



# Installation Guide

Panel-level Rapid Shutdown (PLC)

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## 1 Safety Precautions





### 1.1 Scope of Application

This User Manual describes instructions and detailed procedures for installing, operating, maintaining, and troubleshooting of the following Projoy Panel-level Rapid Shutdown Equipment:

PEFS-PL80P-11 PEFS-PL80P-21 PEFS-PLC-CN

Please keep this manual all time available in case of emergency.

### 1.2 Safety Instructions

 <b>DANGER</b>
<ul style="list-style-type: none"> <li>• DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.</li> </ul>
 <b>WARNING</b>
<ul style="list-style-type: none"> <li>• WARNING indicates a hazardous situation which, if not avoided, can result in death or serious injury or moderate injury.</li> </ul>
 <b>CAUTION</b>
<ul style="list-style-type: none"> <li>• CAUTION indicates a hazardous condition which, if not avoided, can result in minor or moderate injury.</li> </ul>
 <b>NOTICE</b>
<ul style="list-style-type: none"> <li>• NOTICE indicates a situation that can result in potential damage, if not avoided.</li> </ul>

### 1.3 Target Group





Only qualified electricians who have read and fully understood all safety regulations contained in this manual can install, maintain and repair the Panel-level rapid shutdown equipment.

## 2 Preparation

### 2.1 Safety Instructions

 <b>DANGER</b>
<ul style="list-style-type: none"> <li>• Do not disconnect PEFS-PL while the PVRSS is working. There is possibility of dying due to electrical shock and high voltage.</li> <li>• To prevent risk of electric shock during installation and maintenance, please make sure that PEFS-PLC-CN or any other control unit, such as the DC switch of inverter, are turned off.</li> </ul>
 <b>WARNING</b>
<ul style="list-style-type: none"> <li>•The installation, service, recycling and disposal of the PVRSS must be performed by qualified personnel only in compliance with national and local standards and regulations.</li> <li>•Any unauthorized actions including modification of product functionality of any form may cause lethal hazard to the operator, third parties, the units or their property. Projoy is not responsible for the loss and these warranty claims.</li> <li>•While PSFS-PL80P-11 or PEFS-PL80P-21 are used without PEFS-PLC-CN, be sure that 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 that the completed PV system meets the rapid shut down functional requirements. This equipment must be installed according to the manufacturer's installation instructions.</li> <li>•While PSFS-PL80P-11 or PEFS-PL80P-21 are used with PEFS-PLC-CN, be sure that this photovoltaic rapid shutdown system (PVRSS) incorporates one or more pieces of equipment that exercise the rapid shutdown control of PV system conductors required by section 690.12 of the NEC (NFPA 70). other equipment installed in or on this PV system may adversely affect the operation of this PVRSS. it is the responsibility of the installer to ensure that the completed PV system meets the applicable rapid shut down functional requirements. this equipment must be installed according to the manufacturer's installation instructions.</li> </ul>
 <b>CAUTION</b>
<ul style="list-style-type: none"> <li>•The PSFS-PL80P-11 or PEFS-PL80P-21 will become hot during operation. Please do not touch the surface during or shortly after operation.</li> <li>•Risk of damage due to improper modifications.</li> <li>•All electrical installations must be done in accordance with the National Wiring Rules of Standard and local code.</li> </ul>

## 2.2 Explanations of Symbols

Symbol	Description
	<b>Danger of high electrical voltage</b> This device is connected in series to the solar inverter, thus all work to the PVRSE shall only be carried out by qualified personnel.
	<b>Danger of hot surface</b> The components inside the PVRSE will release a lot of heat during operation. Do not touch the surface during operating.
	<b>Read the User Manual First</b> Please read the User Manual first before the installation and operation.
	<b>Recycling and Disposal</b> This device SHALL NOT be disposed of in residential waste.
<b>RoSH</b>	<b>RoSH Directive</b> This device complies the RoSH Directive.

## 3 Product Information

### 3.1 Application Scope of Products

### 3.2 Specification for Product Model

#### PEFS - PL80P-11

PEFS: RSD represents for Rapid Shutdown.

PL: Panel-level.

80: Voltage parameter.

P: Power carrier communication.

1/2: Input port.

1/2: Product Iteration.

### 3.3 System Diagram

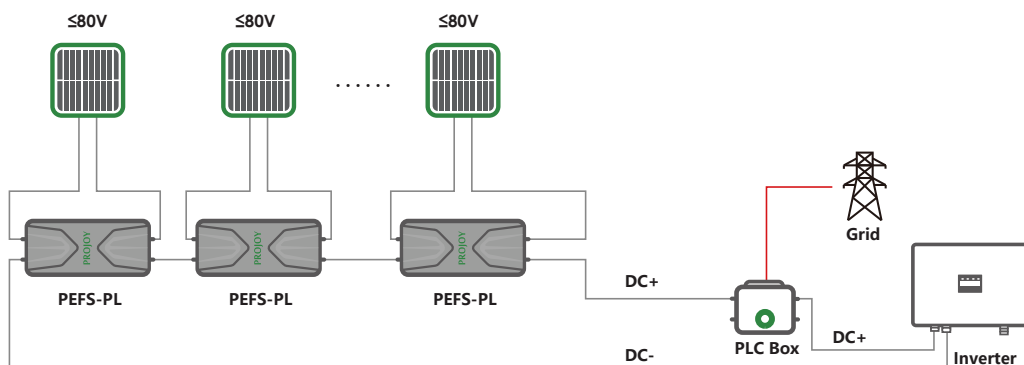


Figure 3.1 System Diagram (PEFS-PL80P-11 and PEFS-PLC-CN)

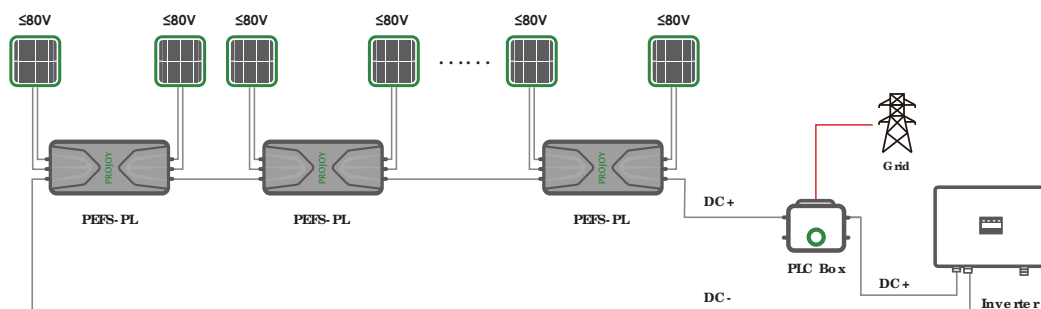


Figure 3.2 System Diagram (PEFS-PL80P-21 and PEFS-PLC-CN)

### 3.4 Overview and Dimensions of products

The dimensions of PEFS-PL80P-11 and PEFS-PL80P-21 are shown in Figure 3.3.

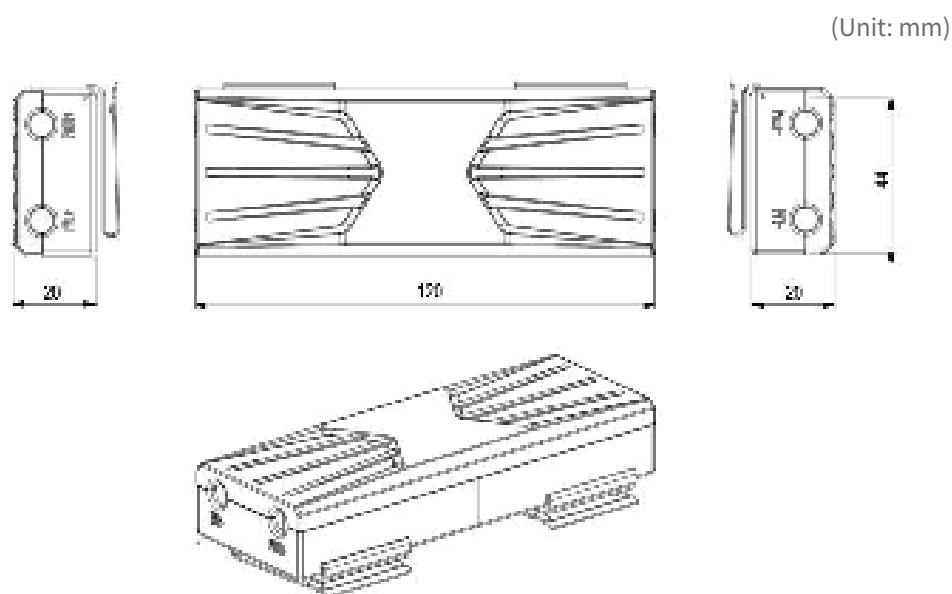


Figure 3.3 Dimensions of PEFS-PL80P-11 and PEFS-PL80P-21

The dimensions of PEFS-PLC-CN are shown in Figure 3.4.

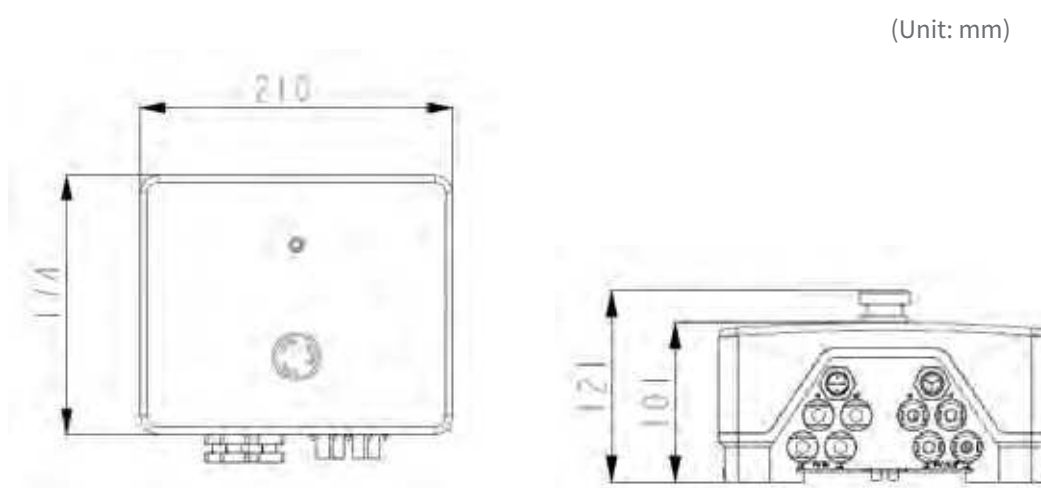


Figure 3.4 Dimensions of PEFS-PLC-CN

### 3.5 Datasheet



MODEL	PEFS-PL80P-11	PEFS-PL80P-21
Max. Input Current [A]	20	20/20
Input Vmax PV [Vdc]	80	80/80
Output Vmax PV [Vdc]	80	160
Max. System Voltage [V]	1500	1500
Isc PV (absolute Max.) [A]	20	20
Rapid Shutdown Time Limit [s]	10	
Initiators	Loss of Power supply	
Operating Temperature [°C]	-40 to +80	
Ingress Protection	Type 6P	
Humidity	0 – 90%	
Communication	PLC	
Overvoltage Category	II	
Mounting	Clip	
Dimension W*H*D [mm]	120 * 44 * 20	

MODEL	PEFS-PLC-CN
Operating AC Voltage Range	100 V-240 V
Norminal Frequency	50/60 Hz
Power Consumption	<1W
DC Input Strings	4 Strings
Operating Temperature Range	-30°C to +55°C
Protection Class	IP65
Communication	PLC
Mounting	Wall Mounted
Connector	MC4 Compatible (DC) , Plug in Connector (AC)
Dimension(W*H*D)	210mm*174mm*101mm
Weight	1800g



## 4 Instructions for installation


### 4.1 Safety Instructions

 <b>DANGER</b>
<ul style="list-style-type: none"> <li>• To prevent risk of electric shock during installation and maintenance, please make sure that PEFS-PC or any other control unit, such as the DC switch of inverter, are turned off.</li> </ul>
 <b>NOTICE</b>
<ul style="list-style-type: none"> <li>• All electrical installations must be done in accordance with the National Wiring Rules of Standard and local code.</li> </ul>

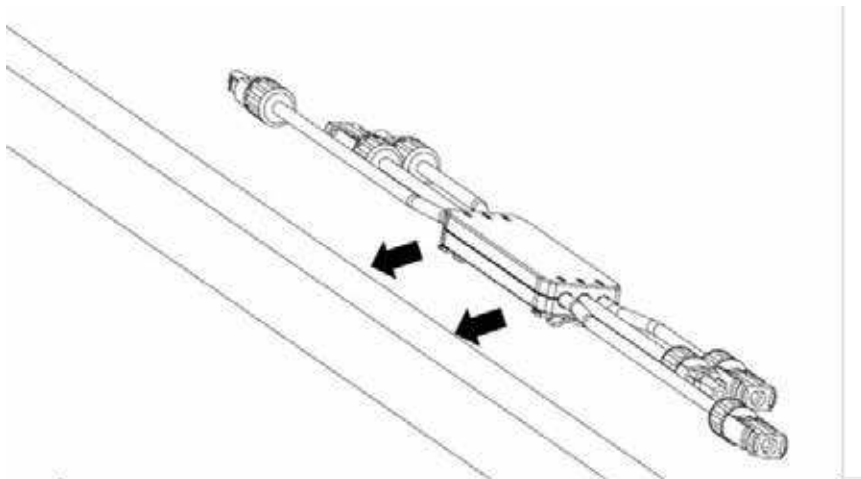
### 4.2 Pre-installation Check

Although Projoy's products have surpassed stringent testing and are checked before they leave the factory, it is uncertain that the products may suffer damages during transportation. Please check the package for any obvious signs of damage, and if such evidence is present, do not open the package and contact your dealer as soon as possible.

### 4.3 Installation of PEFS-PL80P-11/21

 <b>WARNING</b>
<ul style="list-style-type: none"> <li>• While PEFS-PL80P-11/21 are used without PEFS-PLC-CN, be sure that 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 that the completed PV system meets the rapid shut down functional requirements. This equipment must be installed according to the manufacturer's installation instructions.</li> </ul>

- 1) Fix the rapid shutdown device (PEFS-PL80P-11/21) on the frame of solar module.



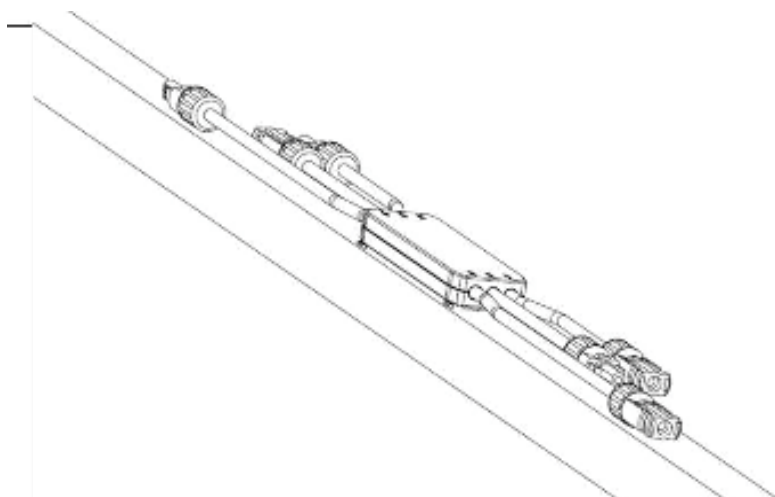


Figure 4.1&4.2 Fixing the Rapid Shutdown Device

2) Connect the input of rapid shutdown device to the solar module.

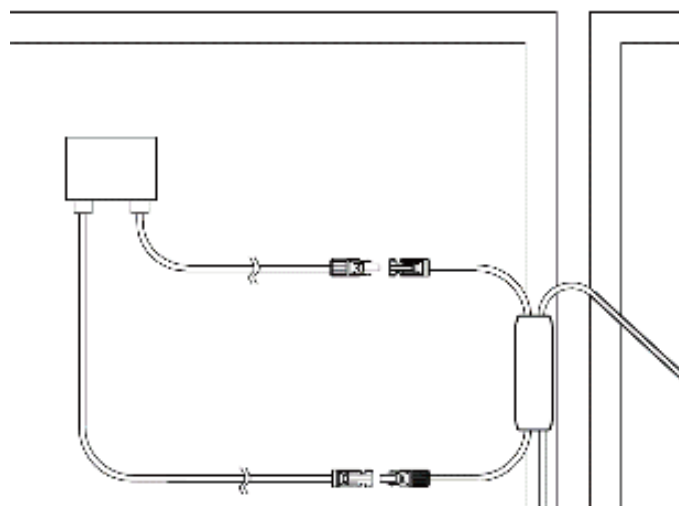


Figure 4.3 Connecting PEFS-PL80P-11 and solar module

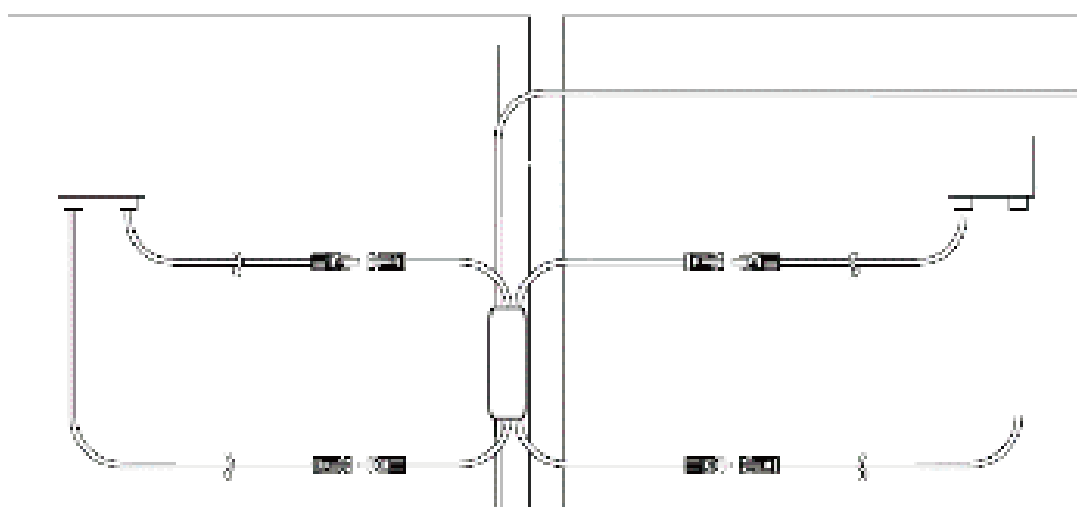


Figure 4.4 Connecting PEFS-PL80P-21 and solar modules

3) Connect the outputs of all the rapid shutdown devices one after another.

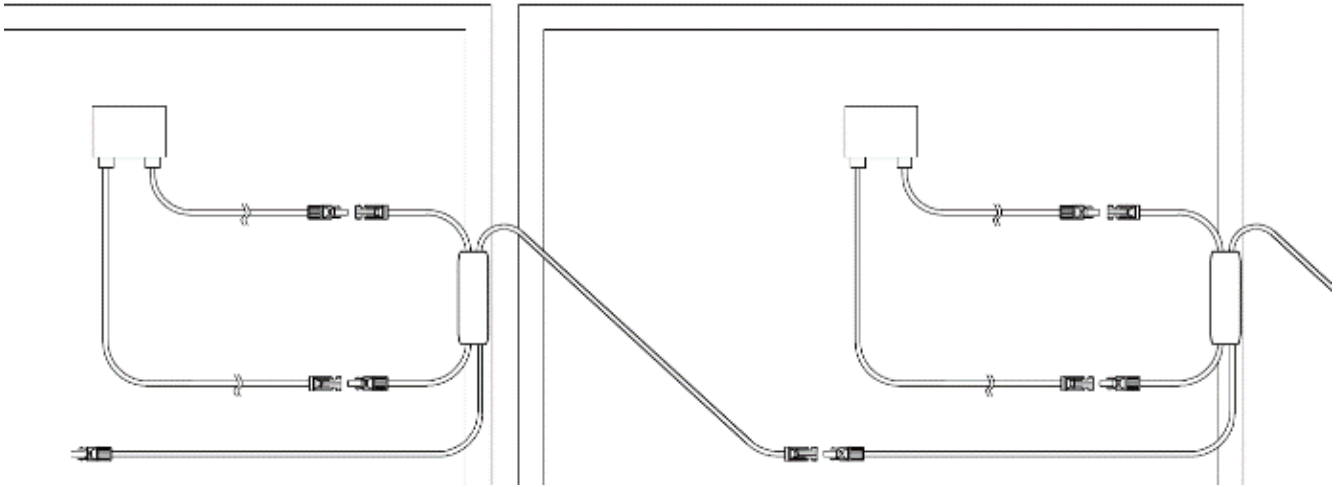


Figure 4.5 Connecting Rapid Shutdown Device in Series

4) While PEFS-PL80P-21 are used without PEFS-PLC-CN, connect each string of the rapid shutdown devices to the solar inverter.

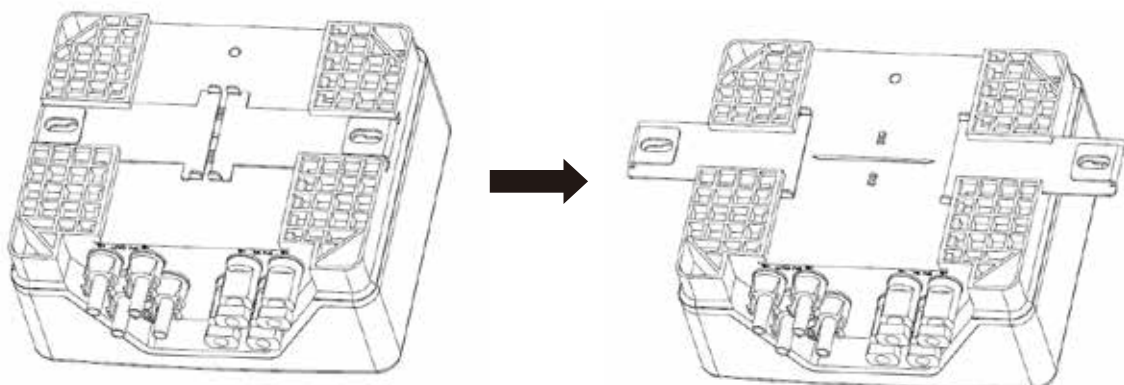
## 4.4 Installation of PEFS-PC



### WARNING

- While PEFS-PL80P-21 are used with PEFS-PLC-CN, be sure that this photovoltaic rapid shutdown system (PVRSS) incorporates one or more pieces of equipment that exercise the rapid shutdown control of PV system conductors required by section 690.12 of the NEC (NFPA 70). Other equipment installed in or on this PV system may adversely affect the operation of this PVRSS. It is the responsibility of the installer to ensure that the completed PV system meets the applicable rapid shut down functional requirements. This equipment must be installed according to the manufacturer's installation instructions.
- Installers should determine the installation location of rapid shutdown controller according to local regulations.

Push out the bracket of the rapid shutdown controller. Fix the rapid shutdown controller (PEFS-PLC-CN) on the wall.



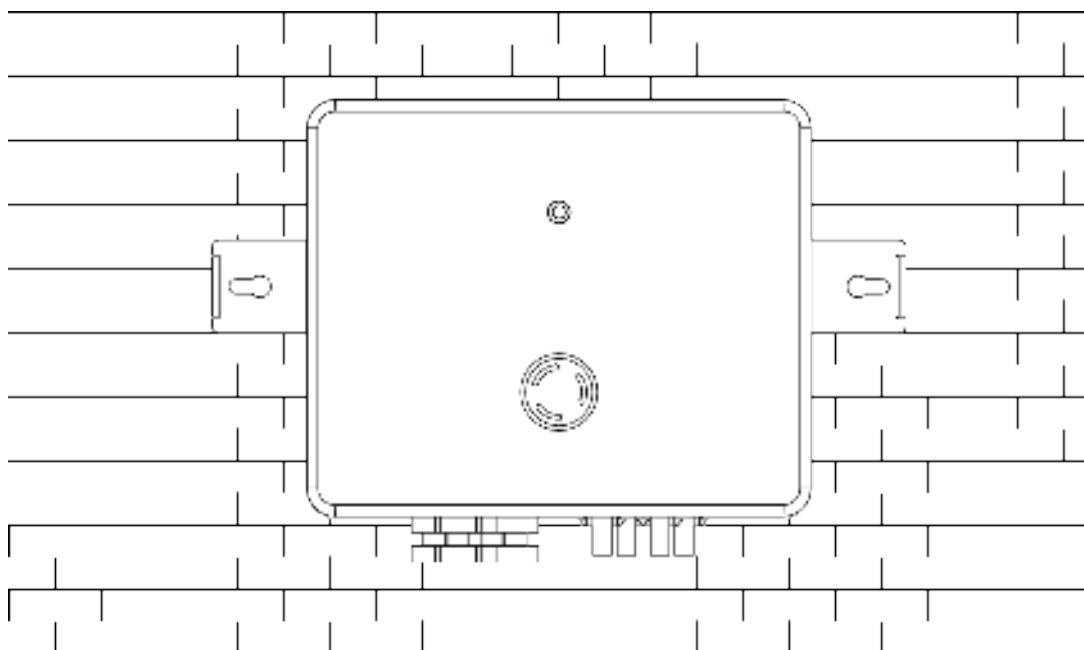


Figure 4.6&4.7 Fixing the Rapid Shutdown Controller

2) Plug each string of rapid shutdown devices to the rapid shutdown controller. Then plug each output cable to the solar inverter.

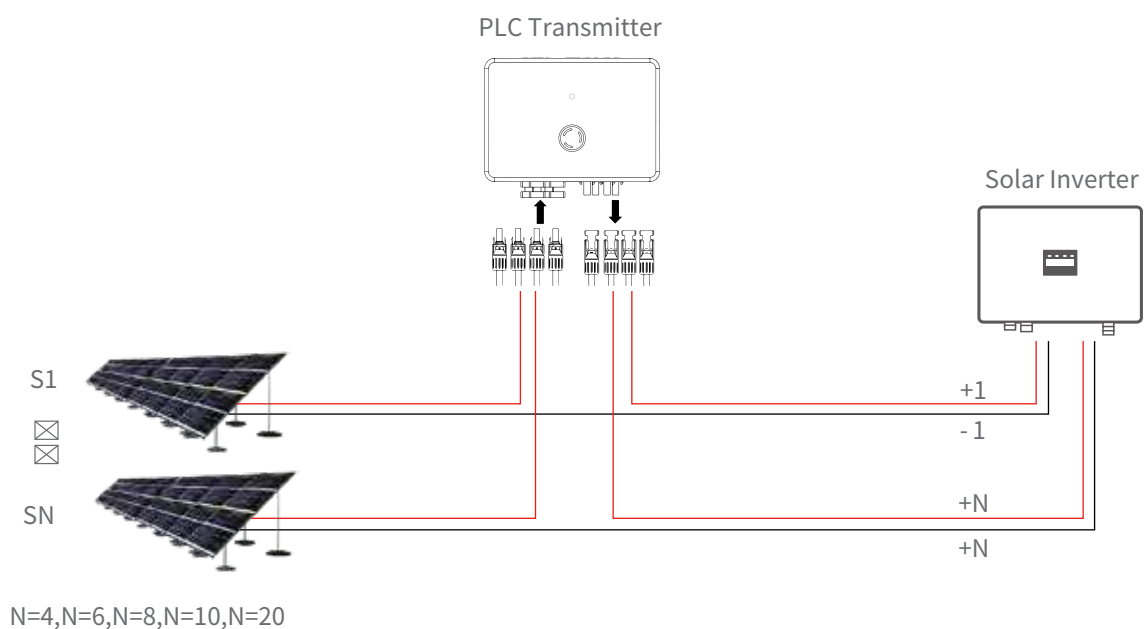


Figure 4.8 Wiring diagram of control box

3) Multiple control boxes can be connected in series and can be controlled by a single master control box.



Figure 4.9 Connection diagram of multiple control boxes

4) Put the warning label in the PV system as required in the section 690.56(C) of NEC (NFPA70).

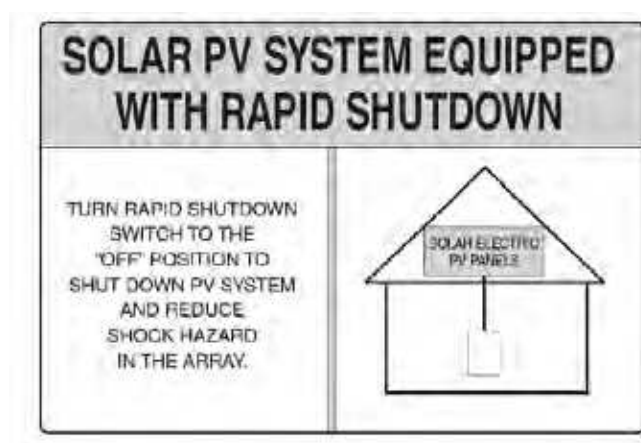


Figure 4.10 Connecting PEFS-PL80P-21 and solar modules

## 4.5 Start the PVRSS system

Turn on the power source of rapid shutdown controller. The rapid shutdown control system will start to work.

The status of lights is shown as below:

	On	Off
<b>Power (Red)</b>	Rapid shutdown controller is powered on and send signals to the rapid shutdown devices in each string.The status of lights is shown as below:	Rapid shutdown controller is powered off or stop sending signals to the rapid shutdown devices in each string.

Table 4.1 Light Status

Firefighters can push the button to cut off all the solar modules while in the emergency.

After the emergency, users can rotate the button and the solar module will work again.

## 5 System Test and Troubleshooting

### 5.1 System test

#### 5.1.1 Function test

Please do the function test regularly.

- 1) Push the button of rapid shutdown controller. The status of light will be off. Check the solar inverter. The DC current will be cut off and the DC voltage will be lower than 30V in 30 seconds.
- 2) Rotate the button of rapid shutdown controller. The status of light will be on. The solar will start to work again.

#### 5.1.2 Maintain test

When the PEFS-PLC-CN stops working, the PEFS-PL80P-11 will have a continuous 0.9 V output and the PEFS-PL80P-21 will have a continuous 1.75 V output.

- 1) Push the button and stop the PEFS-PLC-CN.
- 2) Separate the DC cable and rapid shutdown controller. Test the voltage of each DC cable.

System Voltage = 0.9 V * Quantities of PEFS-PL80P-11 or System Voltage = 1.75 V * Quantities of PEFS-PL80P-21	System Work Normally
System Voltage < 0.9 V * Quantities of PEFS-PL80P-11 or System Voltage < 1.75 V * Quantities of PEFS-PL80P-21	System Work Abnormally

Table 5.1 System test

### 5.2 Troubleshooting

Description	Troubleshooting
Status light is always off. PVRSS doesn't work.	<ol style="list-style-type: none"> <li>1) Check if the button of controller is turned to off;</li> <li>2) Check if the AC power supply is normal;</li> <li>3) Check if the AC voltage is over the operating voltage rang;</li> <li>4) Contact Projoy.</li> </ol>
Status light is on. DC voltage of inverter is 0V. PVRSS doesn't work.	<ol style="list-style-type: none"> <li>1) Test the voltage of DC cable. If the voltage of DC cable is zero, check the connection of DC cable.</li> <li>2) If the voltage of DC cable is normal as described in § 5.1.2, there is something wrong in the DC input of inverter. Contact the supplier of inverter.</li> <li>3) Contact Projoy.</li> </ol>
Status light is on. DC voltage of inverter is 0V. PVRSS doesn't work.	<ol style="list-style-type: none"> <li>1) Check if the button of controller is turned to off;</li> <li>2) Check if the AC power supply is normal;</li> <li>3) Check if the AC voltage is over the operating voltage rang;</li> <li>4) Contact Projoy.</li> </ol>
Status light is on.	1) Test the output voltage of each rapid shutdown device. If the

PVRSS work well. DC voltage of inverter is abnormal ( § 5.1.2).	output voltage is not 0.9V or 1.8V. Replace the rapid shutdown device. 2) Contact Projoy.
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Table 5.2 Troubleshooting

## 6. Recycling and Disposal

This device should not be disposed as residential waste. A rapid shutdown device or controller that has reached the end of its life and is not required is to be returned to your dealer or you must find an approved collection and recycling facility in your area.

## 7. Guarantee Service

Within warranty period of the products, the invoice and date of purchase are required for the service. Besides, the trademark on the product should be clearly visible, otherwise warranty is not available.

The product warranty covers all damage caused by design or production. However, the followings are not covered:

- \* Beyond the warranty period;
- \* No valid warranty card and product serial number;
- \* Damage in transportation;
- \* Incorrect use, operation and modification;
- \* Operation in very harsh environment not as described in this manual;
- \* Out of the scope of installation and use specified in relevant international standards;
- \* Damage caused by abnormal natural environment.

## 8 Contact us

### Projoy Electric Co., Ltd.

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