



Installation and Operation Manual

PVG-1/PVG-2/PVG-3/PVG-4

Rapid Shutdown Device



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COMPANY PROFILE

Northern Electric & Power Inc. (NEP) was founded in the United States and has manufacturing and R&D facilities in China. The mission of the company is to develop cutting-edge clean energy technologies and provide state-of-the-art solar inverter products to its customers. The first round of investment to the company was US\$20 Million, with a planned total investment of US\$50 Million. The company is headquartered in the city of Tsingtao, a major industrial center and trading port in the northeastern China. The company campus occupies more than 18 acres in the Tsingtao Export Processing Zone, and has more than 650,000 square feet building space. The campus is planned to be connected through a micro smart grid demo community and powered by electricity from solar, wind and micro turbines. Outside China, the company has operation offices in Chicago, U.S. and Vancouver, Canada.

The technology founders of the company are well-known experts in the fields of power electronics, automatic control, signal processing, and communications. Each of the founders has multiple U.S. and world patents in their specialty areas. They received Ph.D. degrees from top universities in North America, and each has more than 10 years engineering and management experiences in leading U.S. companies.

NEP has a complete product line of grid-tied solar inverters, including 180W~500W micro inverters, 1.5kW~5kW single phase solar inverters, and 10kW~500kW three-phase solar inverters. Field deployment results demonstrated high system efficiency and reliability of NEP solar inverters.

NEP is committed to develop Clean, Reliable, Affordable and Efficient (CARE) products for worldwide customers.

1. INTRODUCTION

1.1 Prefix

Dear customer, thank you for choosing the PVG rapid shutdown device. We hope you will find our products meet your need for renewable energy. Meantime, we appreciate your feedback regarding our products.

1.2 Standards Compliance

PVG rapid shutdown devices comply with the NEC 2014 and NEC 2017 article 690.12, and CC 2015 section 64-218.

1.3 How to Use This Manual







This manual provides detailed product information and installation instructions for the PVG rapid shutdown devices (RSD). Please read through this manual before installation and operation.



WARNING: This indicates a situation where failure to follow instructions may be a safety hazard or cause equipment malfunction. Use extreme caution and follow instructions carefully.

1.4 Label

The label is located on the side of the inverter. The information on the label includes technical data as well as type, firmware version and serial number of the device. Safety instructions on the label are listed and explained below:

	Danger! The term "danger" describes an issue which, if ignored can cause personal injury.
	Attention! With the term "attention" a circumstance is listed which may cause property damage if disregarded.
	Instructions for use! Under "Instructions for Use", it is pointed out that installation and operating instructions are to be read and understood before installation or repair.
	Caution, hot surface! Under "Caution, hot surface", it should be noted that surfaces of equipment may be hot and create a burn hazard.
	Special disposal instructions! With "Note Separate Disposal", it is pointed out that this product may not be disposed of with normal garbage. An improper conducted disposal can lead to damage to the environment.
	CE mark The product complies with essential requirements of relevant directives of EU

2. SAFETY INSTRUCTION



WARNING:

PLEASE READ THIS MANUAL BEFORE INSTALLATION. ANY DAMAGE TO THE PRODUCT DUE TO NOT FOLLOWING THIS MANUAL IS NOT COVERED BY THE WARRANTY.

ALL THE INSTALLATION SHOULD BE DONE BY CERTIFIED ELECTRICIAN

BESIDES THE CABLE CONNECTORS, NOTHING INSIDE THE PRODUCT SHOULD BE MODIFIED.

ALL INSTALLATION SHOULD FOLLOW THE LOCAL ELECTRIC CODE



WARNING:

WHEN THE PHOTOVOLTAIC ARRAY IS EXPOSED TO LIGHT, IT SUPPLIES A DC VOLTAGE TO THE PVG RSD.

3. FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class I digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

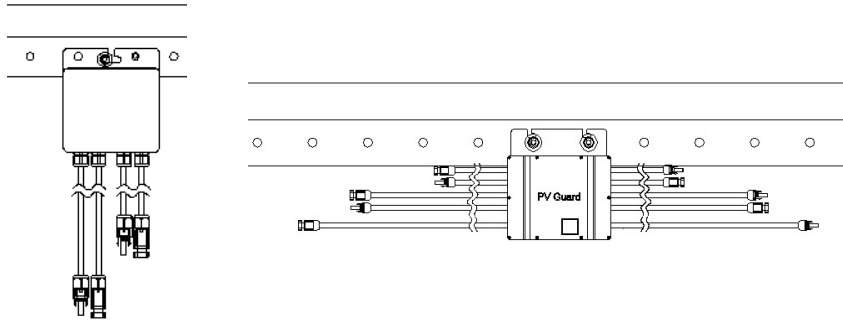
4. INSTALLATION



WARNING: PVG IS A DEVICE WITH MEMORY. IF THE LAST STATE OF A PVG IS UNKNOWN, PLEASE TEST AND CONFIRM IT IS AT OFF STATE BEFORE WIRING. ON STATE PVGS MAY RESULT IN HIGH VOLTAGE ON THE PV STRINGS. BE AWARE THAT INSTALLATION OF THIS EQUIPMENT INCLUDES RISK OF ELECTRIC SHOCK.

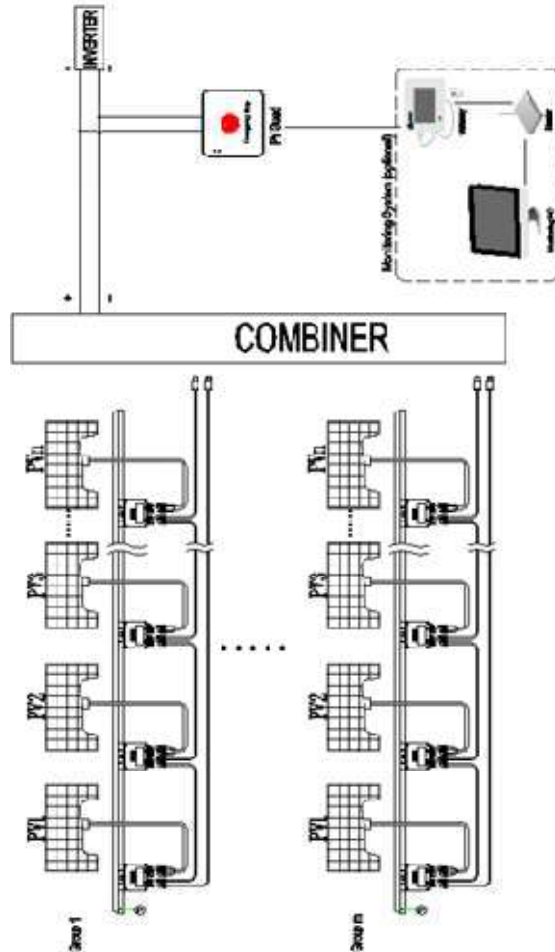
4.1 Attach PVGs to the Racking

Mount PVGs on the racking use hardware recommended by module racking vendor
 Recommend bolt size of 1/4" and torque no more than 76 in lbs.

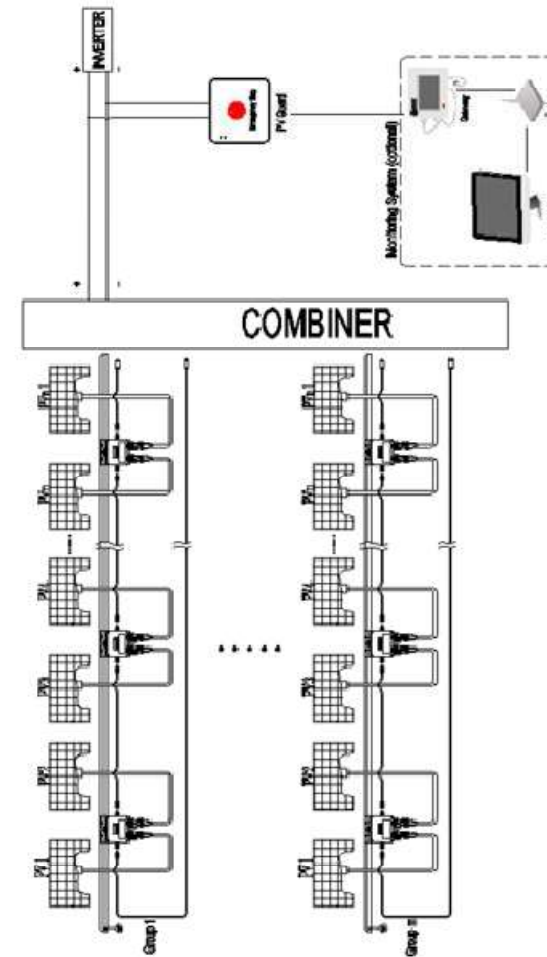


4.2 PVG System Diagram

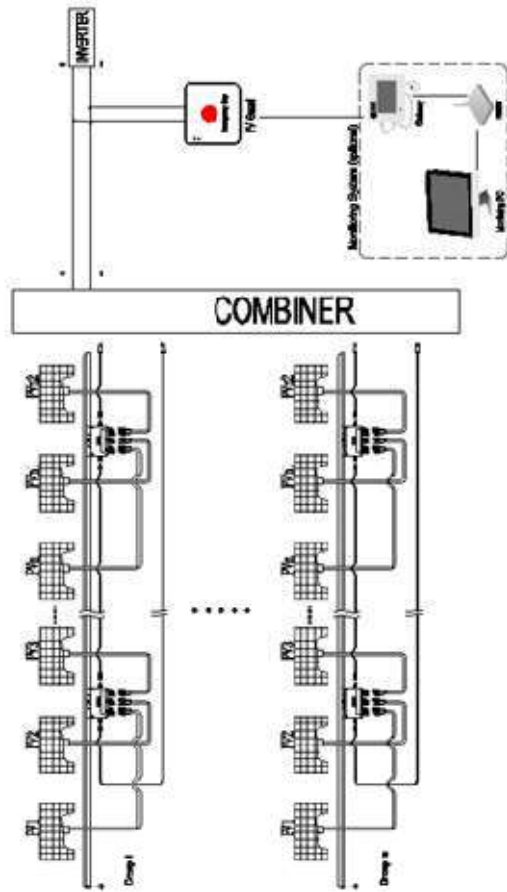
4.2.1 PVG-1 System Diagram



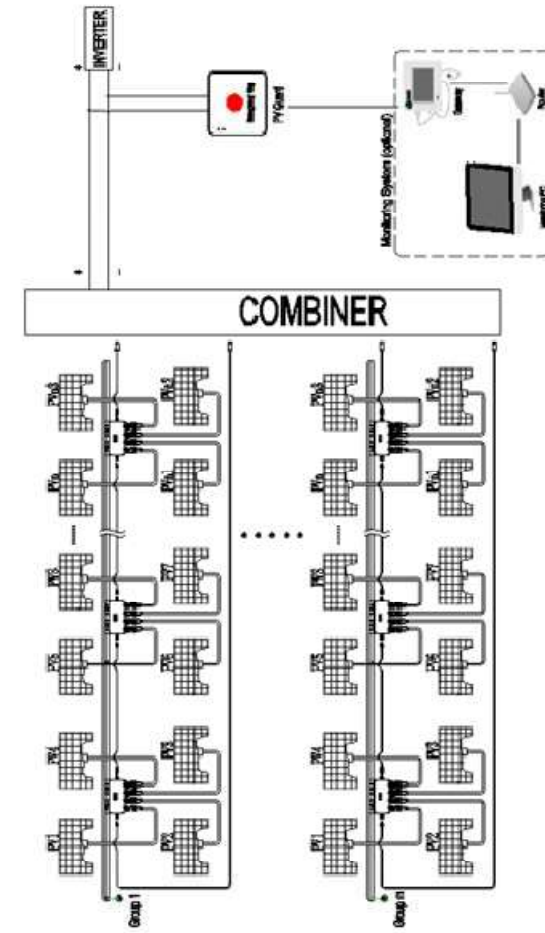
4.2.2 PVG-2 System Diagram



4.2.3 PVG-3 System Diagram



4.2.4 PVG-4 System Diagram



Connecting PVG-C controller to a BDG-256 gateway (Option)

A BDG-256 gateway can connect one or multiple PVG-C controllers, and upload the monitoring data from PVG to NEPVIEWER monitoring website. For details of BDG-256 gateway and NEPVIEWER, please refer to the user manual of BDG-256 gateway.

Connecting BDG-256 gateway to PVG-C is optional, and shall not affect the rapid shutdown function of PVG-C and PVG-1/2/4.

WARNING: ONE PVG-C CAN ONLY MONITOR ONE CHANNEL OF PV PANELS (ONE MPPT).

5. OPERATING INSTRUCTIONS

WARNING: PVG RAPID SHUTDOWN SYSTEM SHALL BE CHECKED REGULARLY TO MAKE SURE IT FUNCTIONS PROPERLY. TEST SHALL BE DONE AT DAYTIME, AND BY MANULLAY PUSH DOWN THE EMERGENCY BUTTON. SOLID GREEN LIGHT SHALL BE ON WITHIN 10 SECONDS AFTER THE EMERGENCY BUTTON IS PUSHED.

WARNING: IN ORDER TO MAKE THE RAPID SHUTDOWN FUNCTION PROPERLY, THE VOLTAGE ON THE DC BUS CAPACITOR OF THE STRING INVERTER SHALL BE REDUCED TO LESS THAN 30Vdc WITHIN 10 SECONDS, USING ONE OF THE FOLLOWING APPROACHES:

- 1) A DC SWITCH ON THE DC INPUT OF THE STRING INVERTER IS SWITCHED OFF WITHIN 10 SECONDS TO DISCONNECT THE DC BUS OF THE INVERTER
- 2) IF THE INVERTER DC BUS CANNOT BE DISCONNECTED, A "BLEEDING" RESISTOR SHALL BE CONNECTED ACROSS THE DC INPUTS OF THE STRING INVERTER AND DISSIPATE THE ENERGY ON THE DC BUS WITHIN 10 SECONDS

PVG is powered by the PV panel. Thus the rapid shutdown is operable during daytime when the PV panel is energized. Rapid shutdown can be activated by one of the following two operations:

- Option-1 Press the E-STOP button on the PVG controller (PVG-C)
- Option-2 Disconnect AC adapter to the PVG-C remote controller

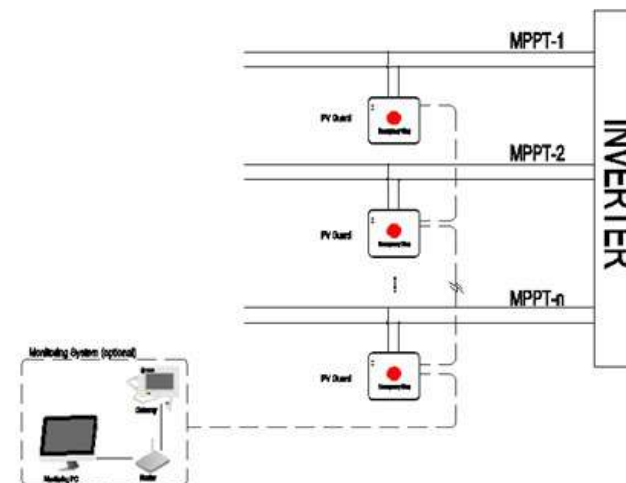
To re-connect the PV panels, a re-connection command can be send to each PVG by the following steps:

- Step-1: Plug AC adapter into the PVG-C
- Step-2: Release the E-Stop button on PVG-C

This operation can only be done at day time since the PVG is powered by PV panels. In most cases, all panels are re-connected immediately following the steps above.

6. PV PANEL MONITORING USING BDG-256

Using BDG-256 gateway, DC current, voltage, power, daily energy, and temperature of each PV panel can be monitored using MICROVIEWER locally, or NEPVIEWER remotely. BDG-256 usage should refer to the BDG-256 gateway manual. Connection of BDG-256 and PVG-C is as follows:



7. SPECIFICATION

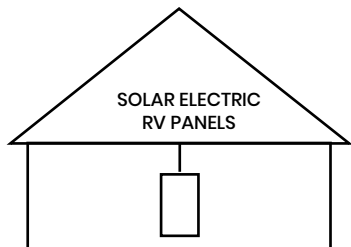
MODEL		PVG-n
INPUT(DC)	Max Recommended PV Power	500(*n)
	Max DC Open Circuit Voltage	80V per input
	Max DC Input Current (Adc)	15
OUTPUT(DC)	Maximum Output Power (Wp)	0 ~ 450(*n)
	Maximum Output Current	15
	Maximum Output Voltage	0 ~ Voc(*n)
SYSTEM	Maximum System Voltage	600/1000/1500
	Maximum Series Fuse Rating	20
PROTECTION	Protection Degree	NEMA-6
	Ambient Temperature	-40C ~ +85C
	Display	LED LIGHT
	Communication:	DC Power Line
	Product Safety Compliance	NEC 2014/2017 690.12

8. Mark

The following label shall be permanently placed close to the PVG-C remote controller.

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

**PUSH RAPID SHUTDOWN
BUTTON TO SHUT
DOWN PV SYSTEM
AND REDUCE
SHOCK HAZARD
IN THE ARRAY**



9. WARRANTY AND PRODUCTION INFORMATION

What does this warranty cover and how long does it last?

This Limited Warranty is provided by Northern Electric & Power Co. Ltd (NEP) and covers defects in workmanship and materials in your PVG and PVG-C. This Warranty

This Limited Warranty is transferable to subsequent owners but only for the unexpired portion of the Warranty Period. Subsequent owners also require original proof of purchase as described in "What proof of purchase is required?"

What will NEP do?

During the Warranty Period, NEP will, at its option, repair the product (if economically feasible) or replace the defective product free of charge, provided that you notify NEP of the product defect within the Warranty Period, and provided that NEP through inspection establishes the existence of such a defect and that it is covered by this Limited Warranty.

NEP will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. NEP reserves the right to use parts or products of original or improved design in the repair or replacement. NEP repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty Period or 90 days from the date of the return shipment to the customer, whichever is greater. All replaced products and all parts removed from repaired products become the property of NEP.

How do you get service?

If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact NEP directly at:

Northern Electric & Power Inc
Email : support@northernep.com

What does this warranty not cover?

Claims are limited to repair and replacement or if in NEP's discretion that is not possible, reimbursement up to the purchase price paid for the product. NEP will be liable to you only for direct damages suffered by you and only up to a maximum amount equal to the purchase price of the product.

This Limited Warranty does not warrant uninterrupted or error-free operation of the product or cover normal wear and tear of the product or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. This warranty does not apply to and NEP will not be responsible for any defect in or damage to: a) the product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment; b) the product if it has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the NEP product specifications including high input voltage from generators and

lightning strikes; c) the product if repairs have been done to it other than by NEP or its authorized service centers (hereafter "ASCs"); d) the product if it is used as a component part of a product expressly warranted by another manufacturer; e) the product if its original identification (trade-mark, serial number) markings have been defaced, altered, or removed; f) the product if it is located outside of the country where it was purchased; and g) any consequential losses that are attributable to the product losing power whether by product malfunction, installation error or misuse.

Disclaimer Product

THIS LIMITED WARRANTY IS THE SOLE AND

EXCLUSIVE WARRANTY PROVIDED BY NEP IN CONNECTION WITH YOUR NEP PRODUCT AND IS, WHERE PERMITTED BY LAW, IN LIEU OF ALL OTHER WARRANTIES, CONDITIONS, GUARANTEES, REPRESENTATIONS, OBLIGATIONS AND LIABILITIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE IN CONNECTION WITH THE PRODUCT, HOWEVER ARISING (WHETHER BY CONTRACT, TORT, NEGLIGENCE, PRINCIPLES OF MANUFACTURER'S LIABILITY, OPERATION OF LAW, CONDUCT, STATEMENT OR OTHERWISE), INCLUDING WITHOUT RESTRICTION ANY IMPLIED WARRANTY OR CONDITION OF QUALITY, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE TO THE EXTENT REQUIRED UNDER APPLICABLE LAW TO APPLY TO THE PRODUCT SHALL BE LIMITED IN DURATION TO THE PERIOD STIPULATED UNDER THIS LIMITED WARRANTY.

IN NO EVENT WILL NEP BE LIABLE FOR: (a) ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, LOST REVENUES, FAILURE TO REALIZE EXPECTED SAVINGS, OR OTHER COMMERCIAL OR ECONOMIC LOSSES OF ANY KIND, EVEN IF NEP HAS BEEN ADVISED, OR HAD REASON TO KNOW, OF THE POSSIBILITY OF SUCH DAMAGE, (b) ANY LIABILITY ARISING IN TORT,

WHETHER OR NOT ARISING OUT OF NEP'S NEGLIGENCE, AND ALL LOSSES OR DAMAGES TO ANY PROPERTY OR FOR ANY PERSONAL INJURY OR ECONOMIC LOSS OR DAMAGE CAUSED BY THE CONNECTION OF A PRODUCT TO ANY OTHER DEVICE OR SYSTEM, AND (c) ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF MISUSE OR ABUSE, OR THE INCORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT.

IF YOU ARE A CONSUMER (RATHER THAN A PURCHASER OF THE PRODUCT IN THE COURSE OF A BUSINESS) AND PURCHASED THE PRODUCT IN A MEMBER STATE OF THE EUROPEAN UNION, THIS LIMITED WARRANTY SHALL BE SUBJECT TO YOUR STATUTORY RIGHTS AS A CONSUMER UNDER THE EUROPEAN UNION PRODUCT WARRANTY DIRECTIVE 1999/44/EC AND AS SUCH DIRECTIVE HAS BEEN IMPLEMENTED IN THE EUROPEAN UNION MEMBER STATE WHERE YOU PURCHASED THE PRODUCT. FURTHER, WHILE THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, YOU MAY HAVE OTHER RIGHTS WHICH MAY VARY FROM EU MEMBERSTATE TO EU MEMBERSTATE OR, IF YOU DID NOT PURCHASE THE PRODUCT IN AN EU MEMBER STATE, IN THE COUNTRY YOU PURCHASED THE PRODUCT WHICH MAY VARY FROM COUNTRY TO COUNTRY AND JURISDICTION TO JURISDICTION..

Warranty Card

Customer Information

Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Tel: _____ Fax: _____ E-mail: _____

System Information

Fault Product(s) Serial Numbers: _____

System Commissioning Date: _____ Product Models: _____

No. of Products Used: _____ Bill of Lading Date: _____

Fault Product(s) Quantities: _____ Fault Time/Date: _____

Fault Message(s) or Code(s): _____

Brief Fault Description and Photos: _____

Installation Information

Modules Used: _____

Modules Quantity: NEP Product quantity per string: _____

Installation Company Name: _____

Installer Name: _____

For the information on our warranty terms and conditions, please see our website: www.northernep.com/en
All fields must be completed in order to process claim.

Customer Signature: _____ Date: _____

*All rights reserved by NEP. This information is subject to changes without notice.





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