NRG SP100
INSTRUCTIONS

NRG Systems®

support@nrgsystems.com
+1 802 482 2255

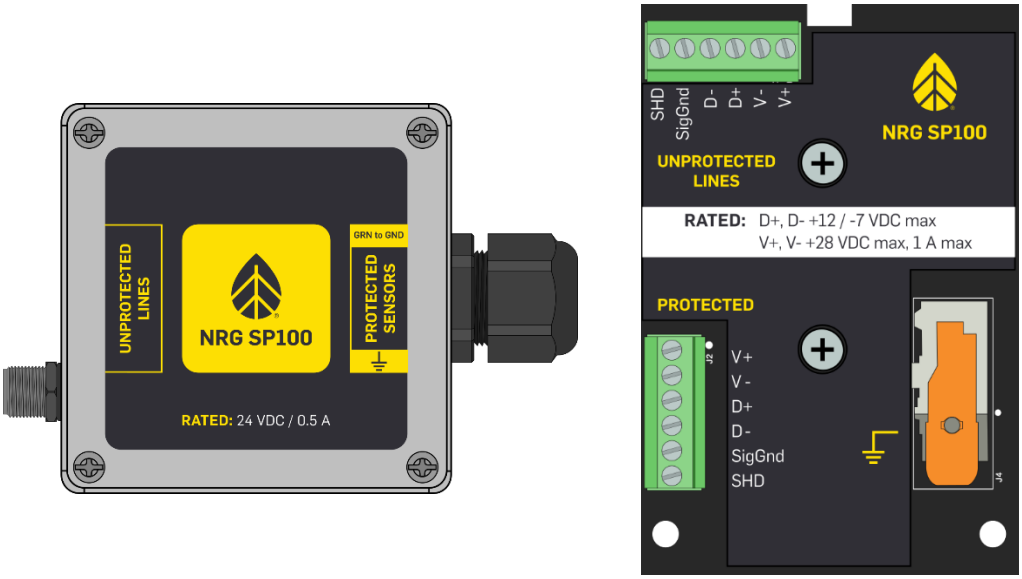
CONTENTS

Introduction

The NRG Systems SP100 is a surge protection device used to protect equipment installed in utility scale solar applications which are at increased risk of electrostatic discharge (ESD) events such as lightning. It is particularly applicable for use with array-mounted sensors separated from the meteorological station.

The SP100 system includes **two** devices to protect array mounted sensors (Array-Side SP100, item # 20304) and the logger (LOGR-Side SP100, item # 20325 OR SymphoniePRO-Side SP100, item # 20442) from surge events. Each device is grounded locally and is connected via a “home run cable.” This is the cable traditionally used to connect the sensor directly to a logger COM port.

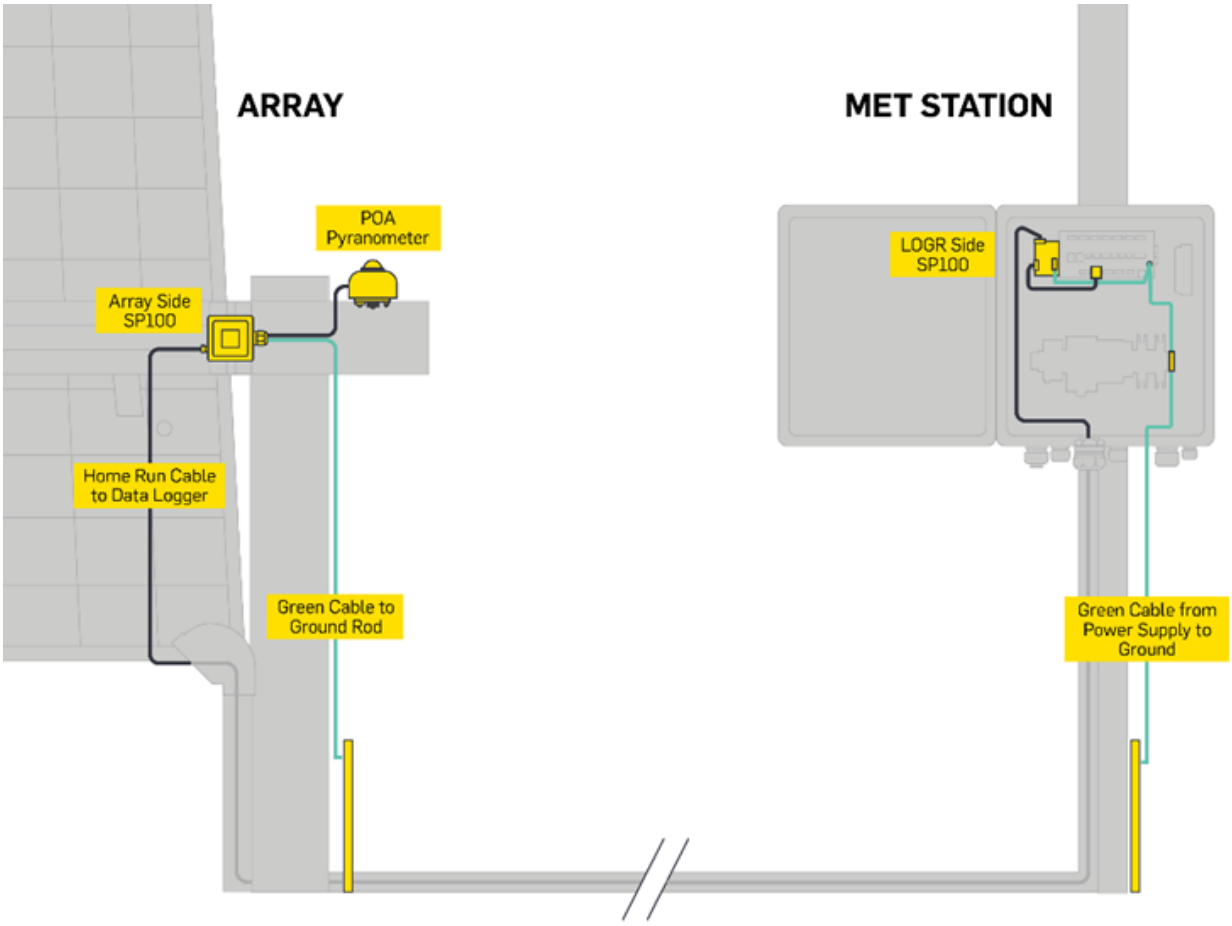
The SP100 should be used in conjunction with proper isolation, grounding, and cabling according to system requirements. The manufacturer is not responsible for device malfunction if the device is not installed as intended.



Array-Mounted SP100 Device (left)

Shelter Box SP100 Device (right)

System Layout Overview



SP100 Parts

NRG Part Number	Part Description	Part Specification	Qty
20304	Array-Mounted SP100	NRG Surge Device, SP100, Array Assembly	1
20325	Shelter Box-Installed SP100	NRG Surge Device, SP100, LOGR Assembly	1
OR			
20442	Shelter Box-Installed SP100	NRG Surge Device, SP100, SymPRO Assembly	1

Additional Parts (Upon Request)

NRG Part Number	Part Description	Part Specification	Qty
14242	Connecting Cable	Cable, SR30, 50m, M12-A	1
14241	Connecting Cable	Cable, SR30, 30m, M12-A	1
1533	4ft Ground Rod	Rod-Ground,5/8"x4', CopperCladSteel	1
NRG Daisy Chain Part Number			
20340	Cable Splitter	M12 Splitter, MFF, 0.75m Leads, Shielded	1
20341	Cable Splitter	M12 Splitter, MFF, 12” Leads, Shielded	1
20342	Cable Plug	M12, Termination Plug, Female, Unshielded	1
20343	Cable Adapter	M12, F-F Adaptor, Unshielded	1
20344	Cable Extension	M12 Extension, MF, 2m, Shielded	1

Safety Considerations and Warnings

Warning symbols:

	This universal symbol represents a general warning and is marked on the unit and included in this manual.
	This universal symbol represents an electrical hazard and is marked on the unit and included in this manual. Care should be taken to avoid coming into contact with electricity.
	This universal symbol signifies that the user manual must be read and is marked on the unit.

WARNING: 	**Observe safety precautions:** Failure to observe precautions may result in bodily injury and/or damage to the product or interconnected equipment.
WARNING: 	**Follow directions:** Operate this equipment only as directed in these instructions.
WARNING: 	**Inspect before using:** Inspect the equipment and note any damage or defects, including in wiring. Do not use the equipment if damaged or defective.
WARNING:  	**Qualified personnel only:** The product should only be installed and serviced by trained and qualified personnel.
WARNING: 	**Do not exceed module voltage or current ratings:** To prevent damage to the product, ensure that the power supply connected to the inputs never exceeds the product's listed voltage and current ratings.
WARNING:  	**Do not open the enclosure:** There are no user-serviceable parts inside the product enclosure. Do not open it. Opening the enclosure may damage the product and/or interconnected equipment and risks bodily injury.
WARNING: 	**Follow standard safety rules:** Follow all other standard safety rules for your PV array installation, in addition to the specific precautions listed here.

Environmental Operating Conditions

The **Array-Mounted** portion of the SP100 (item # 20304) is designed for outdoor installation. The **Shelter Box-Mounted** portion (logger-side) of the SP100 (item # 20325 for LOGR or item # 20442 for SymphoniePRO) should be mounted inside a water-tight enclosure such as the NRG approved shelter box. The Technical Specifications section of this document contains detailed operating conditions.

Installation Considerations

Location

- The SP100 system contains two parts intended to be mounted in two locations. The item # 20325 or # 20442 Shelter Box-Mounted component of the SP100 is installed inside the logger or power supply shelter box. The # 20304 Array-Mounted SP100 is installed onto a solar array. Proper safety considerations should be accounted for when installing in this environment.
- A “home run” cable connects the Shelter Box-Mounted SP100 and Array-Mounted SP100. The length of the connecting cable will vary depending on the site. A variety of cable lengths are available. See Additional Parts.
- The Array-Mounted SP100 must be installed within one meter of the array-mounted sensor. It should be located along the torque tube; co-located with the sensor it is protecting.

Grounding and Isolation

- The SP100 diverts surge or spike energy into the functional ground. It is important to properly connect the functional ground to maintain the full benefit of the SP100 system. Ground rods should only be installed by authorized personnel with explicit permission from the site to avoid hazardous equipment buried underground. Contact project organizers to ensure ground rod is installed in advance of SP100 installation.
- A six-meter ground cable is provided with a raw termination for the Array-Mounted SP100 device. Shorten this cable as much as possible. The grounding rod should be located near the Array-Mounted SP100.
- Ground the Logger-Side SP100 directly to the logger or the pile. A pre-terminated grounding cable is provided with the Logger-Side SP100 device.
- The SP100 system will not function as intended unless the protected sensors are isolated from the array. This can be confirmed with a multimeter beep test, testing continuity between the sensor body and array. Isolation bracketry should be installed with each sensor to ensure maximum surge protection and data accuracy.

Power Ratings and Protection Specifications

- The SP100 system is rated to carry excitation (sensor power) **up to 1 amp at up to 24 V DC** on the V+ to V- lines. Note that the voltage drop in the cabling may limit the available power to less than the SP100 rating.

- The SP100 system is designed to protect a Modbus/RTU communication bus, or any other RS-485 compatible signal. The SP100 signal connections (D+ and D-) are rated for **up to 12 V DC or -7 V DC** with respect to functional earth, in accordance with the RS-485 specification.

Brackets / Mounting Fasteners

- Standard SP100 kits contain all bracketry and isolation hardware needed to mount the system as designed.
- Technicians may want to bring cable management accessories (e.g. zip ties) to keep cable routing organized.

Tools

- Both power and hand screw drivers will be required
    - Both flathead and Phillips heads may be required
- 5/23” nut driver for tightening item #2703 Hose Clamps
- 1/2” nut driver to secure grounding rod assembly hardware
- Ethernet cable (for LOGR-S system verification, post-installation)
    - OR
- USB A-B cable (for SymphoniePRO system verification, post-installation)
- 3mm (1/8") flat blade screwdriver for connecting cables to wiring terminals
- Multi-meter

Compatibility

- Data Logger Compatibility
  - NRG LOGR series
  - NRG SymphoniePRO
  - Any data logger which supports:
    - 12-28 VDC
    - RS485 communication
- Sensor Compatibility
  - Any Sensor which supports:
    - 12-28 V DC
    - RS485 communication
    - M12 connectors
  - If utilizing EKO sensors or other non-standard sensors, please contact NRG Systems Technical Support for assistance.

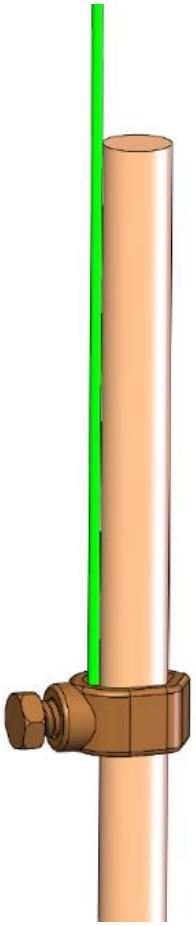
System Installation

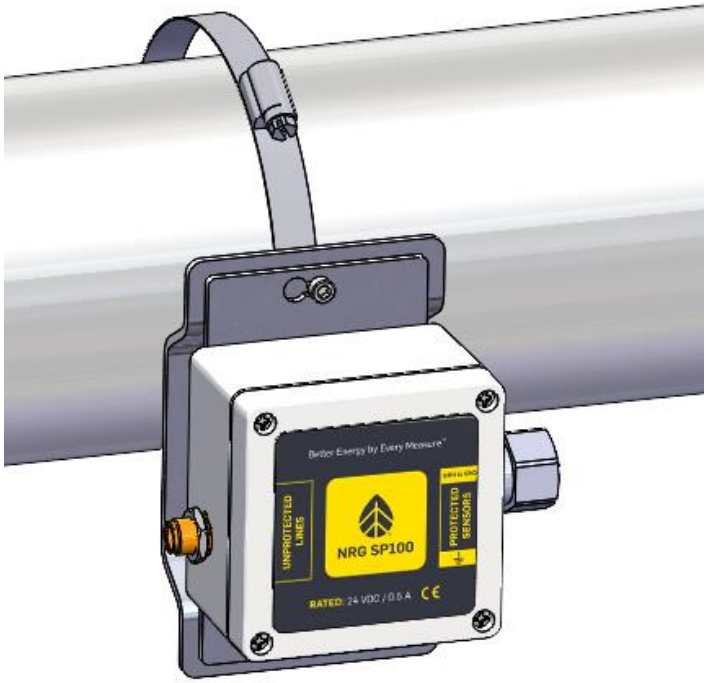
SP100 Array Mount installation

The following are step-by-step instructions for installing the Array-Mounted portion of the NRG SP100 (item # 20304).

Mount SP100 to torque Tube:

1. First, locate a position on the torque tube to mount the Array Side SP100 box. Install it within **one meter** of the array-mounted sensors and within **six meters** of the ground rod. Ensure the SP100 box and cabling clears any moving torque tube components.
2. Pass the hose clamp through the mounting backet on the back of the SP100 box. Secure the SP100 box to the torque tube by tightening the hose clamps with a 5/32” nut driver.
3. Connect the ground cable to the ground rod using the grounding clamp provided (diagram below, left).





WARNING: Ensure power is shut off to the array sensors prior to connecting cables to the SP100 and array-mounted sensors. The AC breaker in the station power supply box must be OFF (lever down).

4. Connect the array-mounted sensor body to the one-meter M12 cable that runs from the “Protected” terminal of the Array-Side SP100 box.

5. Connect the “home run” cable (the original sensor cable) to the “Unprotected” side of the LOGR-Side SP100 box. Manage cables as needed.
6. Run the “home run” cable through conduit to the shelter box containing the Logger-Side SP100.

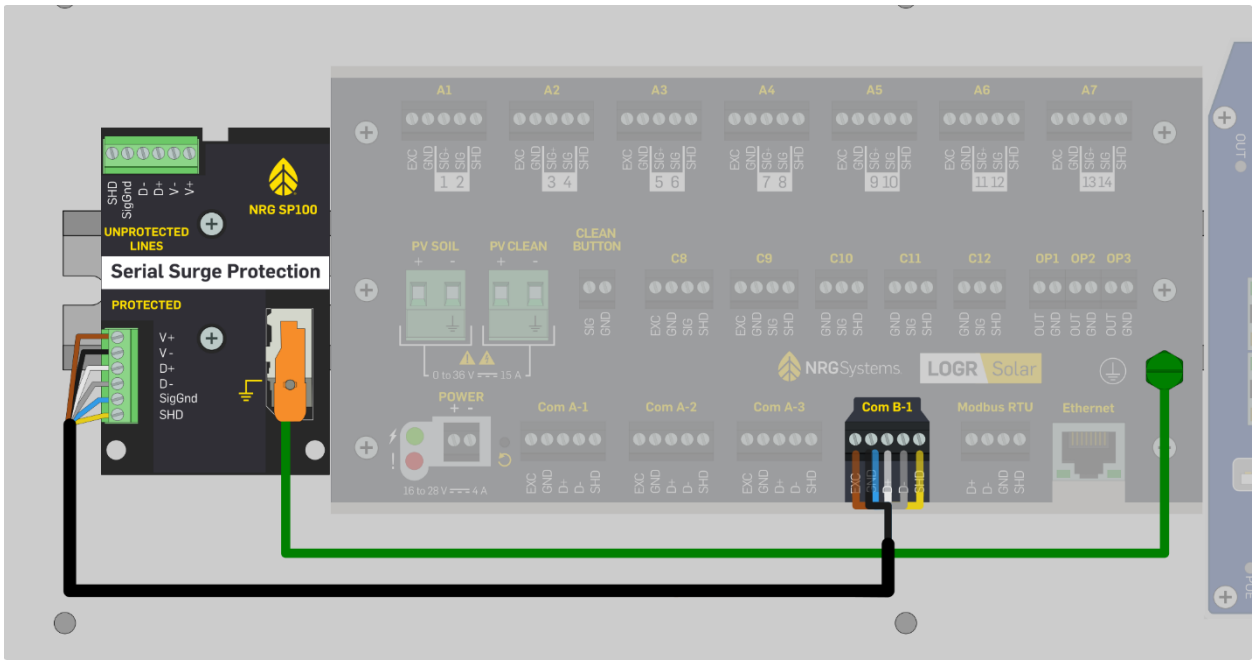
LOGR-Side SP100 Installation

In addition to protecting array-mounted sensors from surge events, the SP100 installed in the shelter box protects the LOGR from surges originating at the array. ***Note that direct lightning strikes or extreme inclement events may still result in system failures.***

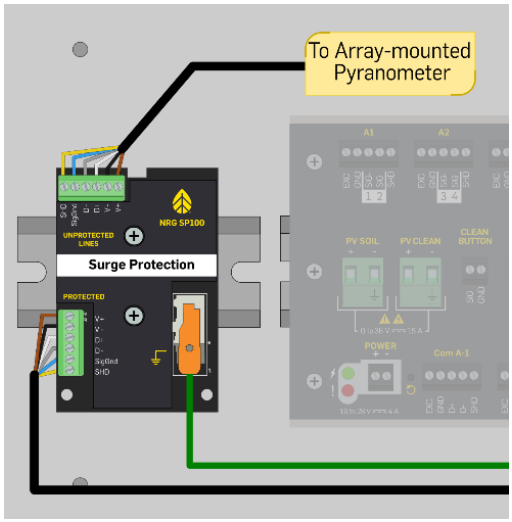
This portion of the SP100 is DIN-rail mounted next to the logger in the shelter box. The “Protected” terminal is directly connected to the COM port associated with the array-mounted sensor (see Array-Mounted portion instructions above and wiring below). The ground cable connects directly to the LOGR ground terminal.

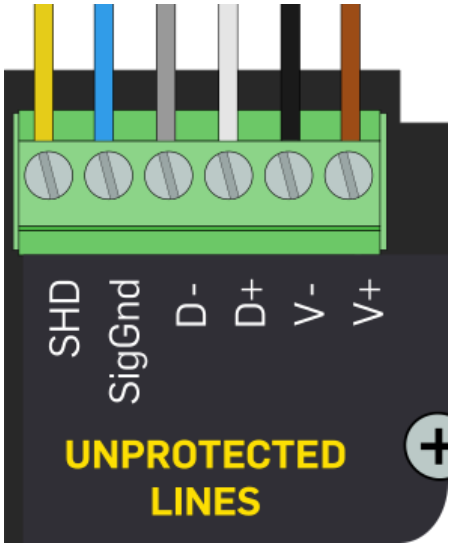
Before proceeding, ensure the AC breaker is OFF (lever down).

1. Clip the LOGR Side SP100 device onto the DIN rail next to the logger.
2. Using the provided cable, wire the “Protected” side of the SP100 to the array-mounted sensor LOGR COM port.
3. Ground the SP100 to the logger using the provided grounding cable.



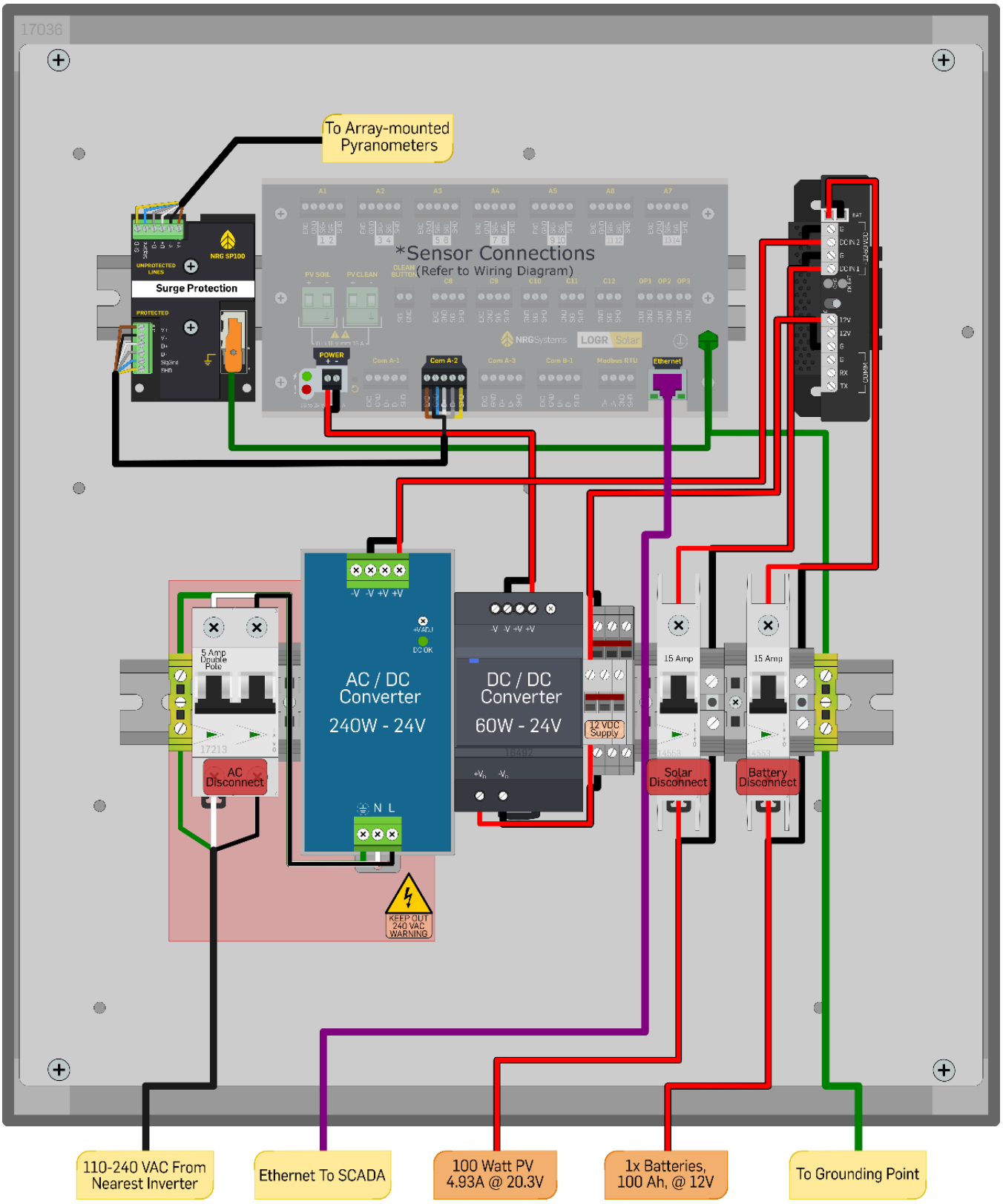
4. Connect the “home run” array sensor cable to the “Unprotected” side of the LOGR-Side SP100.





LOGR: Wiring Table		
Wire Color	**Function**	**Termination**
Brown	Power Excitation	V+
Black	Power Ground	V-
White	RS-485 B+ [data+]	D+
Gray	RS-485 A- [data -]	D-
Blue	RS-485 Signal Ground	SigGnd
Yellow	Cable Shield	SHD

5. Verify the entire system is installed and configured correctly, then turn the AC Breaker back **ON** to restore power to the station.
6. Verify the array-mounted sensor and logger communicate data.


17036
To Array-mounted Pyranometers
NRG SP100
Surge Protection
*Sensor Connections
(Refer to Wiring Diagram)
POWER
Com A-2
Ethernet
5 Amp Double Pole
AC Disconnect
AC / DC Converter
240W - 24V
DC / DC Converter
60W - 24V
12 VDC Supply
15 Amp
15 Amp
Solar Disconnect
Battery Disconnect
KEEP OUT 240 VAC WARNING
110-240 VAC From Nearest Inverter
Ethernet To SCADA
100 Watt PV 4.93A @ 20.3V
1x Batteries, 100 Ah, @ 12V
To Grounding Point

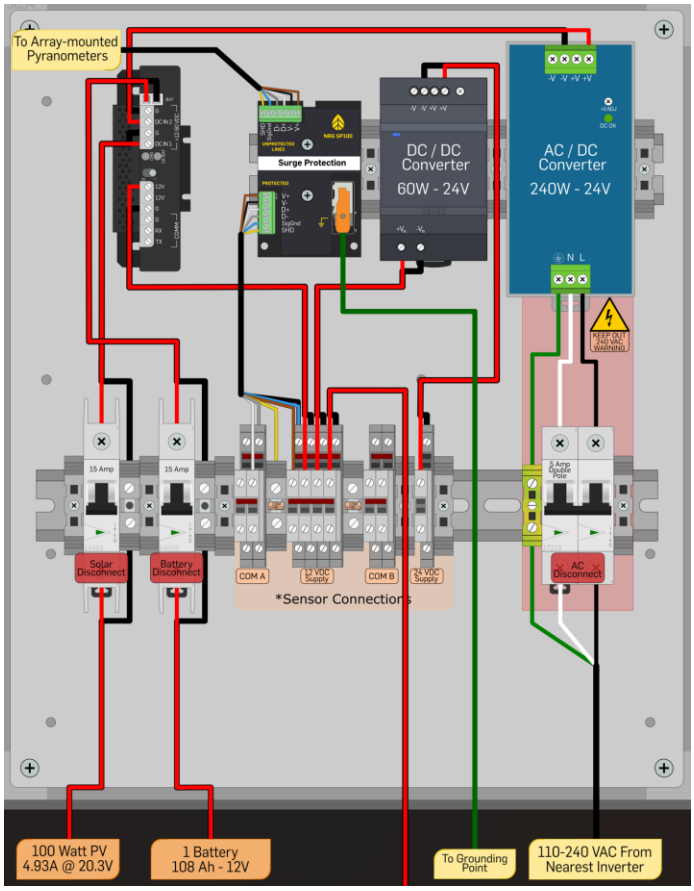
SymphoniePRO-Side SP100 Installation

In addition to protecting array-mounted sensors from surge events, the SP100 installed in the shelter box protects the SymphoniePRO logger from surges originating at the array. ***Note that direct lightning strikes or extreme inclement events may still result in system failures.***

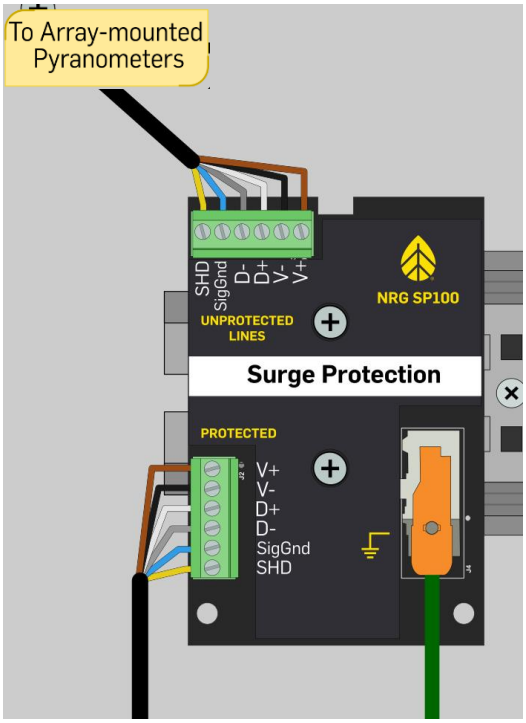
This portion of the SP100 is DIN-rail mounted in the power supply shelter box. The “Protected” terminal connects directly to the COM port terminals associated with the array-mounted sensor (see Array-Mounted portion instructions above and wiring below). The grounding cable connects to the grounding point outside of the shelter box.

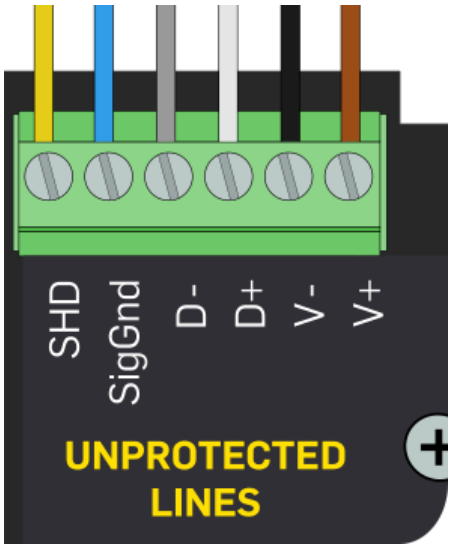
Before proceeding, ensure the AC breaker is OFF (lever down).

1. Clip the SymphoniePRO Side SP100 device onto the available DIN rail in the power supply shelter box.
2. Using the provided cable, wire the “Protected” side of the SP100 to the COM terminals associated with the array-mounted sensor.
3. Route the provided green SP100 grounding cable out of the shelter box and connect to the local grounding point.



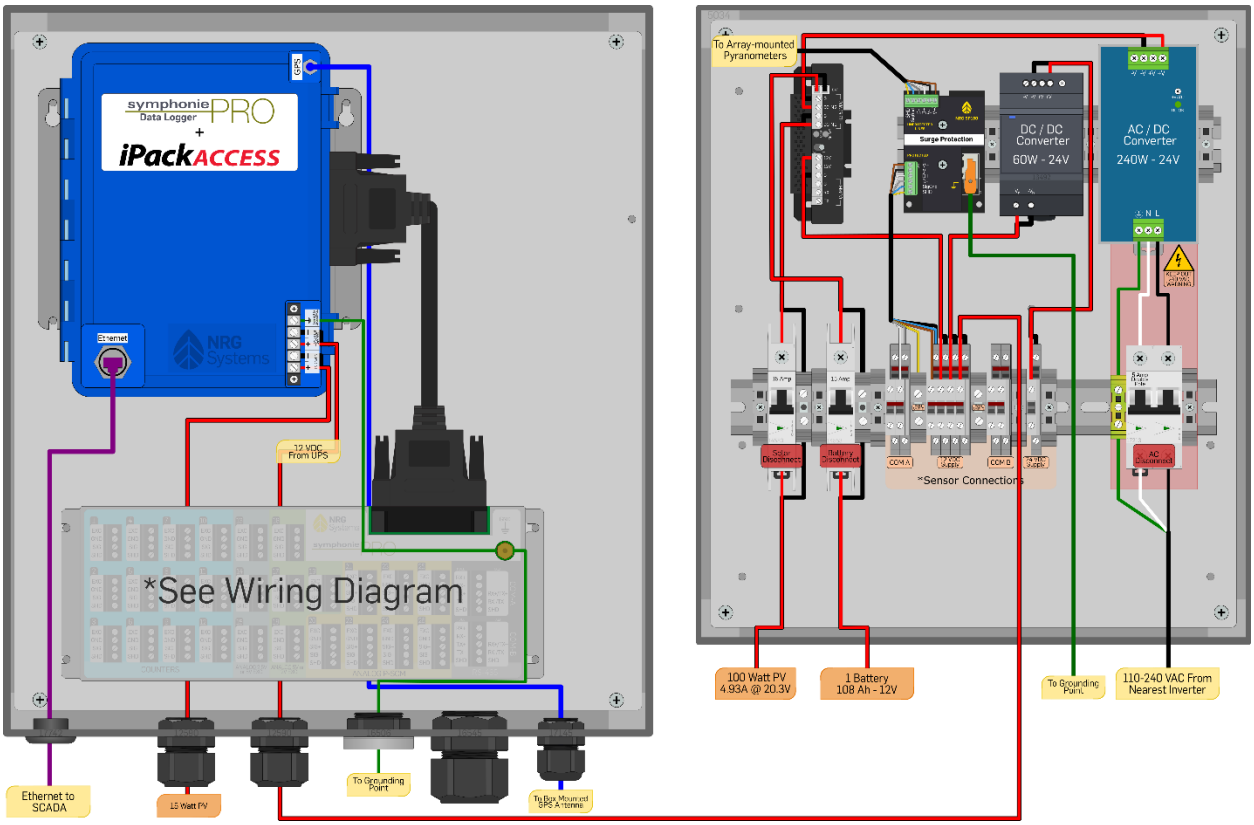
4. Connect the “home run” sensor cable to the “Unprotected” side of the LOGR side SP100.





SymphoniePRO: Wiring Table		
Wire Color	**Function**	**Termination**
Brown	Power Excitation	V+
Black	Power Ground	V-
White	RS-485 B+ [data+]	D+
Gray	RS-485 A- [data -]	D-
Blue	RS-485 Signal Ground	SigGnd
Yellow	Cable Shield	SHD

5. Verify the entire system is installed and configured correctly, then turn the AC Breaker back **ON** to restore power to the station.
6. Verify the array-mounted sensor and logger communicate data.



Final Verification

Ensure the sensor is electrically isolated by using a multimeter to test continuity between the sensor body and the array.

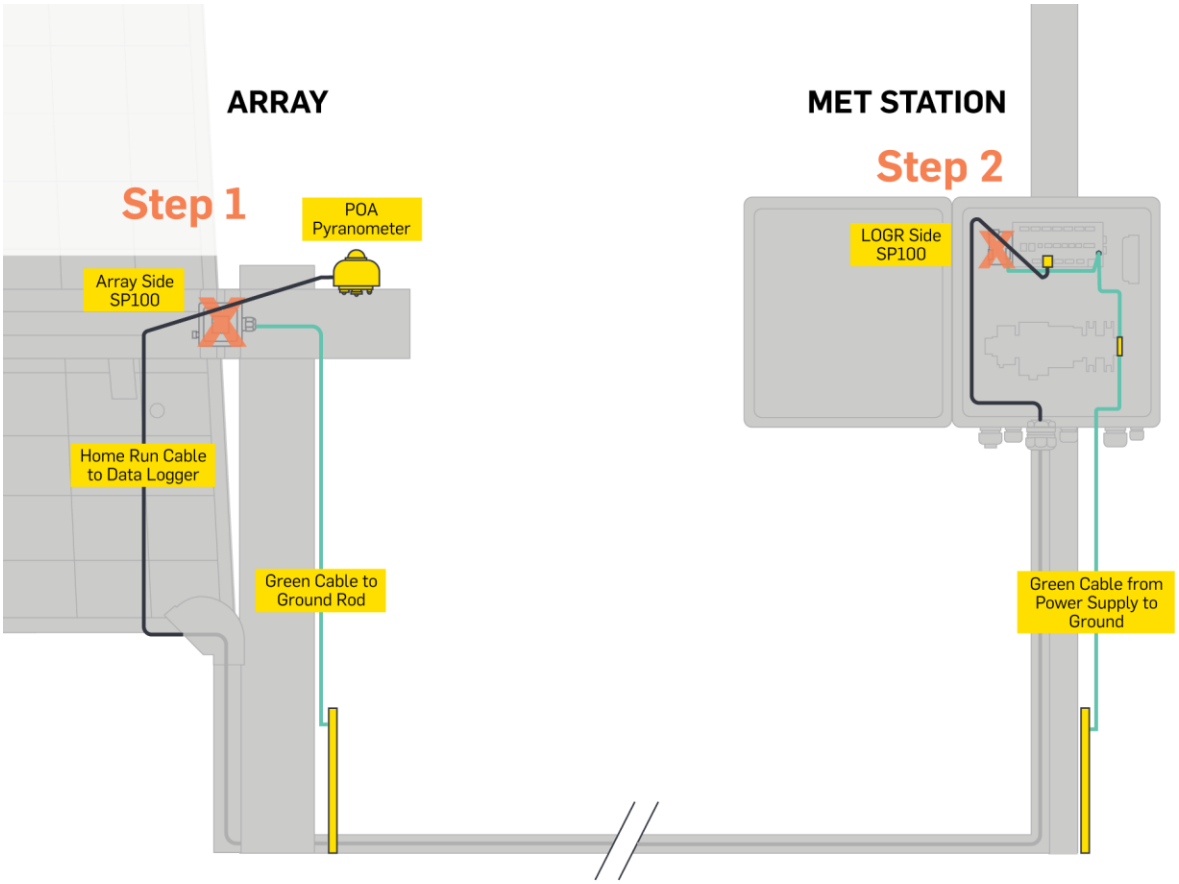
If not completed before, verify accurate live data via the data logger.

SP100 Maintenance

The SP100 requires replacement following a surge event. This device protects other connected devices such as loggers and sensors by catching excess electrical surge and diverting it to ground. Following a series of surge events—or potentially one large surge event—replacement of the device is required to maintain protection.

When the SP100 needs replacement, the device will prevent communication between the connected sensor and/or logger. **The devices are no longer protected from surge events.** To check if the SP100 has successfully protected the sensor(s), replace the SP100 devices with a fresh set to restore communication with functional sensors.

Alternatively, unplug both sides of the "home run" cable from the unprotected sides of the SP100 devices. Then connect the cable directly from the sensor to the logger, bypassing the SP100 system. Communications should resume; **however, the sensor(s) and logger are now unprotected from surge events until new SP100 devices are installed**. If communications do not resume, further troubleshooting is required**.**



Loggers and sensors damaged by surge events due to consumed or bypassed SP100s are NOT covered under warranty. Functional equipment warranty resumes when replacement SP100 surge protectors are installed.

There are no serviceable parts for the SP100. However, NRG Systems **strongly recommends** maintaining an on-site stock of spare SP100 devices. Keeping replacements on hand minimizes equipment outages and/or unprotected devices. Spares can be purchased via NRG Sales at sales@nrgsystems.com. Should any issues or questions occur, please contact NRG Technical Services at support@nrgsystems.com.

⚠ **WARNING:** Should any part of the system need to be replaced, ensure the **power to the SP100 is OFF prior to any work**.

SP100 Warranty

The internal fuse of the SP100 is not covered under warranty as this device is designed to protect connected devices from surge events and will eventually degrade. Manufacturer workmanship and device defects are covered under the NRG Systems' 2-year standard warranty.

Technical Specifications

Rated Operating Voltage	12-24VDC
Rated Maximum Voltage V+, V-	28VDC
Rated Maximum Voltage D+, D-	+12V/-7VDC
Maximum Current	1A
Surge immunity	EN 6100-4-5+A1 2017
Maximum line-to-ground Surge	4kV
Maximum line-to-line Surge	2kV
Number of Protected Instruments	1-4

Environmental Conditions			
Rated Operating Temperature range	-40 to 60		°C
Ingress Protection Code	Array SP100: 65	LOGR SP100: N/A	

1: Exceeding Absolute Maximum Ratings, even at short durations risks permanently damaging the product and may expose the operator to bodily harm

2: Product may operate with reduced ratings at higher altitudes. Contact NRG Systems for more information.

Contact Information

NOTE: The SP100 system is a consumable product designed for field replacement. Therefore, the SP100 internal device does not fall under the standard 2-year NRG Warranty, with the exception of out-of-box manufacturer defects. See SP100 Warranty.

To return a defective product, request a Service Request RMA (return merchandise authorization) by emailing the Technical Services team at support@nrgsystems.com.

Please provide the date of purchase or original order number. No products will be accepted by NRG Systems without a Service Request RMA number. Defective products must be returned, postage prepaid, to NRG Systems with a brief description of the issue, Service Request RMA number, and a return address with phone number.

For complete information about returns and the Service Request RMA process, visit the Return Merchandise Authorization Request page on our website, located in the Customer Support section.

NRG Systems
110 Riggs Road
Hinesburg, VT 05461, USA
802-482-2255 | nrgsystems.com
support@nrgsystems.com

Additional Views