

# SolarSCADA Pyranometer Surge Protection Device (SPD)

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The SolarSCADA Pyranometer Surge Protection Device (SPD) is a multi-purpose power isolator and RS-485 isolator/repeater. The SPD is a cost-effective solution where galvanic isolation is needed for both power and RS-485 communications. This device was designed for Pyranometers that use RS-485 communications, but it can be used wherever a powered RS-485 repeater / isolated power supply / surge arrester / galvanic isolation is required. Use examples include breaking ground loops, extending RS-485 cable to powered peripherals in noisy environments, voltage conversion for small-scale sensors, and providing general surge and galvanic isolation to otherwise unprotected communications lines.

Multiple devices can share the same home-run cable through a single SPD device, provided power capacity of the SPD (24Volts @625mA, 15 watts) is not exceeded. **The cable shields ARE NOT CONNECTED inside the SPD. When used with Pyranometers, analog output devices are NOT supported.**

SPD Specifications	
Size (inches)	7"x4"x1.5" thick box with mounting ears (outdoor) 3.5" x 4.5" Conformal-coat PCB with DIN clips (internal)
Cable	Input Cable M12-M x 0.5m, Output Cable M12-F x 1.5m (outdoor) DIN rail: Spring Cage Clamps, conductors up to 16AWG (internal)
Grounding	Attach included #12 green earth conductor to solid earth
Voltage	9-36 VDC In, 24VDC +/-2% output
Power	500mW max quiescent power, 625mA Max out @ 24VDC (15 watts)
Box Style	Potted UV-resistant plastic (outdoor) Conformal-coated PCB on DIN clips (internal)
Supported Devices	All M12x5 RS-485 Modbus™ equipped Hukseflux sensors and Any device using RS-485 and needing 24VDC power input
Cable	Hukseflux® Pyranometer pinout 5-pin M12 A-Coded (outdoor) Spring Cage Clamp (internal)
Surge Protection	Level 4(4kV), Semiconductor TVS, Bourns® TBU® Devices, and Arc Tubes
Isolation Rating	3kV input to output and all inputs to earth ground.
Communications	RS-485, Modbus™ up to 115200bps, isolated repeater built-in

A block diagram of the SPD is shown in Figure 1. The "in" side (To Data Logger / ADAS) has an isolated 9-36VDC DC to DC converter providing 24VDC to the "out" side (to Instrument). The power in includes over/under voltage protection and reverse polarity protection. Both power in and out feature series and parallel protection to dissipate surges to earth ground. The rest of the circuit is dedicated to an auto-direction sensing double-isolated RS-485 repeater between "in" and "out" sides. All signals entering and leaving the SPD device have 3-layers of surge protection: Arc tubes, Bourns® TBU™ series protection elements, and RS-485 specific Zener-based TVS protection. The SPD is designed to fail open and completely when a surge exceeds the units' capacity, giving its life to save the protected device to which it is attached.

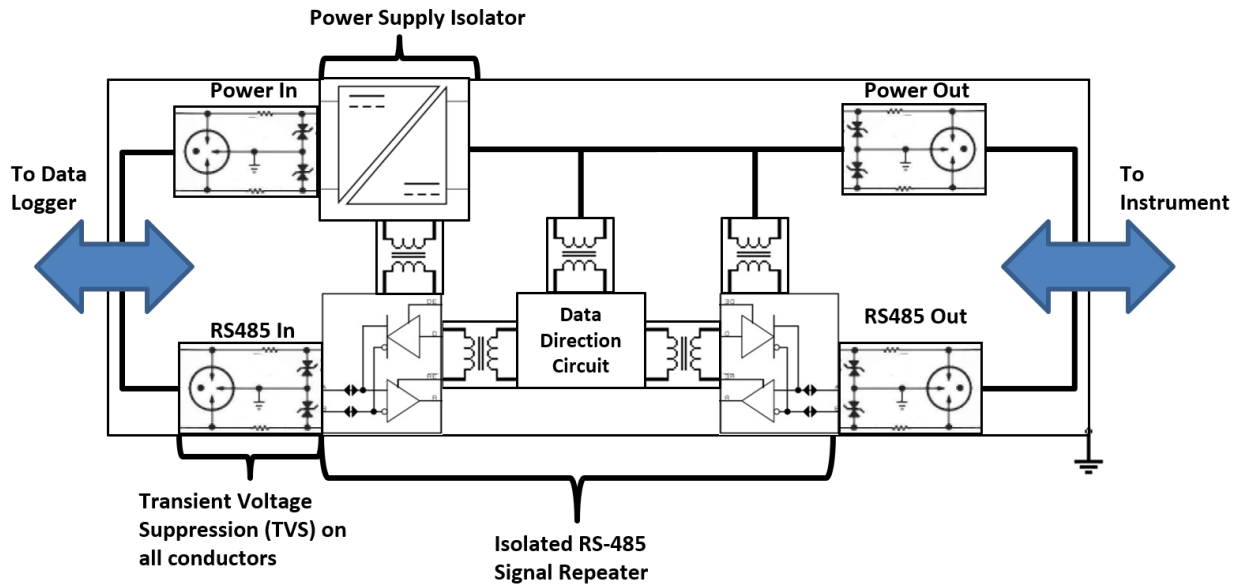


Figure 1 SPD Protection Device Block Diagram

Figure 2 illustrates common use cases for the SPD device. In all cases, a solid earth bond MUST be provided to the SPD GREEN / Ground wire, or TVS elements will not function.

**Case A** has little benefit of an SPD install as the Pyranometer ADAS panel share a common well-bonded ground.

**Case B** is appropriate for the Internal DIN-rail mount conformally coated SPD. The SPD mounts inside the ADAS panel and is internally bonded to ground. This is the default configuration for SolarSCADA™ systems. The Pyranometer and the home run floats with the field ground, and the SPD input is bonded to the main ADAS earth ground.

**Case C** is appropriate for longer runs of cable. The SPD mounts at the Pyranometer location and is attached directly to the instrument. The Ground lead is bonded to a solid earth near the mounting location. The Pyranometer is left floating. The home run cable is referenced to the main ADAS panel, and the Pyranometer floats with the SPD device in the field.

**Case D** is the “mid-span” install case. This can be used for long cables, and is the same as Case C except a cable is attached between the “out” side of the SPD and the input on the pyranometer. This provides for extra-long cable runs if needed, as both sides of the SPD have isolated RS-485 drivers. The first segment of the span is referenced to the ADAS panel ground, and the second segment is left floating with the pyranometer. If this method is used, the floating cable leg between the SPD and Pyranometer should be kept as short as required for the install.

Up to (2) SPD’s can be chained in series for a 3-segment long RS-485 line, before clock skew becomes a problem. Using the SPD in this “multi-span” configuration dramatically increases the voltage excursions possible during a transient event. If a system requires a 3,000-foot-long RS-485 cable with a single powered device at its terminus, further meditation on how to solve the problem is recommended. SolarSCADA has radio systems appropriate for such things

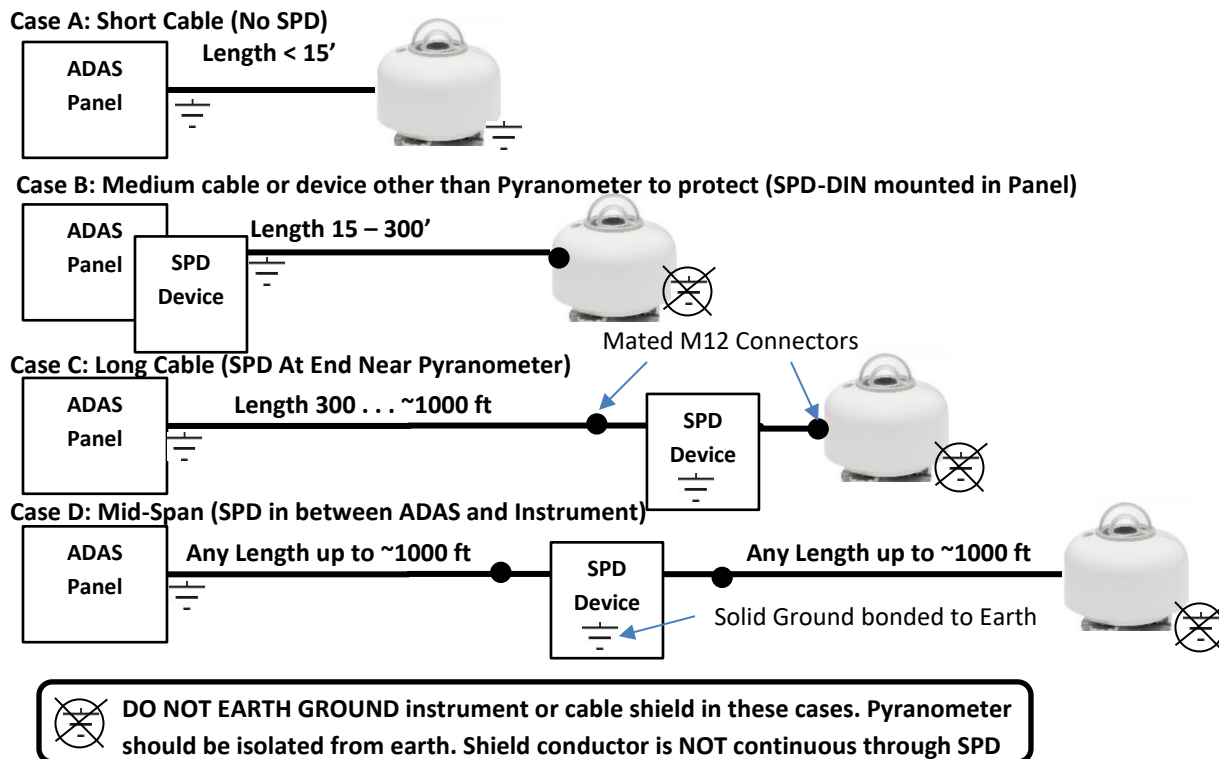


Figure 2 Standard SPD Uses Cases

#### Basic Installation:

- (1) Unplug Home Run Cable from Pyranometer
- (2) Plug Home Run Cable into SPD Input Side (M12-M Connector)
- (3) Plug SPD Output Side (M12-F Connector) into Pyranometer.
- (4) Bond the supplied 2m green grounding wire to a solid earth ground.

**THE GROUND LEAD MUST BE SOLIDALY BONDED TO EARTH GROUND FOR TVS PROTECTION.**

- (5) Verify that the pyranometer data is operational.
- (6) Mount the SPD using the attached U-Bolt devices to a spot ideally out of direct sun exposure.