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EPISODE 55

Using the piecewise method to check the PV string ground point

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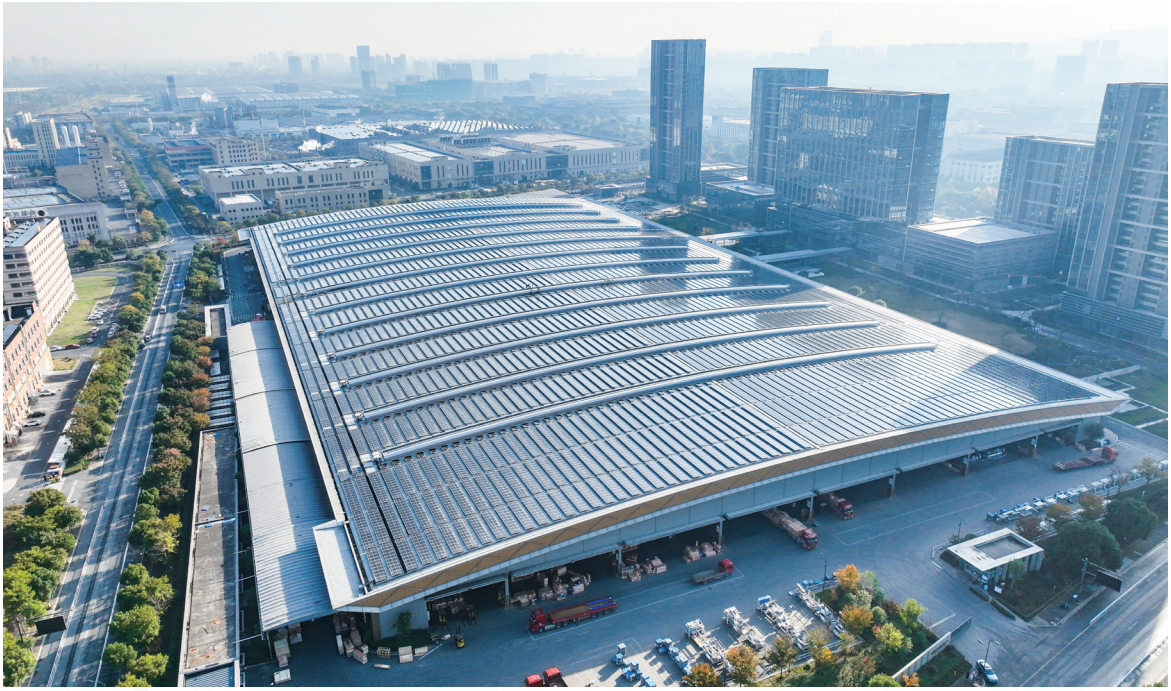
>> Background

As the running time of PV plants increase, the DC line slowly ages, and the waterproof performance of the DC terminal (MC4 terminal) deteriorates. As a result, the insulation impedance of the DC line is too low, or the positive and negative terminals are short circuited to the ground. Either way, major failures may occur, affecting the generation of electricity. It may be difficult for inexperienced power plant O&M personnel to exclude grounding PV string or to find the point of grounding PV string. This Solis seminar will share a method of locating ground fault points to improve troubleshooting speed and cut down on manpower.



Troubleshooting

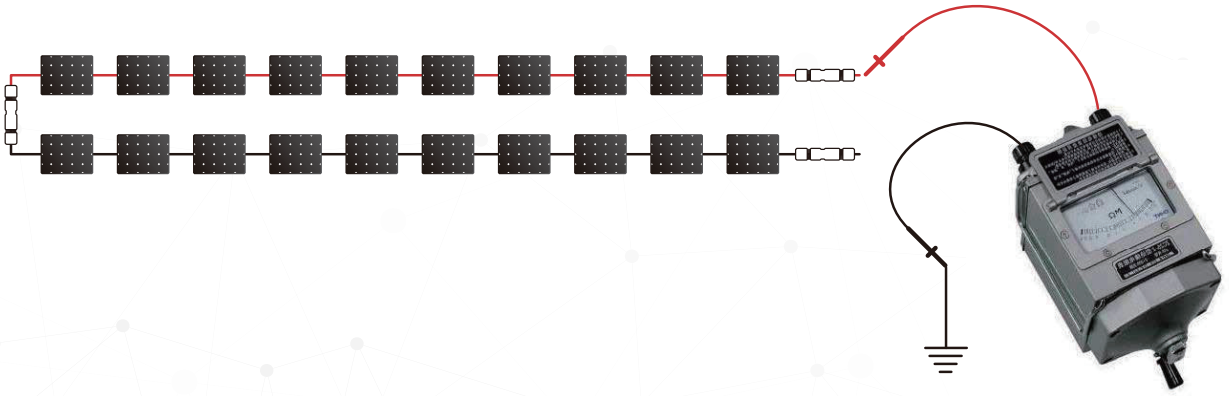
Disconnect the DC switch of each PV string connected to the inverter. After 10 minutes, remove each PV string from the inverter and use a multi-meter to measure the voltage of the PV+ to ground and PV- to ground of each string. This will identify which string has the ground fault.

Under normal circumstances, the absolute value of the voltage to ground at the positive or negative terminals should be between 100 ~ 1000 V, gradually dropping within 20V of the measurement.

If the string voltage of the PV+/PV- terminal to ground is unbalanced, it can be determined that the PV string has a ground fault. For example, the voltage of one polarity to ground is 0 V or close to 0 V, and the other polarity to ground voltage exceeds 600 V without any change in value.

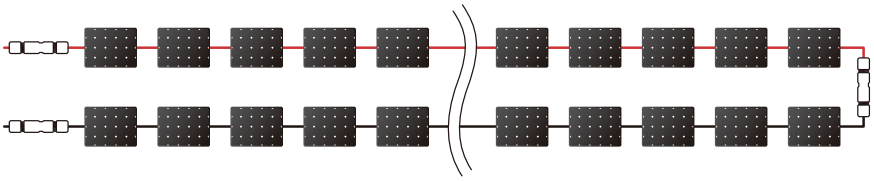
You will then need to focus on troubleshooting the identified faulty PV string to determine the precise faulty node.

In addition, a meg-ohmmeter can be used to measure the insulation resistance of the PV+/PV- line ends of the module side to the ground in series. The value should be greater than 2MΩ.



Piecewise Solution

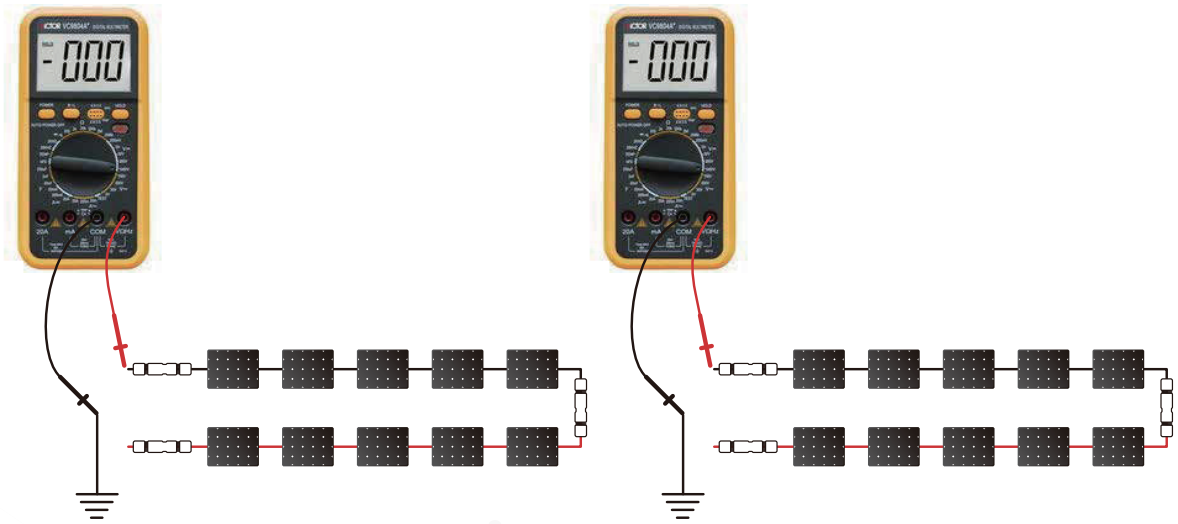
If the PV string is grounded, the grounding point must be located for insulation to rectify the fault. However, the PV string can be tens of feet long and has cable slots or buried ground, so the grounding point cannot be easily located. It is suggested to further adopt the segmented exclusion method to shorten the inspection workload and reduce the complexity.



The method is as follows:

a. Disconnect the intermediate PV model terminals of the same PV string to form two smaller PV strings.

b. Measure the PV+ and PV- of small PV string respectively. If there is a fault, then there will inevitably be abnormal PV+ or PV- voltage to ground. You can now pinpoint the fault in a smaller section of the PV string.



c. If the electrode to ground voltage of the smaller PV string side is about 0V, the ground point is near the electrode at the PV module side. If the electrode to ground voltage of the PV module side is equal to the no-load voltage, the ground point is on the DC cable;

d. If it is still difficult to find the ground point location, the search area should be further reduced according to the subsection exclusion method.