



## Surge Protective Solutions for Photovoltaic Systems

The desire to find cleaner, more cost-efficient and safer power generation alternatives has led to increased construction of photovoltaic (PV) power plants worldwide. This trend will continue and as these new PV power plants come online, operators will be faced with many unknowns including long-term system reliability and maintenance levels needed. These concerns are further intensified for plants that are located in remote, hard-to-access areas.

- Raycap's expertise in surge protective devices (SPDs) for photovoltaic power is built upon years of experience
- This experience was strengthened by the development of a photovoltaic power plant adjacent to Raycap's manufacturing facility at Drama, Greece
- In this application note, key locations and solutions for optimum protection levels and maintenance-free surge protection are discussed

A significant concern for PV power plant operators is equipment damage caused by direct or indirect lightning strikes. Damage from these overvoltage events can bring a PV installation offline for days or perhaps weeks, resulting in power interruption and revenue losses. To avoid the destructive effects of lightning strikes, overvoltage protection must be installed at various locations throughout the PV facility.

Raycap is committed to developing electrical protection solutions that eliminate downtime from lightning strikes and reduce stress to PV power plants caused by overvoltage. To support this, the

company invested in its own PV power plant which was completed in March 2011 on a 34,000m<sup>2</sup> site adjacent to Raycap's manufacturing facilities in Drama. It is one of the largest installations in Northern Greece. The state-of-the-art facility is equipped with 18,200 high-efficiency thin-film solar panels and is capable of generating 1.4MW of power. Two 800kW central inverters ensure effective, reliable power distribution to the grid. The plant is expected to generate 2 Million KWh yearly, while also serving as Raycap's photovoltaic testing facility.

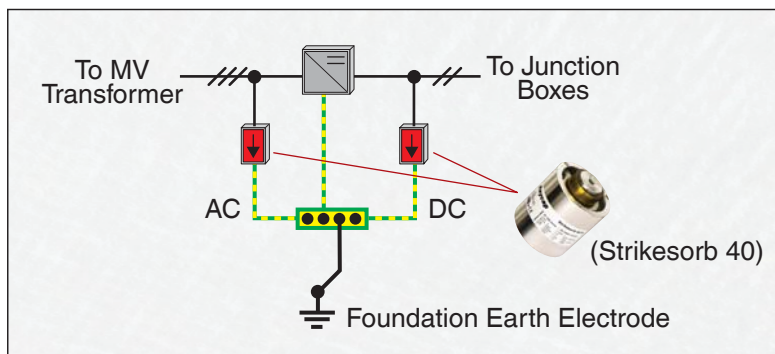
### Surge protection of power & monitoring lines

Raycap's lightning protection solutions for photovoltaic applications are based on its unique Strikesorb® SPD technology. Strikesorb SPDs provide safe, uninterrupted protection up to 200kA per module without requiring maintenance, even under harsh environmental or poor power quality conditions. Strikesorb's unique characteristics include: no fuses or thermal disconnects, no parallel Metal Oxide Varistors (MOVs) or Silicon Avalanche Diodes (SADs), low clamping voltage, no aging of the device (capable of absorbing multiple lightning strikes without failing), and an industry-leading 10 year warranty.



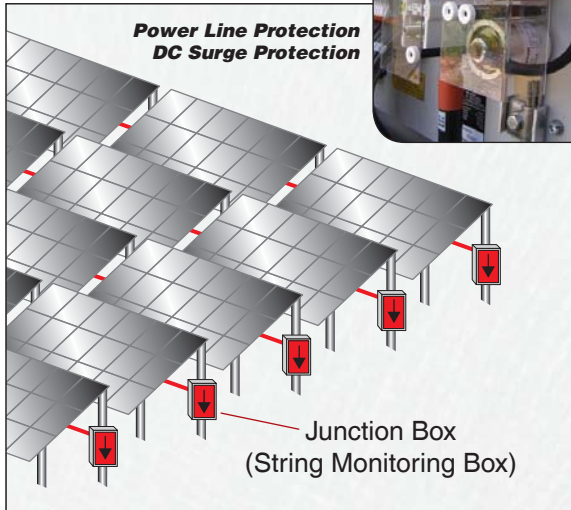
**Figure 1** illustrates the highly recommended locations for lightning protection in a PV application.

In the inverter section at the Drama PV facility, two Strikesorb 40 modules (Class I/II) are installed at +DC and -DC to ground to protect the inverter against lightning strikes that create surge currents on DC lines. Three additional Strikesorb 40 modules are installed in the AC section of the inverter to protect against surges, spikes and other overvoltage events generated on the grid.



**Figure 1:** Inverter Section - PV Park-Drama, Greece

As illustrated in **Figure 2** Strikesorb surge protection is implemented in every junction box at the Drama site to prevent damage to the PV modules during surge events.



**Figure 2: Junction box Installation**



**Dataline with the Strikesorb DRM Modules**

Intelligent string monitoring is part of every state-of-the-art photovoltaic power plant. Printed Circuit Boards (PCBs) are integrated inside the junction boxes and connected by cables directly to the inverter or a control cabinet. Two Strikesorb 30 modules are deployed in every junction box to protect the string monitoring units from the DC power supply. In addition, one Raycap ACData® TJ1010B module is used to protect the sensitive electronics equipment from surges on the

data lines. At the Drama PV park both inverters and junction boxes were designed and built by the manufacturers with Strikesorb pre-installed, so no modification was necessary in the field.

For the PV facility, Raycap designed a special purpose PV Terminal Box product to protect the monitoring section of the central inverter, and installed it near the inverter. **See Figure 3.** Inside this PV Terminal Box, ten Strikesorb 30 SPDs are used to protect several DC power supplies and five modules of Raycap's ACData TJ1010B are installed to protect the data lines.



**Figure 3: Terminal box**

### Conclusion

The system designed by Raycap in conjunction with its electrical contractor for the Raycap PV facility at Drama is a well designed and engineered solution to a problem that is of great importance to developers of photovoltaic power plants worldwide.



For more information on how to implement a similar PV protection solution, please visit [www.raycapsurgeprotection.com](http://www.raycapsurgeprotection.com)