. Therefore, the two roofs will each have one RSD device. The larger roof 3 is a contiguous array consisting of two strings. That means one RSD device will need to be installed for each of the two strings within the array.
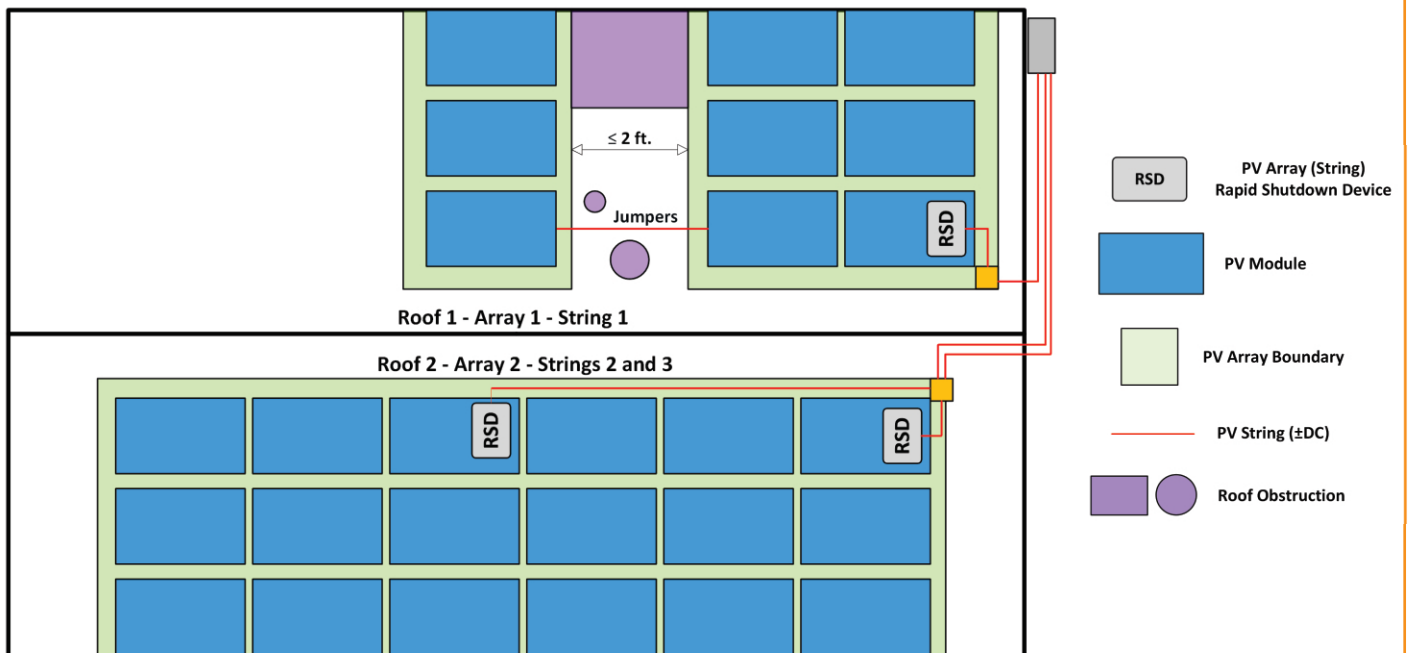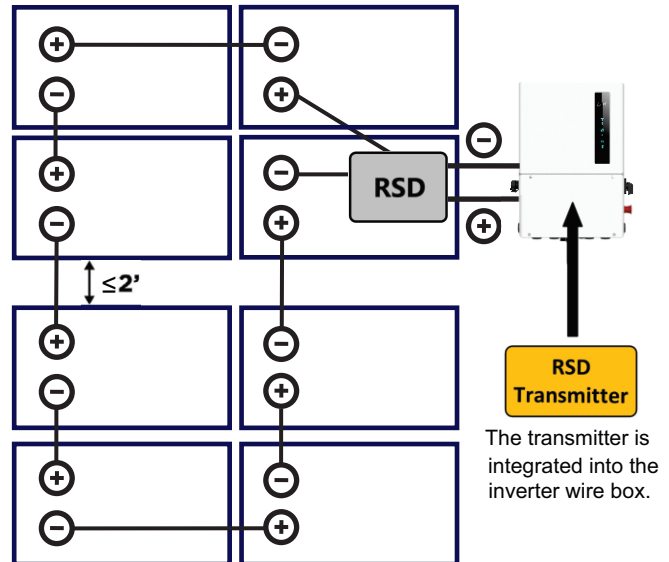
Non-Contiguous Arrays

Maximum voltages after initiation of RSD:
Outside Array Boundary: ≤ 30V (30 seconds)
Inside Array Boundary: ≤ 600V

Where any PV array is separated by more than 2 feet, RSD devices shall be installed as follows:

1. One RSD device per array regardless of the number of PV modules in the array.

2. If a single string is split going to be split into arrays separated by more than 2 feet, then each array must have at least one RSD device.

3. If the arrays consist of multiple strings, then the system will have as many RSD devices as there are strings. One device per string.

The transmitter is integrated into the inverter wire box.
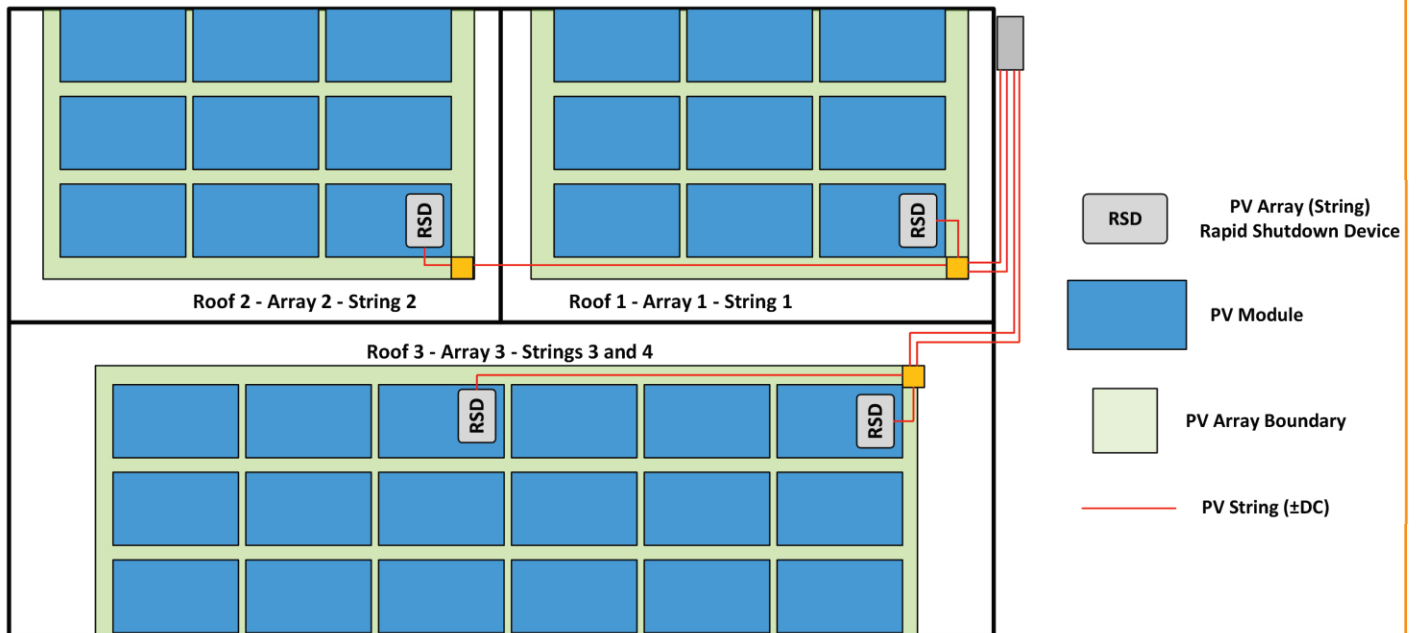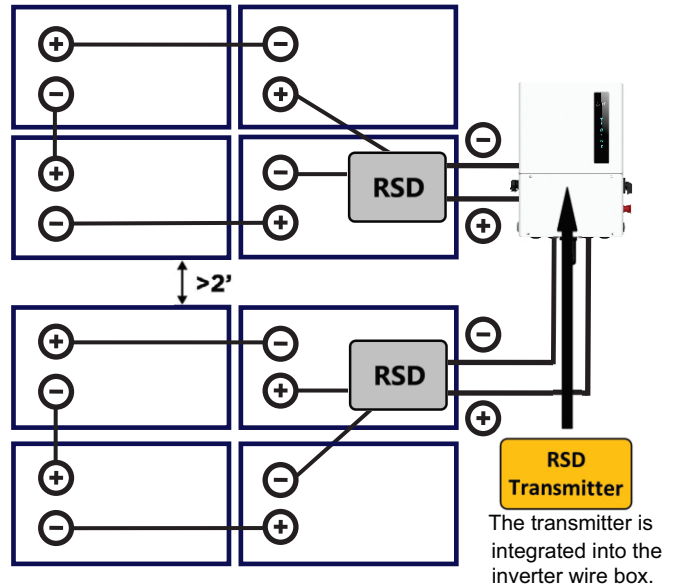
Example 2: Non-Contiguous Arrays (> 2 ft separation between PV arrays and strings)

A **non-contiguous sub-array** is when a single PV string is split up into two or more arrays *and* the gaps between the array and sub-array are less than or equal to 2 feet. This allows a single RSD device to be used for both the array and the sub-array, provided that they consist of a single string.

In Example 3 below, Roof 1 has an array with a sub-array that is only one string. The gap in this case was due to there being multiple obstructions on the roof. However, because the gap is 2 feet or less, one RSD device could be installed for both the main array and the sub-array. Standard jumpers could be used to connect the sub-array. If the gap were greater than 2 feet, the array of three modules would need to become a separate string with a separate RSD device.

Non-Contiguous Sub-Arrays

Maximum voltages after initiation of RSD:
Outside Array Boundary: ≤ 30V (30 seconds)
Inside Array Boundary: ≤ 600V

Where any array is separated by less than or equal to 2 feet shall be installed as follows:

1. One RSD device per PV array regardless of the number of PV modules in the array.

2. If the sub-array and the main array make up a single string, then one RSD device must be installed for the main array and sub-array. See Example 3 below.

3. If the sub-array completes a string with the main array and consists of additional strings, then RSD devices must be installed for each of the other strings in the sub-array.

RSD Transmitter

The transmitter is integrated into the inverter wire box.

Example 3: Non-Contiguous Sub-Arrays (≤ 2 ft. separation between PV arrays same string)

The RSD device has a set of positive and negative whips that connect to the PV string. It has a second set of whips that connect to the inverter. Connect the modules together in a string, then connect the positive and negative ends of the string to the RSD device. Run positive and negative leads from the inverter to the RSD and connect them to the string inputs of the RSD device. The inverter comes with a PLC signal-generating transmitter integrated into the wire box. This transmitter core induces a PLC signal on the positive PV string leads. The signal travels to the RSD devices in the array(s) which turns the devices on. When RSD is initiated, the transmitter loses power. The PLC signal stops causing the RSD devices to shut off. The DC voltage outside of the PV array boundaries will be 30VDC or less within 30 seconds of initiating rapid shutdown. The voltage inside of the PV array boundaries will be a maximum of 600VDC.
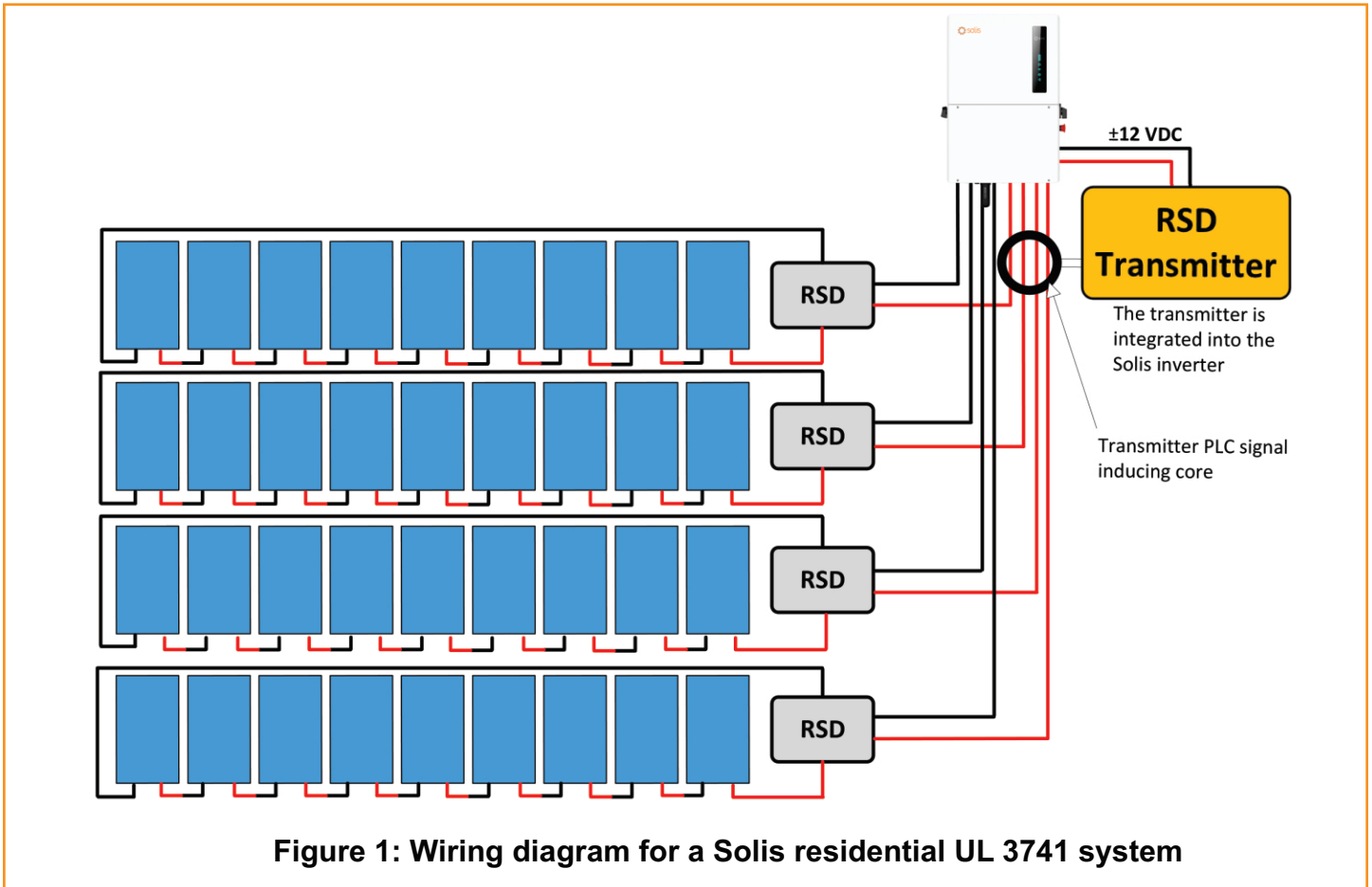

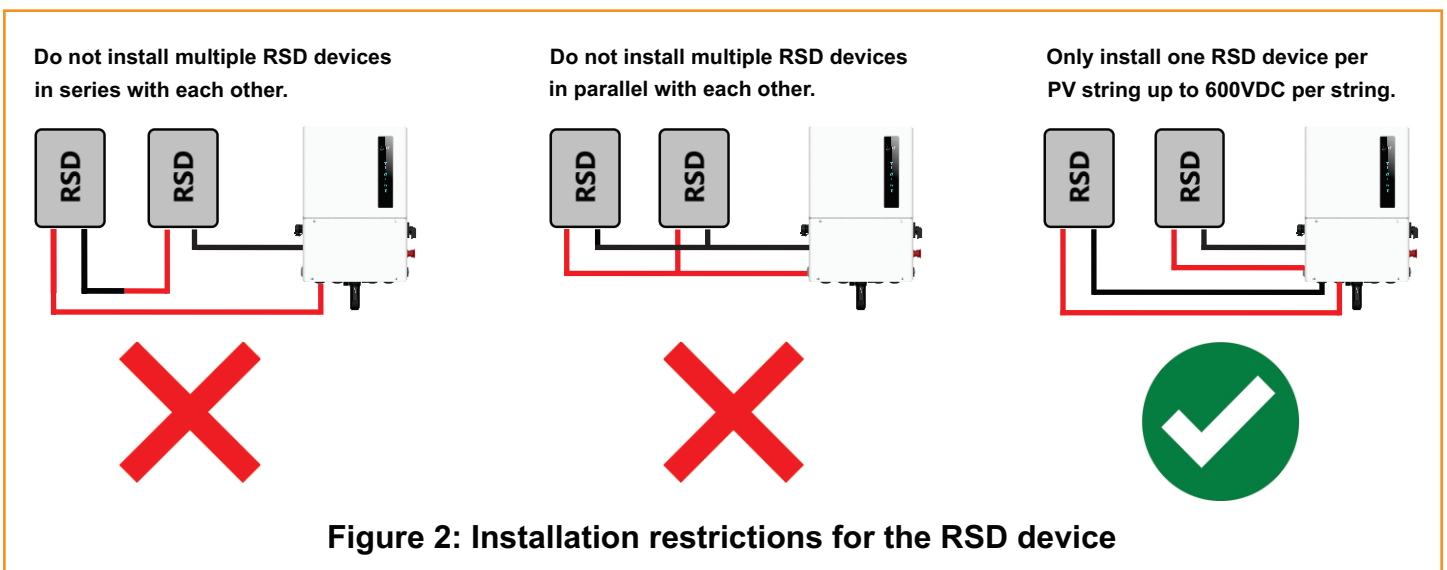**Figure 1: Wiring diagram for a Solis residential UL 3741 system**

Figure 2: Installation restrictions for the RSD device