

Installation Manual Installation Manual for PV Link and SnapRS Models: S2502, RS802, and RS802-clip



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## SAVE THIS MANUAL FOR FUTURE REFERENCE

### Use this page to record important information about your Generac Product

Record PV Link<sup>™</sup> and SnapRS<sup>™</sup> information for your PWRcell® system on this page. When contacting a Generac Products Authorized Service Dealer (ASD) about parts and service, always supply complete model number and serial number information.

### **Operation and Maintenance**

Proper maintenance and care of the energy storage system ensures a minimum number of problems and keeps operating expenses at a minimum. It is the operator's responsibility to perform all safety checks, to verify that all maintenance for safe operation is performed promptly, and to have the equipment checked periodically by an ASD. Normal maintenance, service and replacement of parts are the responsibility of the owner/operator and, as such, are not considered defects in materials or workmanship within the terms of the warranty. Individual operating habits and usage may contribute to the need for additional maintenance or service.

### Table 1 PV Link and SnapRS Important Information

PV Link Number	Location	Serial Number	RCP Number	Parallel Input?	Number of SnapRS	SnapRS Date of Manufacture
1						
2						
3						
4						
5						
6						

### ▲ CALIFORNIA WARNING

This product can expose you to chemicals including 1,4-butanediol dimethanesulfonate, a carcinogen and reproductive toxicant, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to: www.p65warnings.ca.gov

(W000818)



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## Section 1: Introduction and Safety

## Introduction

Thank you for purchasing a Generac PWRcell® product.

This manual provides instructions for installing PV Link and SnapsRS devices. Consult the installation and operation manuals for other Generac PWRcell system components, as applicable. The PV Link and SnapRS devices are to be installed by qualified personnel.

The information in this manual is accurate based on products produced at the time of publication. The manufacturer reserves the right to make technical updates, corrections, and product revisions at any time without notice.

### **Read This Manual Thoroughly**



### 

Consult Manual. Read and understand manual completely before using product. Failure to completely understand manual and product could result in death or serious injury.

(W000100)

If any section of this manual is not understood, contact the nearest Independent Authorized Service Dealer (IASD) or Generac Customer Service at 1-888-436-3722 (1-888-GENERAC), or visit <u>www.generac.com</u> for starting, operating, and servicing procedures. The owner is responsible for correct maintenance and safe use of the unit.

This manual must be used in conjunction with all other supporting product documentation supplied with the product.

SAVE THESE INSTRUCTIONS for future reference. This manual contains important instructions that must be followed during placement, operation, and maintenance of the unit and its components. Always supply this manual to any individual that will use this unit, and instruct them on how to correctly start, operate, and stop the unit in case of emergency.

## Safety Rules

The manufacturer cannot anticipate every possible circumstance that might involve a hazard. The alerts in this manual, and on tags and decals affixed to the unit, are not all inclusive. If using a procedure, work method, or operating technique that the manufacturer does not specifically recommend, verify that it is safe for others and does not render the equipment unsafe.

Throughout this publication, and on tags and decals affixed to the unit, DANGER, WARNING, CAUTION, and NOTE blocks are used to alert personnel to special instructions about a particular operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully. Alert definitions are as follows:

### 

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

(D000001)

### 

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

(W000002)

### 

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

(C00003)

**NOTE:** Notes contain additional information important to a procedure and will be found within the regular text of this manual.

These safety alerts cannot eliminate the hazards that they indicate. Common sense and strict compliance with the special instructions while performing the action or service are essential to preventing accidents.

## How to obtain service

#### How to Obtain Service

When the unit requires servicing or repairs, contact Generac Customer Service at 1-888-GENERAC (1-888-436-3722) or visit *www.generac.com* for assistance.

When contacting Generac Customer Service about parts and service, always supply the complete model and serial number of the unit as given on its data decal located on the unit. Record the model and serial numbers in the spaces provided on the front cover of this manual.

### **General Hazards**

Automatic start-up. Disconnect utility power and render unit inoperable before working on unit. Failure to do so will result in death or serious injury.

(D000191)

## 

Risk of injury. Do not operate or service this machine if not fully alert. Fatigue can impair the ability to service this equipment and could result in death or serious injury.

(W000215)



### 

Loss of life. This product is not intended to be used in a critical life support application. Failure to adhere to this warning could result in death or serious injury.

(W000209)



### 

Hot Surfaces. Locate and install the PV Link so as to avoid inadvertent contact. When operating in hot weather the optimizer will become hot and could result in personal injury. (W000670)

### 

Electric Shock. Only a trained and licensed electrician should perform wiring and connections to unit. Failure to follow proper installation requirements could result in death, serious injury, and equipment or property damage.

(W000155)

### 

Equipment damage. Only qualified service personnel may install, operate, and maintain this equipment. Failure to follow proper installation requirements could result in death, serious injury, and equipment or property damage.

(W000182)

## 

Equipment damage. Never open the PV Link. The optimizer is factory-sealed and contains no field serviceable parts. Opening the optimizer could result in equipment damage.

(C000655)

## 

Equipment damage. Never operate PV Link in ambient temperatures greater than 158 °F (70 °C). Doing so will result in equipment damage.

(C000669)



Equipment Damage. Connect only to REbus-compatible devices to the DC bus. Never connect to any other DC power source. Connecting to other DC power sources could result in equipment damage.

(C000598)

## 

Personal injury. Wear appropriate personal protective equipment at all times while operating and servicing unit. Failure to do so could result in personal injury.

(C000419)

- Connecting Generac PWRcell to the electric utility grid must only be done after receiving prior approval from the utility company.
- Only competent, qualified personnel should install, operate, and service this equipment. Strictly comply to local, state, and national electrical and building codes. When using this equipment, comply with regulations established by the National Electrical Code (NEC), CSA Standard; the Occupational Safety and Health Administration (OSHA), or the local agency for workplace health and safety.
- Protection against lightning surges in accordance with local electric codes is the responsibility of the installer.

NOTE: Lightning damage is not covered by warranty.

- If working on this equipment while standing on metal or concrete, place insulative mats over a dry wood platform. Work on this equipment only while standing on such insulative mats.
- Never work on this equipment while physically or mentally fatigued.
- Any voltage measurements should be performed with a meter that meets UL3111 safety standards, and meets or exceeds overvoltage class CAT III.

## **PVRSE Warning**

**NOTE:** SnapRS devices must be used in conjunction with Generac PV Link to form a complete PVRSS per NEC 690.12.

This Photovoltaic Rapid Shutdown Equipment (PVRSE) does not perform all of the functions of a complete Photovoltaic Rapid Shutdown System (PVRSS). This PVRSE must be installed with other equipment to form a complete PVRSS that meets the requirements of NEC (NFPA 70) section 690.12 for controlled conductors outside the array. Other equipment installed in or on this PV system may adversely affect the operation of the PVRSS. It is the responsibility of the installer to ensure the completed PV system meets the rapid shutdown functional requirements. This equipment must be installed according to the manufacturer's installation instructions.

## **Electrical Hazards**



### 

Electrocution. Water contact with a power source, if not avoided, will result in death or serious injury.

(D000104)



## 

Electrocution. In the event of electrical accident, immediately shut power OFF. Use nonconductive implements to free victim from live conductor. Apply first aid and get medical help. Failure to do so will result in death or serious injury.

(D000145)



### 

Electrocution. Turn battery disconnect OFF and de-energize REbus before touching terminals. Failure to do so will result in death, serious injury, equipment and property damage.

(D000599)



### 

Electrocution. Verify electrical system is properly grounded before applying power. Failure to do so will result in death or serious injury.

(D000152)



### 

Electrocution. Do not wear jewelry while working on this equipment. Doing so will result in death or serious injury.

(D000188)



### 

Electric shock. Avoid contact with DC conductors. DC conductors of this photovoltaic system are ungrounded and may be energized regardless of sun exposure. Contact with conductors will result in death or serious injury.

(D000666)



### 

Electrocution. Potentially lethal voltages are generated by this equipment. Render the equipment safe before attempting repairs or maintenance. Failure to do so could result in death or serious injury.

(W000187)

# Section 2: General Information

## **PV Link Specifications**

Description	Units	S2502	
Rated power	W	2,500 (continuous)	
Peak efficiency	%	99	
MPPT input voltage	VDC	60 — 360	
Rated power input voltage	VDC	200 — 360	
Maximum input voltage	VDC	420 (absolute maximum)	
Maximum input current (operating)	А	13 A @ 122 °F (50 °C) 10 A @ 158 °F (70 °C)	
Maximum input current (short circuit)	А	18	
Maximum output voltage	VDC	420 (open circuit)	
Nominal output	_	REbus DC nanogrid (380 VDC + data)	
Maximum output current (continuous)	А	8	
Standby power	W	<1	
Shutdown time	Sec < 30		
Topology	—	Boost converter	
Protections	—	Ground-fault protection, arc-fault protection (type 1), PVRSE	
Operating temperature range	°F (°C)	-40 to 158 (-40 to 70)	
Enclosure	_	UL Type 4X	
Weight	lb (kg)	7.3 (3.3)	
Certifications	_	UL 1741, UL 1699B, CSA 22.2 No. 107.1	

Specifications are subject to change without notice. Refer to the product specification sheet for complete list.

## **SnapRS Specifications**

Description	Units	RS801	RS801A	RS802, RS802–clip
PV Module maximum VOC	VDC	75	80	80
Maximum number of PV modules per substring	_	10*		
Range of input operating voltage, DC	V	0 - 80		
Typical power loss at maximum input current	W	1.3	1.3	1.33
Maximum input current	А	13	13	14
Max STC ISC of string	А	10.4	10.4	11.2
Shutdown time	Sec	< 10		
Enclosure rating	_	NEMA Type 6P		
Operating temperature range	°F (°C)	-40 to 158 (-40 to 70)		
Certifications	_	UL 1741, CSA 22.2 No.107.1		
Weight	oz (g)	3.6 (103)		

\* 1 SnapRS per PV Module.

## **Important Product Information**

### **PV Link Serial Number Location**

See <u>Figure 2-1</u>. Serial number tag (A) includes a removable layer that can be peeled off leaving the underlying label in place. Adhere the removable layer to the inside cover of this manual and record the information from this tag in <u>Table 1 PVlink and SnapRS Important</u> <u>Information</u>.



Figure 2-1. Serial Number Location

## **Unit Dimensions**

### **PV Link Dimensions**



В*	15-1/2 in (390 mm)
С	2-1/16 in (53 mm)

\*18-1/8 in (460 mm) with PV wire bend radius **SnapRS Dimensions** 





### Figure 2-3. Unit Dimensions

Α	1 1/32 in (26.25 mm)
В	1 1/3 in (33.81 mm)
с	6 7/8 in (174.42 mm)
D	1 1/3 in (33.24 mm)
E	6 7/8 in (174.42 mm)
F	1 1/3 in (33.81 mm)
G	1 1/3 in (33.24 mm)

## **About PV Link**

The PV Link is a nonisolated, interleaved DC-DC converter that boosts PV input to a higher voltage and outputs it to REbus<sup>™</sup>, Generac's regulated 380 VDC bus. The PV Link provides droop-mode power management, enabling multiple optimizers to connect in parallel on a common bus. Its DC output carries a bidirectional power line communication (PLC) protocol for communicating with inverters and other devices on REbus.

PV Link is intended for use with 60-cell, 72-cell, or 96-cell residential DC PV modules. PV modules must not require positive or negative grounding as this would interfere with PLC communications.

**NOTE:** Other PV modules may be suitable for use with PV Link, contact Generac for more information.

The PV Link is sealed in a type 4X enclosure at the factory and is designed for attachment to standard PV racking. Safety features include ground fault detection and interruption (GFDI), arc fault detection, circuit interruption (AFCI), and rapid shutdown capability.

### About Generac SnapRS

SnapRS is an inline PV Rapid Shutdown device that satisfies 2017, 2020, and 2023 NEC 690.12 PV Rapid Shutdown system (PVRSS) requirements. When used with PV Link, SnapRS devices limit all controlled conductors within an array's 1 ft (305 mm) boundary to 80 VDC or less within 30 seconds of rapid shutdown initiation.

## **GFDI** Information

The PV Link's internal ground fault detector and interrupter (GFDI) is designed to trip at 240 mA ( $\pm$  40 mA) of PV DC voltage ground current. Ground faults are displayed on the PWRcell Inverter control Panel. The PV Link meets the ground fault protection requirements in NEC Article 690.41(B).

IMPORTANT NOTE: When a ground fault is indicated, normally ungrounded conductors may be grounded.

## **AFCI Information**

The PV Link is a Photovoltaic DC Arc Fault Circuit Protection Type 1 device that incorporates an internal arc fault circuit interrupter (AFCI) and meets the arc fault circuit protection requirement in NEC Article 690.11.

## **PVRSS** Information

PV Rapid Shutdown system (PVRSS) requirements have evolved over time and are defined by the National Electrical Code (NEC) in conjunction with UL 1741. Determine what level of PV Rapid Shutdown is required for your jurisdiction.

- The 2011 NEC and older editions do not require PVRSS capability.
- The 2014 NEC requires rapid shutdown only on the conductors leaving the PV array.
- The 2017 NEC and forward (e.g. 2020 NEC, 2023 NEC, etc) require rapid shutdown at the PV module level for roof-mounted arrays and on the conductors leaving array.

PV Link is a PV Rapid Shutdown system equipment (PVRSE) component within a PVRSS. It provides rapid shutdown for the conductors leaving the array. SnapRS devices are required for PV Module level rapid shutdown within the array. See <u>PVRSS Compliance Guidelines</u> for more information.

## **Component Locations**

### **PV Link Component Locations**



### Figure 2-4. Component Locations

Α	Attachment Flange Slots	
в	<b>B</b> Grounding Terminals (sized for 1/4 in hardware)	
С	REbus DC Nanogrid Output Negative (-) Lead	
D	REbus DC Nanogrid Output Positive (+) Lead	
Е	PV Substring Input Negative (-) Lead	
F	PV Substring Input Positive (+) Lead	
G	MC4 Connectors	

### **SnapRS Component Locations**



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#### Figure 2-5. Component Locations

Α	Positive PV Connector		
В	Negative PV Connector		
С	C Mounting Clips		

## Section 3: Installation Design

## **Voltage Considerations**

Use the formulas in this section to determine the maximum number of PV modules of a given type that can be connected to a PV Link. For more detailed information on array sizing visit <u>www.generac.com</u>.

**NOTE:** Fewer PV modules may be used providing the minimum MPPT input voltage is satisfied.

1. See <u>Table 3-1</u>. Use Equation (1) to calculate the Adjusted Module Voc for the chosen PV Module.

**NOTE:** The temperature correction factor listed on the module nameplate can be used as a substitute for the NEC Cold Factor if available.

Module  $V_{OC}$  X NEC Cold Factor = Adjusted Module  $V_{OC}$ 

 Use Equation (2) to determine the Max Number of Modules Voc, where PV Link Max Voc = 420 VDC.

 $\frac{420}{Adjusted Module V_{oc}} = Max Number of Modules_{voc}$ 

**3.** Use Equation (3) to determine the Max Number of Modules Vmp, where PV Link Max Vmp = 360 VDC.

 $\frac{360}{Module V_{mp}} = Max Number of Modules_{vmp}$ 

4. Compare the results from Step 2 and Step 3 and choose the smaller number. Round down to the nearest integer. Record this value as the Maximum number of series connected PV modules.

Minimum Temperature (°F)	NEC Cold Factor	Minimum Temperature (°C)
49 to 41	1.08	9 to 5
40 to 32	1.10	4 to 0
31 to 23	1.12	-1 to -5
22 to 14	1.14	-6 to -10
13 to 5	1.16	-11 to -15
4 to -4	1.18	-16 to -20
-5 to -13	1.20	-21 to -25
-14 to -22	1.21	-26 to -30
-23 to -31	1.23	-31 to -35
-32 and below	1.25	-36 and below

### Table 3-1. NEC Cold Factor

### **Current Considerations**

Ensure that the short circuit current (Isc) of the PV modules are suitable for use with the SnapRS and PV Link per NEC 690.8(A)(1). Refer to product current specifications in <u>Section 2 General Information</u>.

## Section 4: PVRSS Compliance

## 2011 NEC and Older Editions

2011 NEC and older editions do not require PVRSS compliance.

**NOTE:** The PV Link will still provide 2014 NEC compliant PV Rapid Shutdown.

### 2014 NEC

The 2014 NEC 690.12 introduced a new requirement for PV systems that is commonly referred to as PV Rapid Shutdown. To meet 2014 NEC compliance:

- 1. Install the PWRcell Inverter as specified in the Generac PWRcell Inverter Installation Manual and Owner's Manual.
- 2. Install the PV Link as specified in this manual.
- 3. Install a PVRSS initiator.
  - The DC disconnect under the PWRcell Inverter front cover labeled PV by the installer can be used as the PVRSS initiation device. See PV Rapid Shutdown in the *Generac PWRcell Inverter Installation and Owner's Manual* for more information.
  - An external actuator, connected by the installer to the PWRcell Inverter's STOP terminals can be used as the PVRSS initiation device. If the PWRcell system includes PWRcell Battery/ies, the battery/ies must have a battery management unit (BMU) with STOP terminal hardware. See *Generac PWRcell Battery Installation and Owner's Manual* for instructions. Appropriate signage, in compliance with the NEC, must be provided by the installer indicating the function of the external actuator.

Rapid shutdown response time is less than 10 seconds.

## 2017 NEC (and forward)

The 2017, 2020, and 2023 NEC have PVRSS requirements mandating the need to reduce voltages of controlled conductors to less than 80 VDC within the array, and less than 30 VDC outside the array, as well as some specification for the location of the PVRSS initiator and its labeling.

To meet 2017, 2020, and 2023 compliance:

- **1.** A PVRSS initiator must be located at a readily accessible location outside the building.
  - The DC disconnects under the PWRcell Inverter front cover labeled PV by the installer can be used as the PVRSS initiation device.
  - An external actuator, connected by the installer to the PWRcell Inverter's STOP terminals can be used as the PVRSS initiation device. If the PWRcell system includes PWRcell Battery/ies, the battery/ies must have a battery management unit (BMU) with STOP terminal hardware. See Generac PWRcell Battery Installation and Owner's Manual for instructions.

**NOTE:** Provide signage indicating the PVRSS initiation device is the REbus PV DC disconnect located under the front cover of the inverter, or the external actuator connected to the STOP terminals.

**NOTE:** Provide signage indicating where PVRSS initiation devices are located. Note that if the inverter is installed in the appropriate outdoor location it may satisfy this requirement.

2. Provide signage complying with section 690.56(C) of the NEC (NFPA 70), stating all conductors are controlled.

**NOTE:** Install one SnapRS to the negative whip (-) of each PV Module connected to the PV Link.

**3.** Install the PV Link. See PV Link Installation Guidelines for more information.

Upon initiation of rapid shutdown PV Link and SnapRS will meet or exceed NEC requirements and control voltage with a response time of less than 10 seconds. Voltage within the array is controlled to no greater 80 VDC and voltage outside the array is controlled to no greater than 30 VDC.

# Section 5: Mounting and Connecting

## **PV Link Installation Guidelines**



### 

Hot Surfaces. Locate and install the PV Link so as to avoid inadvertent contact. When operating in hot weather the optimizer will become hot and could result in personal injury. (W000670)

- Mount the optimizer at least 3 ft (0.9 m) from the ground.
- Install PV Links close to the edge of the array for best cooling and easier service access.
- Ensure at least a 1 in (25.4 mm) clearance between the heatsink fins and adjacent surfaces to allow sufficient air flow for cooling.
- The PV Link can be installed in any orientation. Cooling is most effective if fins are oriented vertically and facing away from the PV module.
- A PV Link can connect to a substring of PV modules with cumulative voltage between 60 420 VDC. Calculate maximum substring length using the Voltage Considerations in <u>Section 3 Installation Design</u> of this manual.
- The modules within each substring must be the same type.
- For optimal performance, all modules should be mounted at the same tilt and azimuth.
- When installing a system with multiple PV Links, it is not necessary to match the number of modules, roof pitch, or azimuth across all substrings in an array.
- Review the PV module instructions to determine if any restrictions for mounting devices under the module exist as part of the PV module listing.
- All PV Wiring shall be properly secured and supported in accordance with NEC Article 690.
- PV wiring shall not contact the building roof and shall be protected from any physical damage.

## Mounting and Grounding PV Link(s)

## 

Equipment damage. Never leave the PV Link MC4 connectors open and exposed to the atmosphere overnight or during rain. Doing so could cause equipment failure. (C000657)

The following sections contain instructions for mounting PV Link (s) with correct attachment and grounding for

Installation Manual for PV Link and SnapRS Installation Manual

various mounting conditions. Correct grounding is necessary for REbus communications.

### Mounting to Metallic or Grounded Structures

See <u>Figure 5-1</u>. If mounting PV Link underneath an array to metallic PV racking, install the PV Link with label (A) facing up. Attachment flange slots (B) accept fasteners up to M8 or 5/16 in diameter.



Figure 5-1. Grounding Terminal Location

### Mounting to a Grounded Rail

 See <u>Figure 5-2</u>. Use two rail-compatible fasteners (D) to secure the PV Link to the grounded rail.



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### Figure 5-2. Attaching to a Grounded Metal Rail

- **2.** Use a grounding washer (E) between the rail and attachment flange to penetrate the rail's anodized coating.
- **3.** Tighten fasteners according to the clip manufacturer's instructions.

### Mounting to Nonmetallic or Ungrounded Structures

- **1.** Use two fasteners appropriate for the structure.
- See <u>Figure 5-1</u>. Fasten the equipment grounding conductor to grounding terminal (C) using a field supplied lug.
- 3. Use listed bonding hardware only.
- **4.** Size equipment grounding conductor per NEC requirements and tighten per manufacturer specifications.

### Mounting to Rail-less Racking

Proceed as follows to mount to rail-less racking.

- Select mounting structures which allow for PV Link to be installed adhering to the <u>PV Link Installation</u> <u>Guidelines</u>.
- 2. See <u>Figure 5-3</u>. Use two fasteners compatible with the mounting structure.



Figure 5-3. Installing to Rail-less Racking

 See <u>Figure 5-1</u>. Fasten the equipment grounding conductor to grounding terminal (C) using a field supplied lug.

**NOTE:** For PV Link model S2502, attachment flange slots (B) may be widened using tooling, such as a drill and bit, where the rail-less racking mount bolt needs to fit for mounting.

- **4.** Use listed bonding hardware only.
- **5.** Size equipment grounding conductor per NEC requirements and tighten per manufacturer specifications.

## **Connecting PV modules**

## 

Equipment damage. Never leave the PV Link MC4 connectors open and exposed to the atmosphere overnight or during rain. Doing so could cause equipment failure. (C000657)

## 

Equipment damage. Never connect PV Link to any other power source. The optimizer is designed to work with series connected PV modules only. Connecting the optimizer to any other power source could cause equipment damage.

(C000661)

**NOTE:** Warranty does not cover water ingress through wiring from external connections due to poor wiring practices.

PV modules require Staubli<sup>®</sup> (Multi-Contact) MC4 connectors. Brands other than Staubli MC4 connectors are not recommended.

### 2014 NEC and Earlier Editions

**NOTE:** For 2014 NEC compliant systems, SnapRS are not required.

See <u>*Figure 5-4*</u> and <u>*Figure 5-5*</u>. Not all PV modules can be wired in series to a PV Link. Parallel series substrings may be necessary for high-voltage modules.

### 2017, 2020, and 2023 NEC Compliant Systems

See <u>Figure 5-4</u> and <u>Figure 5-5</u>. For NEC 2017, 2020, and 2023 NEC compliant systems, connect the substring PV modules in series using one SnapRS device in between each module.



Α	PWRcell Inverter	Е	PV Substring Input -
в	REbus Homerun	F	PV Substring Input +
С	REbus Output -	G	SnapRS Device
D	REbus Output +	н	PV Module

**NOTE:** See <u>*Figure 5-5*</u>. When two smaller series substrings are connected in parallel for high voltage PV modules, each series substring must use the same number and type of PV modules, and there must be one SnapRS device for each module in the array. Additionally, the 'String Count' setting in Mod. Settings at the PV Link device page must be set to '2.'



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#### Figure 5-5. Single PV Substring with Parallel Series Inputs and SnapRS Devices

- A PWRcell Inverter
- D MC4 Branch Connector
- B REbus Homerun
- E SnapRS Device
- C PV Link
- F PV Module

Proceed as follows to install PV modules in series to PV Link:

- Connect the negative lead of the first module in the string to the PV Link at the location marked PV Substring Input (-). See <u>Component Locations</u> for PV Input location.
- **2.** Connect the first module's positive lead to the second module's negative lead.
- **3.** Continue connecting the substring module leads in series until the last module is reached.
- Connect the positive lead of the last module in the substring to the PV Link at the location marked PV Substring Input (+) using an appropriate field installed jumper as necessary. See <u>Component Locations</u> for PV input location.
- Make a substring map using the serial number stickers and record in <u>Table 1 PV Link and</u> <u>SnapRS Important Information</u> the following information:
  - Each PV Link serial number
  - Each PV Link RCP number
  - Number of substrings in parallel.

### **SnapRS Installation Guidlines**

The following important installation requirements should be adhered to for new and existing installations.

- Always verify the number of SnapRS devices detected matches the physical number of SnapRS devices installed. Do not modify "SnapRSInstalled" counts to force PV Link operation.
- Maintain at least 1/2 in (12.7 mm) of clearance between the SnapRS and a PV module substrate. See the PV module installation instructions to determine if any restrictions for mounting devices under the module exist as part of the PV module listing.
- Do not install SnapRS in locations subject to continuous standing water. U-channel racking or confined raceways are prone to water intrusion and are not appropriate locations for SnapRS devices.
- Avoid placing mechanical stress on the MC4 connectors of the input/output of the SnapRS device.
- SnapRS devices should not be installed in such a way that allows direct contact with the building or roofing materials.
- Pre-install SnapRS devices to each PV module's negative (-) whip to ensure a 1:1 ratio.

### Mounting & Connecting RS802 model SnapRS Devices

**NOTE:** MC4 connectors are not watertight unless mated. Never leave this system partially assembled.

- See <u>Figure 5-4</u>. PV modules are installed in series with SnapRS devices connected inline between each module.
- See <u>Figure 5-5</u>. High voltage modules can be configured using parallel substrings to the input of the PV Link.

Proceed as follows to install SnapRS devices:

- See <u>Figure 5-4</u>. For each PV Module in the PV string, connect the positive (+) end of one SnapRS device (G) to the negative (-) whip of the PV module (H).
- 2. Connect the negative (-) end of each SnapRS device to the positive (+) whip of the next PV module in the series.
- Connect the PV substring positive lead to PV Link at the location marked PV Substring Input + (F). See <u>Component Locations</u> for more information.
- Connect the PV substring negative lead with its connected SnapRS device to PV Link at the location marked PV Substring Input - (E). See <u>Component Locations</u> for more information.
- Secure the SnapRS devices to the module frame or racking using PV cable clips or suitably-rated cable ties (UV, exterior use) and allow 3 - 6 in (76.2-152.4 mm) on either side of each SnapRS to provide correct cooling and ventilation.
- Record site details in <u>Table 1 PV Link and</u> <u>SnapRS Important Information</u> and make an array map using <u>Table 2 : PV Array Map</u>.

#### Mounting & Connecting RS802-clip model SnapRS Devices

IMPORTANT NOTE: RS802-clip SnapRS device mounting clips provide grounding for the device and must be used. Do not install the SnapRS without using these clips for mounting to a grounded surface.

**NOTE:** MC4 connectors are not watertight unless mated. Never leave this system partially assembled.

- See <u>Figure 5-4</u>. PV modules are installed in series with SnapRS devices connected inline between each module.
- See <u>Figure 5-5</u>. High voltage modules can be configured using parallel substrings to the input of the PV Link.

Proceed as follows to install SnapRS devices:

- See <u>Figure 5-4</u>. For each PV Module in the PV string, connect the positive (+) end of one SnapRS device (G) to the negative (-) whip of the PV module (H).
- 2. Connect the negative (-) end of each SnapRS device to the positive (+) whip of the next PV module in the series.

- Connect the PV substring positive lead to PV Link at the location marked PV Substring Input + (F). See <u>Component Locations</u> for more information.
- Connect the PV substring negative lead with its connected SnapRS device to PV Link at the location marked PV Substring Input - (E). See <u>Component Locations</u> for more information.
- Mount the SnapRS devices to the module frame using the built-in SnapRS mounting clips. The SnapRS can be mounted to the module frame in one of two configurations:
  - **a.** See <u>*Figure 5-6*</u> for mounting the SnapRS in between the module and the module frame lip.
  - **b.** See <u>*Figure 5-7*</u> for mounting the SnapRS below the module frame lip.



Figure 5-6. Mounting RS802-clip model SnapRS Between the Module and Module Frame Lip



Figure 5-7. Mounting RS802-clip model SnapRS Below the Module Frame Lip

**NOTE:** Solar module frame thickness must be between 1-2 mm for the SnapRS-clip to mount properly. Ensure mounting location allows for connection with module cable leads in a manner which complies with minimum bend radii specified by module manufacturer.

 Record site details in <u>Table 1 PV Link and</u> <u>SnapRS Important Information</u> and make an array map using <u>Table 2 : PV Array Map</u>.

#### **Connecting to Inverter**

### 

Equipment damage. Connect the PV Link output to a REbus-compatible device (± 190 VDC nominal regulated DC bus) only. Connecting to conventional PV inverters or any other device could cause equipment damage. (C000659)

See *Figure 5-8*. Connect each PV Link REbus (RE) output to the REbus DC nanogrid and inverter.



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Figure 5-8. Connecting to Inverter

When connecting PV Links to the inverter:

- Do not reverse the input and output or cross-wire polarity. To avoid confusion, complete the wiring of the PV Link output before installing PV modules.
- Do not connect PV Links in series.
- Connect up to three PV Link outputs in parallel. To connect PV Links in parallel:
  - Connect all negative RE (-) PV Link outputs on a home run together.
  - Connect all positive RE (+) outputs on a home run together.

Current adds when connecting optimizers in parallel. The maximum output current of each PV Link is 8 A. When wiring PV Link outputs to the inverter, observe temperature ratings and current-carrying capacity of the wire used, including appropriate NEC derating factors.

**NOTE:** On a homerun the maximum number of PV Links that may be wired in parallel back to the inverter is three.

**NOTE:** Multiple homeruns will be necessary in larger systems.

- Connect field wiring to the PV Link with Staubli MC4 PV connectors only.
- Mark positive REbus field wiring leads with red insulation or flagging.
- Mark negative REbus field wiring leads with blue insulation or flagging.
- Connect multiple optimizers in parallel, using Staubli MC4 branch connectors or a combiner box.

# Section 6: Operating Instructions

## User Interface via Inverter

PV Link Information and control features are available on the PWRcell Inverter control panel when REbus is energized. See the **Generac PWRcell Inverter Installation and Owner's Manual** for more information.

See <u>Figure 6-1</u>. To access the device page for each PV Link, use left or right arrow buttons (A) on the inverter control panel to scroll through the pages. When on a PV Link device page, press center button (B) to access the main menu and enable or disable the device or to modify settings. The disabled/enabled state does not affect communication with the inverter.



Figure 6-1. Inverter Control Panel

**NOTE:** The PV Link only produces power after the REbus DC nanogrid has been established and the device has been enabled.

## **Commissioning PV Link**

The PV Link ships from the factory in a disabled state. Each unit must be enabled from the PWRcell Inverter control panel. See <u>Table 6-1</u> for settings information. Once the inverter is enabled and REbus voltage is present at the PV Link, the PV Link will be able to communicate on the system. After properly enabling the PV Link, it will detect the REbus nanogrid and begin exporting power based on the system mode and settings selected.

See the *PWRcell Inverter Installation and Owner's Manual* for more information on system modes and commissioning.

To enable and commission PV Link:

- Verify REbus +/- are connected with correct polarity to each PV Link.
- Verify each PV Link has a low resistance ground connection to the inverter ground bar.
- Verify PWRcell Inverter DC Disconnect (s) are in the ON position for each PV Link.
- Verify inverter is enabled.

# Commissioning with SnapRS Devices for PVRSS



### 

Electrocution. Ensure the following important safety settings are correctly configured. Failure to correctly configure PV Link with SnapRS could result in death, serious injury, or property damage.

#### (W000754)

**NOTE:** Before commissioning a PV Link ensure the number of SnapRS devices physically installed on each PV Link is recorded on <u>Table 1 PV Link and SnapRS Important Information</u>.

Proceed as follows to enable PV Link to work as a PVRSS with SnapRS devices:

1. Press the right arrow button on the control module until the PV Link device page appears.

**NOTE:** The device page should read Disabled. If it does not read Disabled, press the center button and disable the device.

- Record the RCPn in <u>Table 1 PV Link and SnapRS</u> <u>Important Information</u>, found on the front cover of this manual.
- **3.** See <u>*Figure 6-2*</u>. Press the center button and select Mod. Settings to access device settings and options.



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### Figure 6-2. PVRSS Commissioning (1 of 8)

**4.** See <u>*Figure 6-3*</u>. If installing parallel series substrings for high voltage modules, select the "String Count" setting and update the value to '2'.



### Figure 6-3. PVRSS Commissioning (2 of 8)

5. See <u>Figure 6-4</u>. Select the "Enable PVRSS" settings and update the value to 'on'.



Figure 6-4. PVRSS Commissioning (3 of 8)

 See <u>Figure 6-5</u>. If installing a small number of PV modules on a substring such that the input voltage will not equal 135 VDC, select the "Vin Startup" setting and lower the value as needed.



### Figure 6-5. PVRSS Commissioning (4 of 8)

 See <u>Figure 6-6</u>. Select the "SnapRSInstalld" setting and set the value to the number of SnapRS devices installed in the PV substring for the PV Link recorded in <u>Table 1 PV Link and SnapRS Important Information</u>.



### Figure 6-6. PVRSS Commissioning (5 of 8)

8. See <u>Figure 6-7</u>. Select "Save" to save Mod. Setting values. Do not exit without saving.



#### Figure 6-7. PVRSS Commissioning (6 of 8)

**9.** See <u>*Figure 6-8*</u>. Press the center button and to select "Enable" to enable the PV Link.



Setpoint	Range	Default	Description
PLM Channel	1 – 12	1	Channel for REbus communications. All devices in a system must use the same channel (except REbus Beacon).
Vin Startup	60 – 135 Volts	135V	Minimum input voltage from the PV substring for the PV Link to make power.
String Count	1 – 2	1	Number of substrings plugged into the input of a PV Link. Set to a value of 2 if paralleling two series substrings for high voltage, 96 cell PV modules.
Enable PVRSS	on/off	off	Enables the photovoltaic rapid shutdown system (PVRSS). Turn this setting 'on' by selecting 'Auto Cfg PVRSS'
SnapRSInstalled	0 – 10	0	This is the number of SnapRS that are counted and stored upon the first successful count of SnapRS.
SnapRSDetected	0 – 10	0	This is the number of SnapRS that are detected after each subsequent count. Counts occur daily.

59.0kWh

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#### Table 6-1. PV Link Settings

Figure 6-9. PVRSS Commissioning (8 of 8)

E-total:

## **Disabling PV Link**

**NOTE:** Disabling a PV Link does NOT power down the PV array if SnapRS devices are not installed. If SnapRS devices are installed, array voltages are limited to less than 80 VDC once PV Link is disabled or its DC disconnect is opened.

**NOTE:** Disabling PV Link does not power down REbus if other devices are providing power to the DC bus.

**NOTE:** The disabled/enabled state of each PV Link persists through AC power outages and DC bus power cycling.

Proceed as follows to disable a PV Link:

- 1. On the PWRcell Inverter control panel, use the left or right arrows to scroll to the page for the desired PV Link.
- 2. Press the center button to enter device settings.
- **3.** Use the up and down arrows to highlight Disable and press the center button to select.
- **4.** Arrow right and press the center button to Confirm.
- 5. Repeat steps 1 4 to disable any additional PV Links in the system.

NOTE: Repeat the process to re-enable each PV Link.

## **AFD Self-Test**

**NOTE:** Arc fault detection is always enabled.

Performing an arc fault detection (AFD) self-test confirms arc fault detection functionality is working correctly. When an arc fault is detected, the status message reads Arc Fault.

Proceed as follows to conduct an AFD test:

- 1. On the PWRcell Inverter control panel, use the left or right arrow keys to scroll to the page for the desired PV Link.
- 2. Press the center button to access the device main menu.
- **3.** Use the up and down arrows to highlight Test AFD and press the center button to enter the test state.
- **4.** Arrow right and press the center button to Confirm.

Upon test completion, the inverter control panel will display a result of Test Success or Test Failure. After a few seconds, the AFD test will automatically clear.

## **PVRSS Self-Test**

After commissioning, verify correct function and configuration of the PVRSS system at any time by manually running the PV Link PVRSS self-test.

Proceed as follows to run the PVRSS self-test:

1. On the PWRcell Inverter control panel press the right or left arrows keys to scroll to the desired PV Link.

**NOTE:** The device page display should read Disabled. If it does read not Disabled, press the center button and Disable the PV Link.

2. Press the center button to access the device main menu and select Test PVRSS to enter the Testing PVRSS state.

**NOTE:** The display will indicate Testing PVRSS during the test process, which can take up to three minutes. Upon successful completion, the display will read: Test Success. The PV Link will automatically re-enable.

## Section 7: Maintenance

## 

Equipment damage. Never open the PV Link. The optimizer is factory-sealed and contains no field serviceable parts. Opening the optimizer could result in equipment damage.

(C000655)

### Maintenance

See <u>*Figure 7-1*</u>. For maximum performance, keep heatsink fins (A) free of leaves and other debris.



Figure 7-1. Heatsink Fins

The PV Link does not require regular maintenance and contains no user-serviceable parts.

## Service

If the PV Link is not operating as expected, or if a PV Link error message appears on the Generac PWRcell Inverter control panel LCD, contact the nearest Independent Authorized Service Dealer (IASD) or Generac Customer Service at 1-888-GENERAC (1-888-436-3722), or visit <u>www.generac.com</u> for assistance.

## Section 8: Troubleshooting

## 

Equipment damage. Connect the PV Link output to a REbus-compatible device (± 190 VDC nominal regulated DC bus) only. Connecting to conventional PV inverters or any other device could cause equipment damage.

(C000659)

Problem	Cause	Solution
Low Sun w/ out SnapRS	PV Link does not have adequate input voltage. PV Links will show 'low sun' every night when the sun goes down or if PV modules are covered. Low sun when the sun is shining indicates a problem w/ PV input. This is not a REbus wiring issue.	<ul> <li>If few modules are installed and substring voltage is lower than 135 V, adjust Vin Startup value in mod. settings.</li> <li>Check PV Link Settings</li> <li>Measure Substring Voltage</li> <li>Inspect PV Wiring</li> </ul>
Low Sun w/ SnapRS	PV Link does not have adequate input voltage. PV Links will show 'low sun' every night when the sun goes down or if PV modules are covered. Low sun when the sun is shining indicates a problem w/ PV input. This is not a REbus wiring issue.	<ul> <li>Verify PV Link was enabled w/ PVRSS.</li> <li>If few modules are installed and substring voltage is lower than 135 V, adjust Vin Startup value in Mod. Settings</li> <li>Check PV Link Settings</li> <li>Measure Substring Voltage w/SnapRS</li> <li>Inspect PV Wiring</li> <li>SnapRS Health Check</li> </ul>
No PV Link Device Comms	<ul> <li>DC Disconnects are OFF for PV Links.</li> <li>Polarity is incorrect for REbus (+/-) between the PV Link and the inverter.</li> <li>PV Link has a poor ground connection to the inverter.</li> <li>One or more REbus DC fuses are blown at the inverter.</li> </ul>	<ul> <li>Verify DC Disconnect is ON.</li> <li>Check REbus Wiring Polarity.</li> <li>Check REbus Wiring Ground.</li> <li>May need to:</li> <li>Inspect REbus Fuses.</li> </ul>
Known PV Link 'Offline'	<ul> <li>A PV Link that has communicated with the inverter previously shows 'offline' at its device page when it's connection to the inverter has been disrupted by:</li> <li>Opening the PV Link DC Disconnect</li> <li>Changing the PLM Channel on the PV Link so that it does not match the inverter.</li> <li>Compromising REbus wiring (+ / - / ground)</li> </ul>	<ul> <li>Verify DC Disconnect is ON</li> <li>Check PV Link Settings</li> <li>Check REbus Wiring</li> <li>May need to:</li> <li>Inspect REbus Fuses</li> </ul>
PVRSS fail: high input	The voltage detected with SnapRS devices installed is higher than expected.	<ul> <li>Verify the SnapRS devices are installed correctly.</li> <li>Run the PVRSS self-test.</li> <li>SnapRS devices have not been installed or have failed.</li> </ul>
PVRSS not configured	PVRSS is enabled on the PV Link, but the SnapR- SInstalld setting indicates no SnapRS devices are installed.	Follow the instructions in the PVRSS Commissioning with SnapRS Devices section. See <u>Commissioning with</u> SnapRS Devices for PVRSS.
PVRSS count mismatch	The number of SnapRS devices listed in the SnapR- SInstalld does not match the number of SnapRSDetected.	Check the Mod. Settings menu and update the SnapRSInstalld value to reflect the number of installed SnapRS devices.
PVRSS fail: low input	The module output voltage is too low to accurately count the SnapRS devices.	If the failure occurs with normal exposure to sunlight, contact the nearest Independent Authorized Service Dealer (IASD) or Gen- erac Customer Service at 1–888–436–3722 (1–888–GENER- AC), or visit <u>www.generac.com</u> for assistance.

If the failure persists, contact the nearest Independent Authorized Service Dealer (IASD) or Generac Customer Service at 1–888–436–3722 (1–888–GENERAC), or visit <u>www.generac.com</u> for assistance.

### **SnapRS Health Check**

There are no functional tests which can be performed on SnapRS devices in the field. However, some simple digital multimeter (DMM) checks can confirm the general health of a SnapRS device.

### DMM Red to SnapRS -, DMM Black to SnapRS +

Resistance reads ~ 12 M $\Omega$ 

**NOTE:** The values above were derived using a Fluke 87 DMM, results may vary. Use of a high quality DMM is required, lower cost DMMs may not yield valid results.

### DMM Red to SnapRS +, DMM Black to SnapRS -

Resistance reads ~ 300 k $\Omega$  to 350 k $\Omega$ 

Diode check reads ~ 0.45 V to 0.55 V



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