

ABB solar inverters

Product manual

Rapid Shutdown (RSD) system for residential and small commercial



Power and productivity
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List of related manuals

Rapid Shutdown manuals & guides	Code (English)
Rapid Shutdown (RSD) system for residential and small commercial - Quick installation guide	BCM.00357.0AP_AB
PVI-3.0-3.6-3.8-4.2-TL-OUTD-US (-A) Product Manual	BCG.00681.1_AA
PVI-5000-6000-TL-OUTD-US (-A) Product Manual	BCG.00682.1_AA
UNO-7.6-8.6-TL-OUTD-US-A Product Manual	BCG.00751.0_AA



IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety instructions that must be followed during installation and maintenance of the Rapid Shutdown (RSD) system.



SAVE THESE INSTRUCTIONS!

Keep this document in a safe place near the photovoltaic (PV) system inverter for easy access during installation and maintenance.



WARNING: THE INSTALLER MUST READ THIS DOCUMENT IN ITS ENTIRETY BEFORE INSTALLING THIS EQUIPMENT.

The purpose of this document is to support the qualified technician, who has received training and/or has demonstrated skills and knowledge in construction, to install and maintain the RSD system. This manual covers only the details concerning the RSD system components and how it is installed in the PV system. Information concerning the equipment connected to this product is available from the respective manufacturers.

Warranty conditions can be found on the RSD product page at www.abb.com/solarinverters.

NOTE: Any changes or modifications not approved by the manufacturer could void the warranty of this product.



FCC REMARKS

The equipment has been tested and found to comply with the limits for a Class B 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 of the equipment experiencing interference.*
- *Increase the separation between the equipment and 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.*

Product Manual

Rapid Shutdown (RSD) system for residential and small commercial

1 - Introduction and safety



2 - Installation



3 - Operation



4 - Troubleshooting



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Introduction and safety

1

Description

The ABB Rapid Shutdown (RSD) system is designed to provide compliance with 2014 National Electric Code (NEC) section 690.12 by opening the photovoltaic (PV) circuit(s), disconnecting them from the ABB inverter and removing all residual voltage and current on the conductors. The RSD box is to be installed within ten (10) feet of the PV array on the roof or within five (5) feet of the PV circuits entering the building. The array's PV source circuits (strings) are to be connected directly to the input terminals of the RSD box. Depending on the model chosen, the strings may pass through the box or combine two strings together. Each output conductor is individually disconnected in the event rapid shutdown is initiated. A +24V control conductor provides power to the normally-open contactors which perform the rapid shutdown.

Warnings in this document

Below is a list of special safety symbols used in this manual that highlight potential safety risks and/or provide useful information. The symbol usage is described below:



CAUTION

The reader should stop, use caution and fully understand the operations explained before proceeding.



DANGEROUS VOLTAGE

The product works with high voltages. All work on the RSD box must follow the described documentation and must comply with all prevailing codes and regulations associated with high voltages.



UL1741 Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources. CSA-C22.2 No. 107.1-01 - General Use Power Supplies.

Equipment safety warnings

In addition to the safety and hazard symbols, the following symbols are also used in this installation guide.



Equipment Ground (protective earth)



Alternating current (AC)



Direct current (DC)

General installation warnings

The ABB RSD system is designed to comply with the 2014 National Electric Code, section 690.12 and tested according to international safety requirements (UL1741); however, certain safety precautions must be observed when installing and operating this product. Read and follow all instructions, cautions and warnings in this installation manual.

All operations regarding transport, installation, and maintenance must be carried out by qualified, trained personnel and in compliance with all prevailing local codes and regulations.

This RSD system operates only when properly connected to the power supply and PV strings. These connections must be made only by qualified technical personnel.

Wiring methods used should be in accordance with the National Electric Code, ANSI/NFPA 70 and/or any prevailing local codes and regulations.

Assembly warnings

Prior to installation, inspect the unit to ensure the absence of any transport or handling damage which could affect the integrity of the product; the failure to do so could result in safety hazards. Unauthorized removal of necessary protection features, improper use, incorrect installation or operation may lead to serious safety and shock hazards and/or equipment damage.

Clothing and protective devices

Appropriate personal protective equipment (PPE) must be worn at all times when servicing this equipment under any conditions which may subject personnel to hazardous voltages or temperatures that are not touch-safe. All equipment operations should be performed with proper electrically-insulated instruments.



Location of safety notices and labels

Note the location of safety notices on the RSD box for notification and protection. See Figure 1 and Figure 2 below for location of the safety labels on the left side and inside the RSD box. Labels must not be hidden with external objects or parts such as rags, boxes or other such equipment. They should be cleaned periodically and always maintained in view.

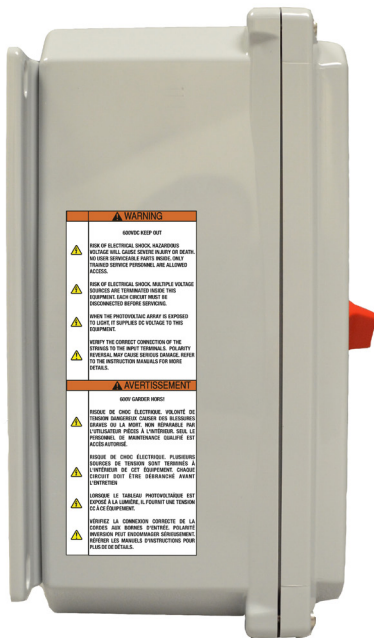


Figure 1

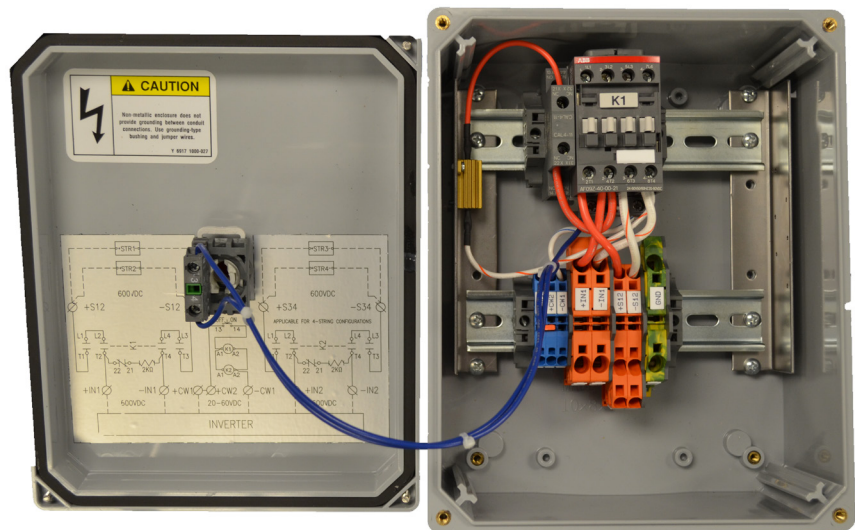


Figure 2

Appropriate usage

The ABB RSD system is a remote DC disconnect system that disconnects the current and voltage of the connected PV strings from the output conductors connected to the ABB string inverter. This product is designed for outdoor use, but can be used indoors if installed to specified environmental and mounting parameters stated in this manual, and adherence to the 2014 National Electric Code section 690.12. (See environmental conditions below and environmental checks in section 2 - Installation).

Conditions of Use

- The DC operating current and voltage **MUST NOT** exceed the limits documented in the technical specifications found in section 5 - Appendix.
- The RSD system is to be used only if all the technical requirements in this manual are applied.
- The RSD system is certified for use only with ABB string inverters (600V).

Improper or Prohibited Use

The following actions are dangerous and not consistent with acceptable practice under the terms of the warranty:

- Installing the equipment in environments with flammable conditions.
- Using the equipment with safety devices not working or disabled.
- Using the equipment or parts of the equipment by connecting it to other machines or equipment, unless otherwise expressed.
- Modifying parts of the equipment in order to vary the performance or change its protection.
- Cleaning with products that may corrode parts of the equipment or with products that might generate electrostatic charges.
- Using or installing the equipment or parts of it without having read the contents of this manual.

Environmental Conditions

The RSD box is intended to be installed on rooftops, but only in environmental conditions indicated in this manual (such as between the operating temperature range of -25°C to +70°C; installation in direct sunlight is acceptable; installation underneath a module is ideal). Care must be taken to provide adequate ventilation if installed indoors.



Available versions

The RSD boxes are provided in three models according to the number of string inputs and PV output circuits. All models contain non-fused terminal blocks for string inputs, PV output and +24V power supply connections. One model is designed for two input strings and two output strings. The remaining two models combine two strings. The two string-combining models include an integrated DC disconnect switch in order to comply with 2014 NEC section 690.15(C) Direct-Current Combiner Disconnects.





Model	Configuration	Disconnect	Weight	Dimensions
RS2-2PN6	2 string in, 2 out	No	6.0 lbs.	10.54" x 8.54" x 5.32"
RS2-1CN6	2 string in, 1 out	Yes	5.8 lbs.	
RS4-2CN6	4 string in, 2 out	Yes	6.2 lbs.	

Regulatory nameplate

Technical data in this manual does not supersede the data on the labels affixed to the equipment. The product nameplate is affixed to the Rapid Shutdown box and provides the following information:

1. Certification
2. Product origin
3. Model type and number
4. DC current/voltage ratings
5. Environmental data





1

C US

UL 1741 and NEC 690.12 Compliant

www.abb.com/solar

SOLAR RAPID SHUTDOWN DEVICE WITH COMBINER

MODEL: RS4-2CN6

4 PV SOURCE CIRCUITS, 2 PV OUTPUT CIRCUITS 3

4 DC RATING	
Power Stage	
Max. Input/Output Voltage	600 V ===
Range of Input Operating Voltage	90 - 580 V ===
Max. Input Current, per Channel	10 A
Max. Short Circuit Current, per Channel	11.25 A input/ 22.5 A output
Max. Output Current, per Channel	20 A
Control Power	
Input Voltage	24 - 30 V ===
Input Current	0.31 A

Operating Ambient Temperature: -25°C to +70 °C 5

Type of Enclosure: 2 Type 4X

Country of Origin: 2 USA

For more details about product specifications refer to the User Manual

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Transportation and handling

When being transported, the RSD kit and electronic components must be protected from vibration, mechanical shocks, humidity, etc.

Incoming inspection

It is the customer's responsibility to examine the condition of the RSD kit (see Table 1 below for description). Upon receipt of the kit, check the following:

- Inspect the shipping container for any external damage.
- Inventory the contents against the table below and verify receipt of all items.
- Use care not to discard any equipment, parts or manuals.
- Call the delivering carrier if damage or shortage is detected.

If inspection reveals damage to any component, contact the supplier or authorized distributor for a return merchandise authorization (RMA) and instructions regarding the process.

Quantity	Description	Part Number	Included in standalone or kit
1	Rapid Shutdown (RSD) box (includes two mounting brackets - part number MFLK10)	RS2-1CN6 RS2-2PN6 RS4-2CN6	Standalone and kit
1	24V power supply	S8VK-G01524	Kit only
2	Three-position terminal blocks	1SNA290428R0400	Kit only
1	Inverter-power supply conductors kit (Terminal 1, Terminal 2, GND)	D 2411 0000-799	Kit only
1	Cover for three-position terminal block	1SNA291723R2000	Kit only
1	Rapid Shutdown (RSD system for residential and small commercial - Quick installation guide	BCM.00357.0AP_AB	Kit only

Table 1

Select the RSD installation location

The RSD kit must be installed by qualified installers and/or licensed electricians according to the applicable local code regulations (NEC, CEC, and other). Once physically mounted, the PV circuit wiring must be carried out without control power supplied to the contactors. The PV system disconnect switch or breaker (AC) must be open in order to isolate the power supply and ensure control power is removed from the circuit.



Environmental check

- See technical data in section 5 - Appendix to check the environmental parameters to be observed (degree of protection, temperature, etc.).
- The maximum operational ambient air temperature (+70°C/158°F) **MUST** be considered when choosing the RSD box installation location.
- To avoid overheating, always make sure the flow of air around the RSD box is not blocked.
- Do not install in places where gases or flammable substances may be present.
- The RSD box has been designed to operate in direct sunlight.

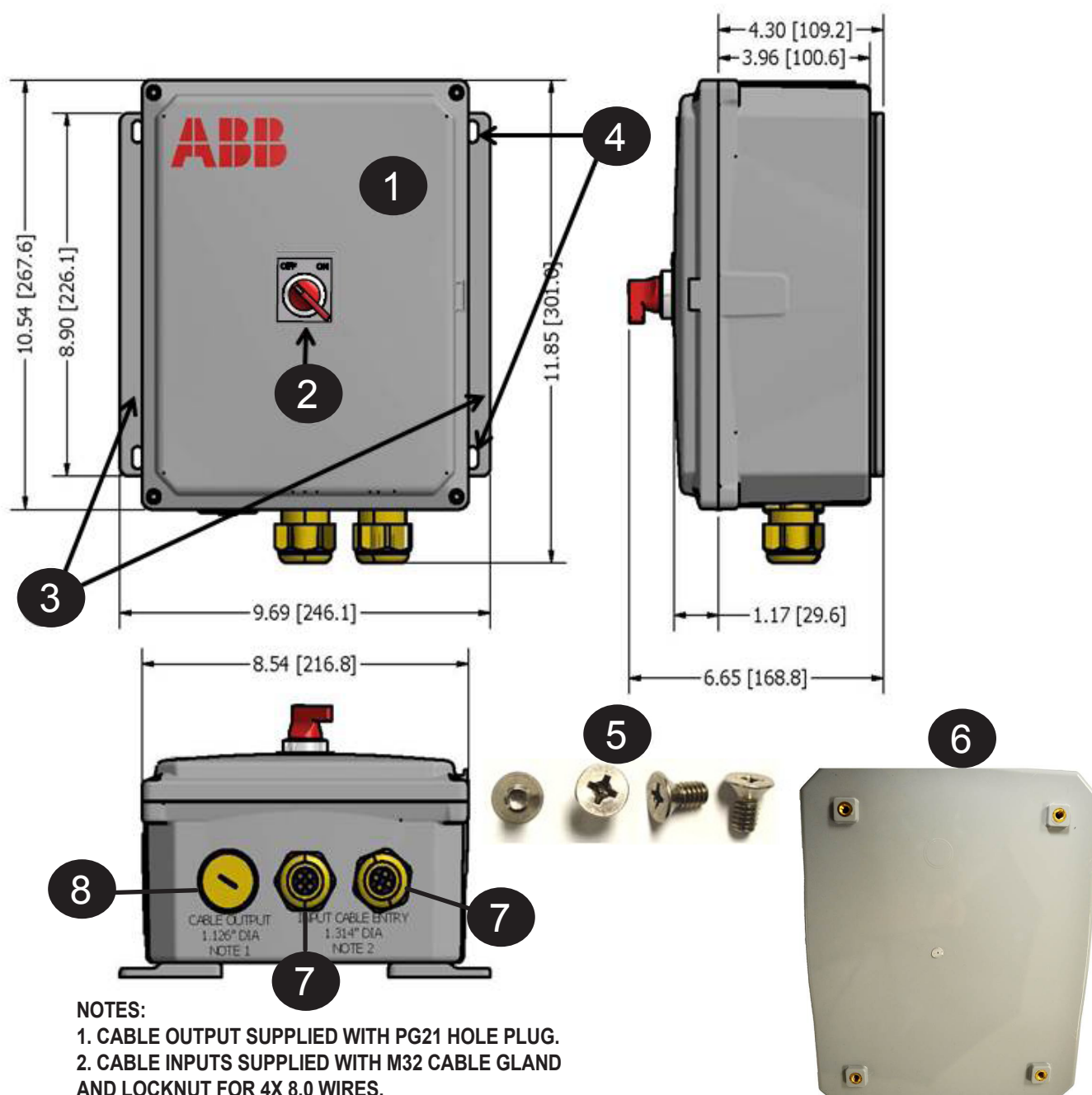
Installation position

The RSD box does not require any clearances to be maintained in order for operation. However, it is recommended to allow adequate access to the RSD in case maintenance or troubleshooting of the PV system is needed. Refer to section 110.26 of the NEC for the required clearances. When choosing the location and position, comply with the following conditions:

- Install the RSD box on the PV module mounting rail, racking system, the roof, or in the attic below the PV array.
- The RSD box may be installed at angles from horizontal to vertical.
- Ensure sufficient working area around the RSD box to allow easy access for maintenance and/or servicing of the PV system.

Labeled illustration of RSD box and mounting bracket

Label	Description
1	RSD disconnect box / cover
2	DC disconnect switch
3	Mounting bracket
4	Mounting holes
5	RSD mounting bracket screws
6	RSD mounting bracket holes
7	String conductor input openings/cable glands
8	Output conductor opening



Mounting the RSD box

The RSD box is intended for roof installation within ten feet of the PV array. The RSD box may also be installed inside the attic below the array within five feet of the point of entry to the building.

The mounting bracket **3** will come connected to the RSD box via the mounting bracket screws **5** and RSD mounting bracket holes **6**.

When mounting the RSD to the PV module racking, use the racking manufacturer's components to secure the mounting bracket **3** to the racking structure through the mounting holes **4** provided on the bracket. On tilt racks, the RSD may be mounted vertically behind the array by securing the mounting bracket **3** to the structural components of the racking. At least two mounting holes must be used to secure the RSD box to the rail or racking structure.

If mounting the RSD box directly to the roofing surface, ensure the penetrations are sealed and flashed according to roofing standards to prevent water intrusion. If the RSD box is installed in an attic, a metallic raceway must be used to bring the PV conductors to and from the RSD box per NEC 690.31(G). The mounting bracket **3** shall be secured to a permanent wall or structural member by the appropriate fasteners for the material to be mounted on. At least two mounting holes must be used.

RSD Rooftop box wiring details

Cable glands have been provided for the PV inputs and a $\frac{3}{4}$ " conduit entry for the PV outputs and +24V control power in order to preserve the integrity of the NEMA 4X environmental rating. See Figure 3 which shows cable glands and the plugged conduit opening on the bottom of the RSD box. The PV string conductors and equipment grounding conductor may enter the box through these cable glands rather than utilizing conduit. If conduit for use on the inputs is preferred or required due to indoor installations, remove the cable glands and connect 1" conduit using the appropriate fittings.



Figure 3

In the OFF position, the 24V control power is removed, opening the contactors. In the ON position, the 24V control power is present when the power supply is producing power. Before wiring the RSD box:

- Turn the disconnect switch **2**, if applicable, to OFF.
- Open the PV system disconnect switch or circuit breaker (AC) to ensure the RSD power supply is not active.
- Cover the PV modules or isolate the PV strings, if possible.

The RSD box utilizes pressure-type terminal blocks for all conductor connections. Acceptable wire size ranges from 14 AWG to 10 AWG for the PV string inputs, when entering the RSD box via the cable glands, and 12 AWG to 6 AWG for the PV outputs. If removing the cable glands on the input side in order to use with conduit, the maximum size PV source conductor allowed is 8 AWG.

The equipment grounding conductor (EGC) must connect the inverter and array in order for the inverter's ground fault protection to operate as required. Ensure the EGC from the array continues on to the inverter. Acceptable wire sizes range from 14 AWG to 10 AWG when entering through the installed cable glands, and 14 AWG to 8 AWG when entering through conduit. Refer to local codes for appropriate wire size on all conductors.



PV string connections

The PV string inputs are labeled +S# and -S# to denote "+ string" and "- string" and the string number (1, 2, 3, 4). The equipment grounding conductor terminal is labeled "GND." Use the procedure below to connect wiring to these blocks.

Use only Copper (Cu) wire rated for 90°C, solid or with type B or type C stranding (19 strands maximum). For conductors with finer stranding, a suitable UL-listed wire ferrule must be used. For suitable wire size (AWG), refer to NFPA NEC Table 310.15(B)(16).

- Strip 0.49" of insulation from the end of the conductor to be terminated, and twist the strands.
- Use a small (approximately 1/4" wide) flat blade screwdriver to open the pressure contact.

See Figure 4 to follow steps 1 - 3.

- Step 1: Insert the screwdriver in the square tool slot at an angle.
- Step 2: Lightly press the screwdriver toward the associated wire slot until the clamp opens; hold the clamp open with the screwdriver. Insert the wire into the associated round wire slot until seated.
- Step 3: Release the pressure on the screwdriver and remove it from the slot.
- Step 4: Check the security of the wire in the connector by gently tugging the wire.

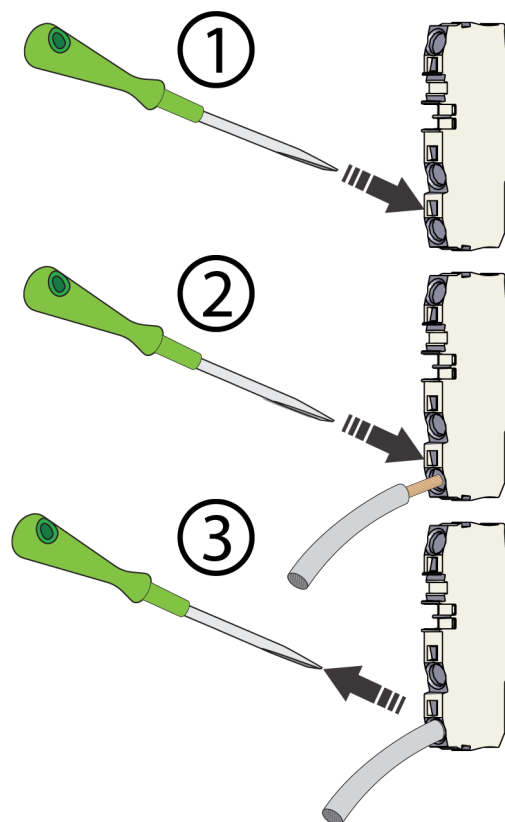


Figure 4

PV output connections

The PV output terminals are labeled +IN# and -IN# to denote “+ inverter” and “- inverter” and the circuit number (1 and 2, when present). Use the procedure below to connect wiring to these blocks. Use one of the open positions of the “GND” terminal to bond the exiting EGC to the inverter and the EGC from the array.

Strip 0.59” of insulation from the end of the PV output conductors to be terminated, 0.42” of insulation off the EGC and twist the strands.

Repeat steps 1-4 above to connect the PV output conductors to +IN, -IN and GND terminals.

Control power connections

The +24V power conductor is connected to the blue terminals labeled +CW1 and –CW1 which denotes “+ control wire 1” and “- control wire 1.” A jumper is installed between +CW1 and +CW2. This is to remain in position for installations that do not require the optional e-stop button. These terminals accept wire ranges of 26 AWG to 12 AWG; refer to local codes for appropriate wire size. Use the procedure below to connect wiring to these blocks.

- Strip 0.49” of insulation from the end of the conductor to be terminated, and twist the strands.
- Repeat steps 1-4 in Figure 4 to connect the Control Wires to the +CW1 and -CW1 terminals.

The RSD control power conductors are permitted to occupy the same raceway or enclosure as the PV output conductors, provided all conductors have an insulation rating equal to the maximum circuit voltage applied to any conductor in the enclosure or raceway per NEC 300.3(C)(1).

Instructions for installation of a watertight conduit

If connecting metallic conduit to the RSD box, use appropriate grounding bushings to connect the equipment grounding conductor (EGC) or equipment bonding jumper if more than one metallic conduit is present. The RSD box is plastic and does not require equipment grounding.

The output is designed for use with ¾” metal conduit. The input is designed for possible use with 1” conduit with the cable gland removed. The conduit shall be connected to the enclosure using a liquid-tight connector; insulated, steel, for metallic LT conduit in order to maintain UL 50E, Type 4 compliance. The liquid-tight connector shall be connected to the conduit before the liquid-tight connector is connected to the polymeric enclosure.



Optional E-stop connections

If required, an optional emergency stop button may be wired in series with the +24V control power to act as the rapid shutdown initiation switch. This may be completed by: 1) wiring the e-stop to the rooftop RSD box or 2) connecting the e-stop in series with the +24V control power conductors. See Figure 5 below for an example of an e-stop connection in series with the control conductors.

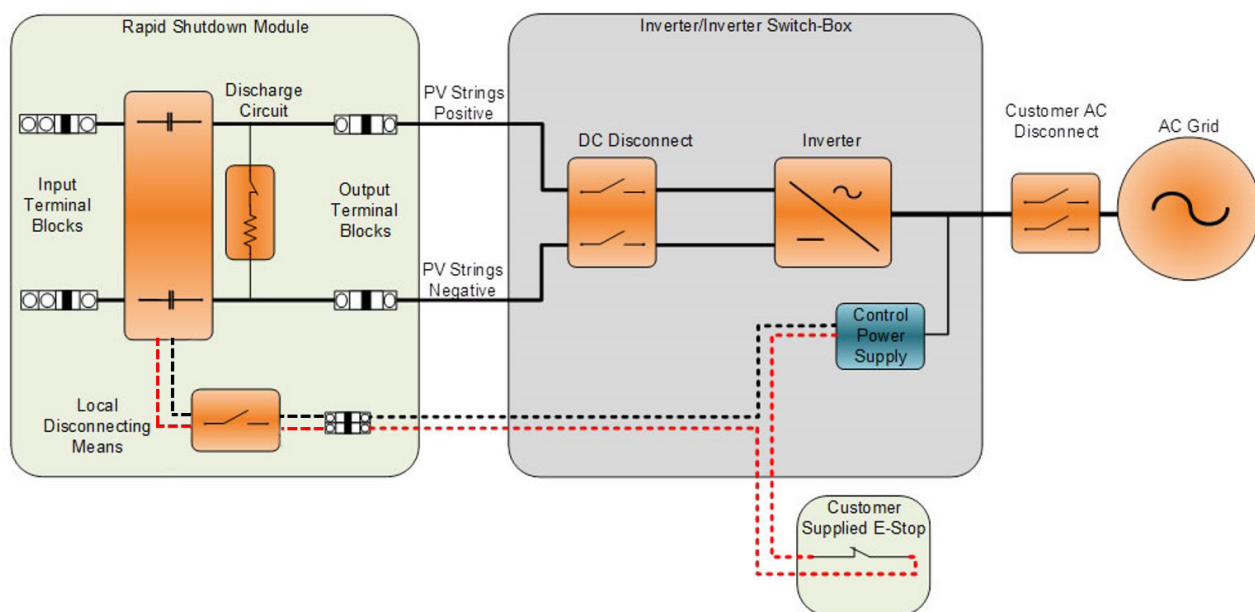


Figure 5

Wired to RSD

When wiring the optional e-stop to the RSD box, an additional +24V power conductor is connected to the blue terminals labeled +CW2 and –CW2 to denote “+ Control Wire 2” and “- Control Wire 2”. The jumper installed between +CW1 and +CW2 is to be removed when the e-stop button is used. These terminals accept wire ranges of 26 AWG to 12 AWG; refer to local codes for appropriate wire size. Use the procedure below to connect wiring to these blocks.

- Strip 0.49” of insulation from the end of the conductor to be terminated and twist strands.
- Use a small (~1/4” wide) flat blade screwdriver to open the pressure contact.

See Figure 4 to follow steps 1 - 4.

- Step 1: Insert the screwdriver in the square tool slot at an angle.
- Step 2: Lightly press the screwdriver toward the associated wire slot until the clamp opens; hold the clamp open with the screwdriver. Insert the wire into the associated round wire slot until seated.
- Step 3: Release the pressure on the screwdriver and remove it from the slot.
- Step 4: Check security of the wire in the connector by gently tugging the wire.



Wired in series

When wiring an emergency stop button in series with the +24V control power conductor, these conductors will need to run through the e-stop. Follow the instructions supplied with the e-stop button to wire this switch. See Figure 5 for an example of the e-stop wired in series with the control power conductors.



Inverter power supply wiring kit installation details

The Rapid Shutdown kit includes two terminal blocks, a 24V power supply and three short conductors used to connect the power supply to the inverter AC terminals and ground. This power supply is to be installed inside the wiring box of the ABB string inverter.



Note this is a 600Vdc-maximum, Rapid Shutdown System and is to be used with inverters in no higher than 600Vdc applications.

Before installing the power supply, open the PV system AC disconnect switch or PV breaker to ensure the inverter is disconnected from the grid.

The RSD Power Supply must only be connected to a 3-wire 240V line-to-line or 2-wire 208V line-to-line inverter output.



The Rapid Shutdown kit is NOT compatible with a 277V grid connection. It must only be used with a 208V or 240V grid connection.



Included in the RSD kit is a terminal block cover which must be installed on the exposed side of the three-position terminal blocks supplied with the kit. In Figure 6 below, the contacts of the green-colored ground terminal block and beige-colored line terminal block would have direct metal-to-metal contact on the DIN rail without the terminal block cover. Figure 7 shows the terminal block cover installed on the line terminal block which prevents this direct metal contact. The terminal block cover is required to ensure metal contact between terminal blocks does not occur.

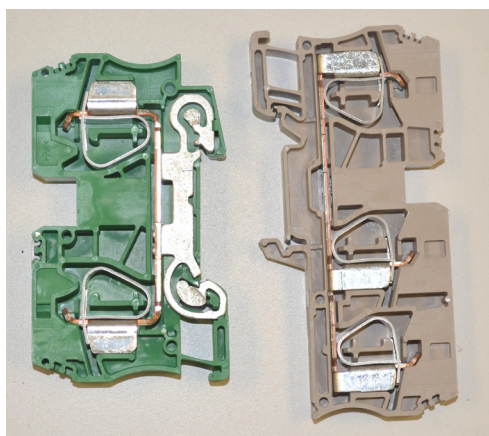


Figure 6

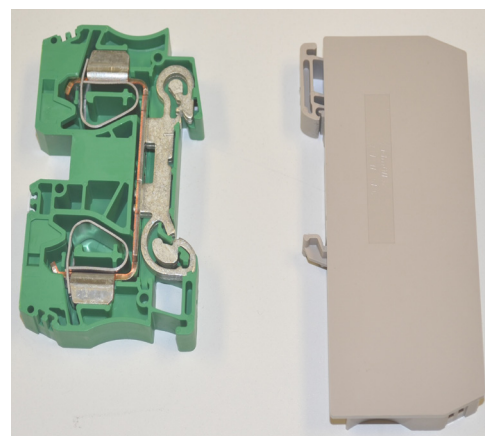
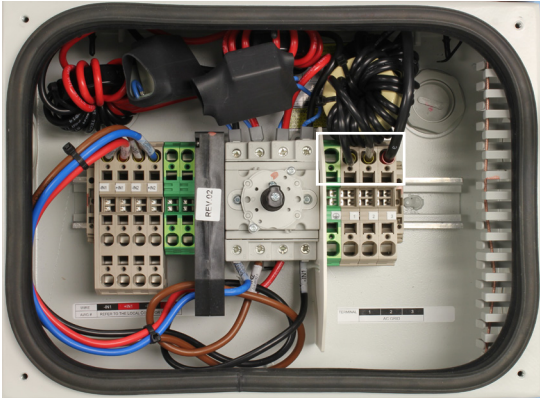

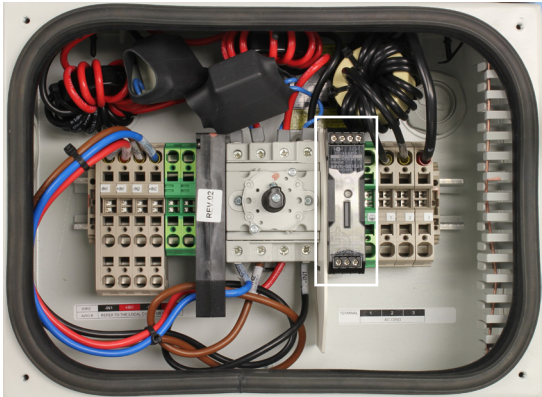

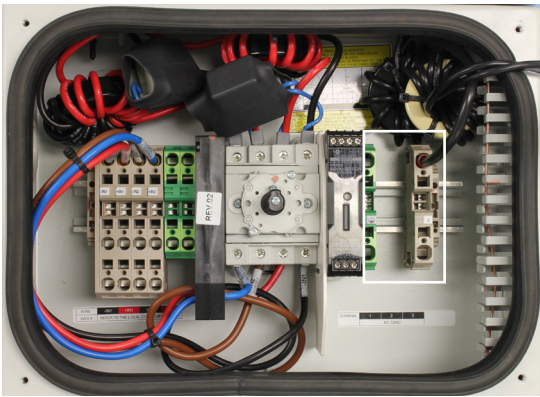
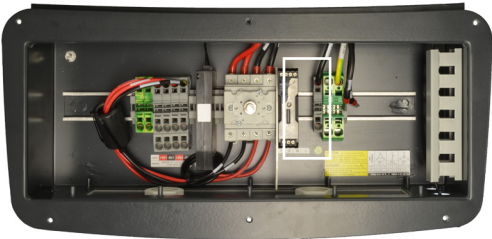


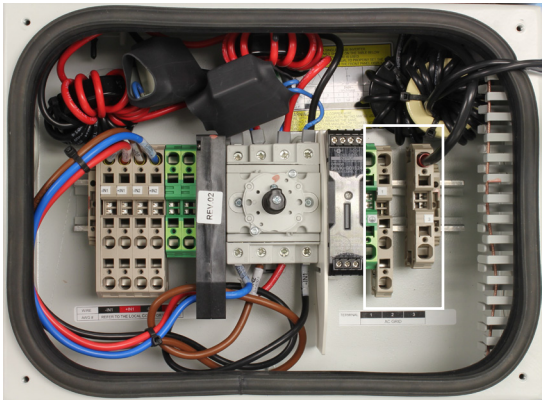
Figure 7

Replace the inverter's AC terminals with the terminals provided in the RSD kit. These new terminals are three-position terminals which will allow the power supply to be connected to the inverter's AC output.

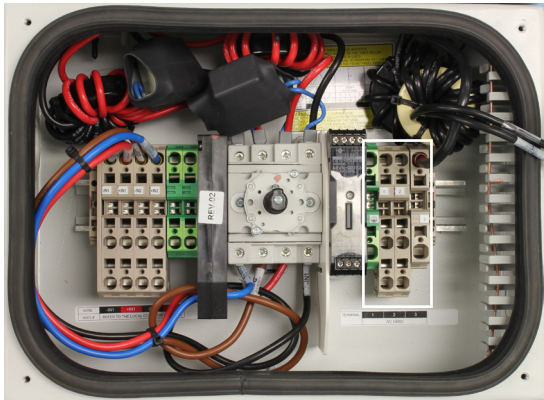
PVI-3.0/3.6/3.8/4.2/5000/6000-TL	UNO-7.6/8.6
Step 1: Disconnect the black inverter conductors in the top positions of the existing terminal blocks by inserting a 1/4" flat screwdriver into the square holes. Lightly press the screwdriver toward the associated wire slot until the clamp opens. Remove the conductors.	
	
Step 2: Install the power supply on the DIN rail.	
	
Step 3: Using the small screwdriver remove and replace <u>terminal 1</u> and <u>2</u> with the provided terminals.	
	



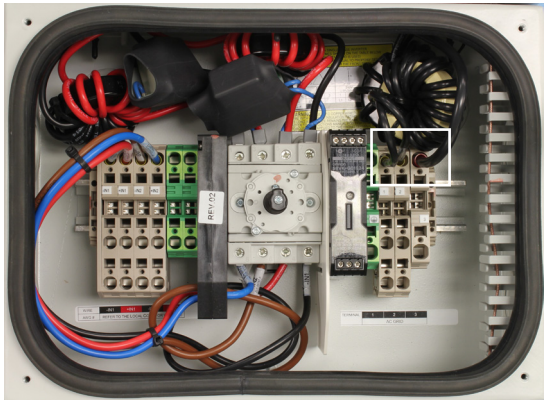
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UNO-7.6/8.6



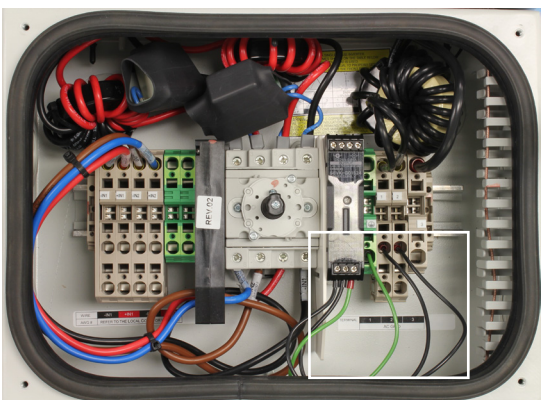
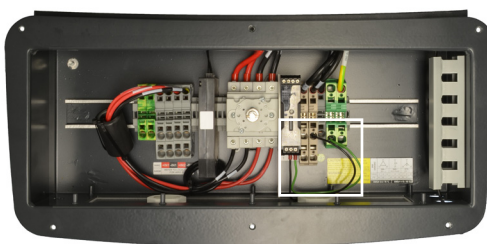
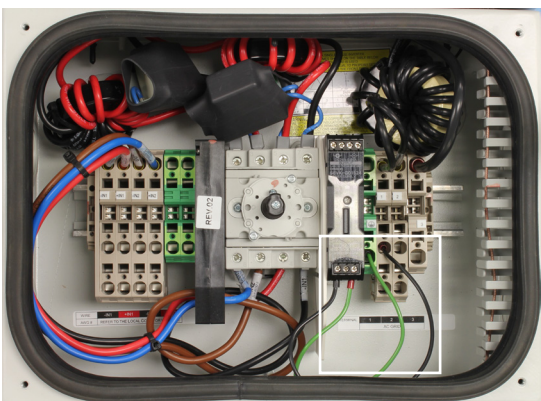
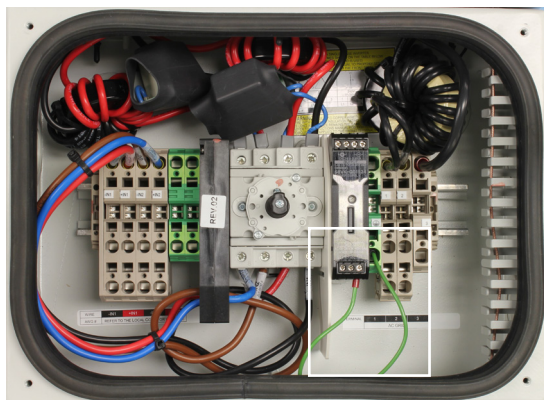
Step 4: Replace the inverter conductors in the top positions of the terminal blocks using the same procedure used to remove the conductors.



PVI-3.0/3.6/3.8/4.2/5000/6000-TL

UNO-7.6/8.6

Step 5: Connect the ground (green) conductor provided to the ground terminal of the power supply and the green terminal block using the previous wiring procedure. Connect one end of a black conductor provided to terminal 1 of the power supply and the other end to the center position of terminal block 1 as discussed above. Connect one end of the second black conductor provided to terminal 2 of the power supply and connect the other end to the central position of terminal block 2 as discussed above.

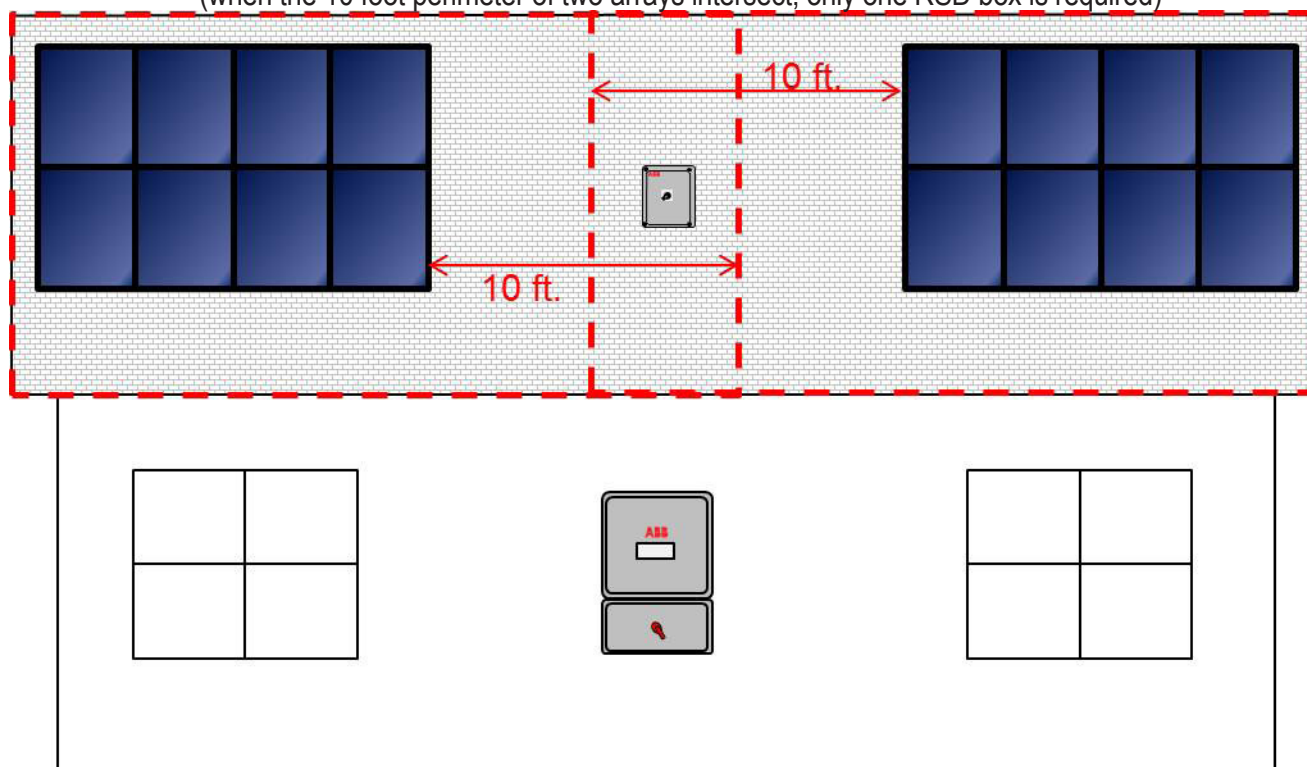


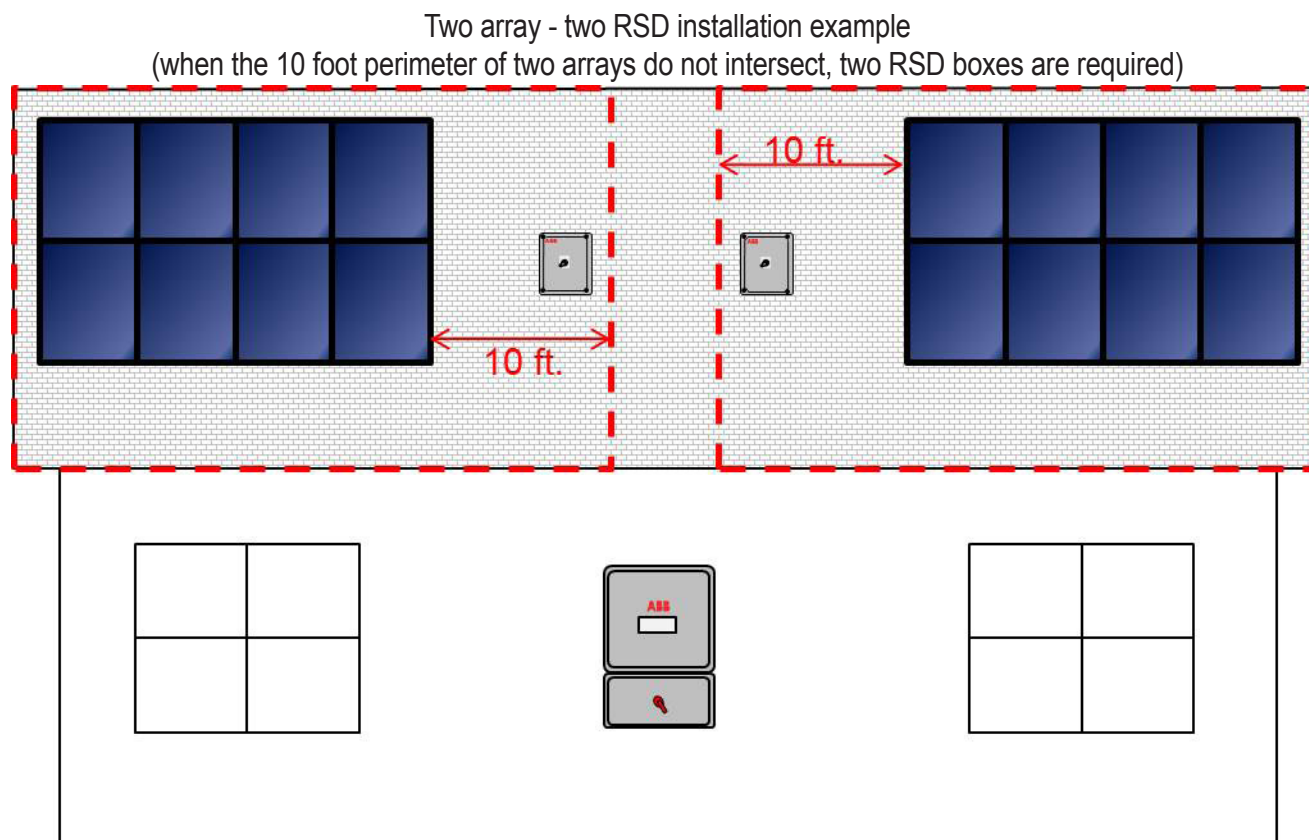
Once the power supply is connected to the inverter output, the +24V power conductor from the rooftop RSD box is to be connected to the power supply output. Strip 0.31" of insulation from the end of the control conductors from the RSD box and connect conductors +CW1 to + (positive) and -CW1 to - (negative) positions of the power supply output. Torque all power supply terminal screws between 4.43 lb.-in (0.5 Nm) and 5.31 lb.-in (0.6 Nm).

Rapid Shutdown installation for multiple PV arrays connected to a single inverter

Multiple RSD boxes may be installed on the same PV system. See diagrams below to determine how many RSD boxes are required for multiple array systems.

Two array - one RSD installation example
(when the 10 foot perimeter of two arrays intersect, only one RSD box is required)





The RSD power supply can power up to two RS2-1CN6 RSD boxes. The power supply installed in the inverter allows for two output circuits to be connected. Repeat the wiring directions above to connect the second RSD control circuit to the second output positions on the power supply.

If other model RSD boxes are needed in the two-RSD system or more than two RSDs are to be installed for a single inverter system, an additional power supply is required. UNO-7.6/8.6 inverters have sufficient space for additional power supplies. If using another ABB inverter, space may only allow for one power supply to be mounted within the inverter.

The +24V control power, when energized, provides power to the RSD box(es) located on the roof or attic and closes the contactors to allow the power generated from the array to reach the inverter. When the inverter is not connected to the grid, the power supply will cease to supply power to the RSD box(es) and the contactors will open.

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Operation

3



In compliance with NEC 690.12, within the ten-foot perimeter of the PV array or within five feet of entering the building, voltage is required to be reduced to no more than 30V and power to 240VA within 10 seconds. When initiating rapid shutdown, by removing AC power to the inverter or activating an optional remote initiation switch, the voltage and current on the PV conductors between the RSD box and inverter will be reduced to the required limits within the required time.

The method of rapid shutdown initiation shall be clearly marked for emergency personnel to quickly activate. A permanent plaque or directory must be installed stating “PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN” according to NEC 690.56(C).

A number of devices may be used to initiate rapid shutdown, many of which are already required to be installed within a PV system by the authority having jurisdiction (AHJ) or utility company. Some of these devices may not be required in all jurisdictions and one device may serve multiple purposes.

1. The back-fed PV breaker
2. The building's main circuit breaker
3. The PV system disconnect switch
4. An inverter AC equipment disconnect switch
5. An optional E-stop installed with the ABB rapid shutdown system

System Testing

Testing Rapid Shutdown within the PV System

Once the PV system has been installed, test the rapid shutdown system by first turning on the PV system. Close all disconnect switches and circuit breakers to begin back-feeding power to the grid. Once the inverter has gone through the startup process and is connected to the grid, perform the following steps to test the rapid shutdown system. A meter will be required to measure the output voltage and current, and proper PPE shall be worn in all steps while working with this equipment.

- If the RSD box contains a disconnect switch, turn the switch to the OFF position and monitor the output conductors of the RSD box for voltage and current.
- Turn the RSD disconnect switch back to the ON position to resume operation.
- With one person monitoring the output of the rooftop RSD box, initiate rapid shutdown by one of the methods listed above by removing AC power to the PV system.
- After the RSD voltage and power are verified to be shut down, return AC power to the PV system to resume operation.

Testing the PV system independent of Rapid Shutdown

If it is necessary to test the PV system without Rapid Shutdown operational, bypass the rooftop RSD box using one of the following methods:



- In the RS2-1CN6 and RS4-2CN6 models, connect the string inputs and PV output circuits on the S# terminals. These are three-position terminals that combine the input strings. By utilizing one position for an input and the other for the inverter output, the conductors are made continuous. The RS2-1CN6 would bypass the RSD contactor and allow for PV system testing with one PV string only. The RS4-2CN6 would bypass the RSD contactors and allow for PV system testing with two strings only.
- The RS2-2PN6 model does not utilize three-position input terminals and therefore cannot be bypassed in the same manner as stated above. It is recommended to join the PV string input with the PV output conductor by joining these conductors together with approved wire nuts, or equivalent.

After testing the PV system, the PV input strings and PV output circuits must return to their proper terminals prior to commissioning of the PV system.

Troubleshooting

If a failure occurs in the RSD system, the contactors will open, ceasing to export power to the inverter. In the event the inverter is not receiving power from the PV array, check the following items:

- The AC grid is present.
- The PV system disconnect and/or back-fed breaker is closed.
- The RSD rooftop disconnect is switched to ON (if applicable).
- Confirm the power supply is supplying power to the RSD rooftop box.
- Check all DC connections from modules to inverter.
- The inverter is ON and does not show any fault conditions.
- An e-stop button, if present, has not been activated.

If all the conditions above have been checked and are found to be in the correct state, call customer service for further assistance.

Making a service call

The following information is necessary to initiate a call with technical support at 877-261-1374. The model number, serial number, and week of production can be found on the product label.

Provide a description of the RSD conditions:

- Is voltage present at the PV string inputs?
- Is voltage present at the PV outputs?
- Is +24V control power present at the RSD power terminals?

Provide a description of the power supply conditions:

- Is the power supply exporting power?
- Is the power supply properly wired to the inverter's AC terminals?
- Is the inverter ON and utility grid present?

Storage and dismantling

If the product is not installed immediately or is stored for long periods, check that it is packaged correctly and contact ABB customer service for storage instructions. The equipment must be stored in well-ventilated indoor areas in a noncorrosive environment. Restarting after a long period requires the removal of oxidation and dust that may have settled inside the equipment if not suitably protected.

ABB CANNOT be held responsible for disposal of the equipment, conductors, contactors, etc. The customer must dispose of these substances, which are potentially harmful to the environment, in accordance with the regulations in force in the country of installation.

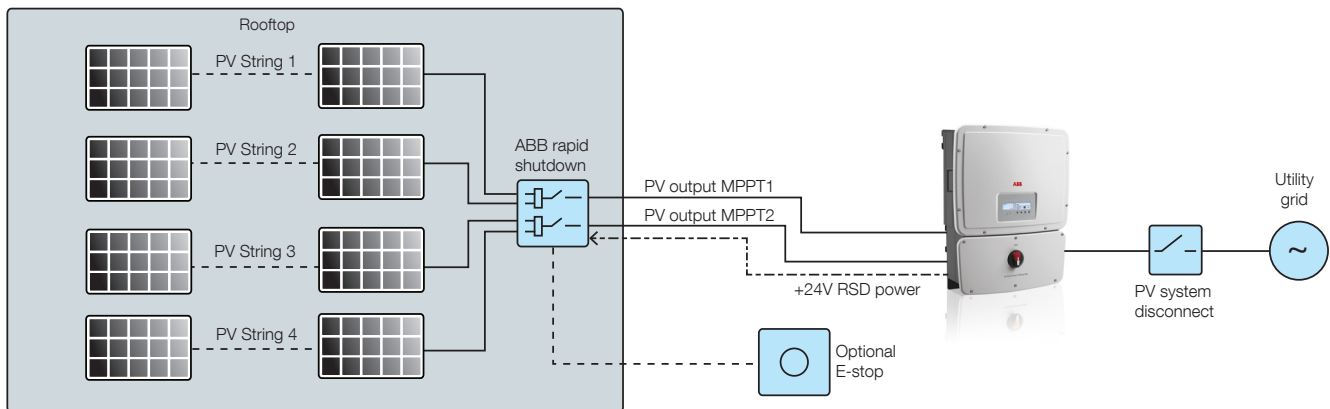
If the equipment is dismantled, follow the regulations in force in the country of destination and avoid causing any pollution upon disposal. Use dumps suitable for disposal of the various types of materials listed below.

Component	Material construction
RSD enclosure	Plastic
Plugs and seals	Rubber/(neoprene and/or butadiene)/polyimide PA6
Electrical conductor	Copper/PVC jacket
Component parts	May contain small amounts of lead; product uses lead-free solder

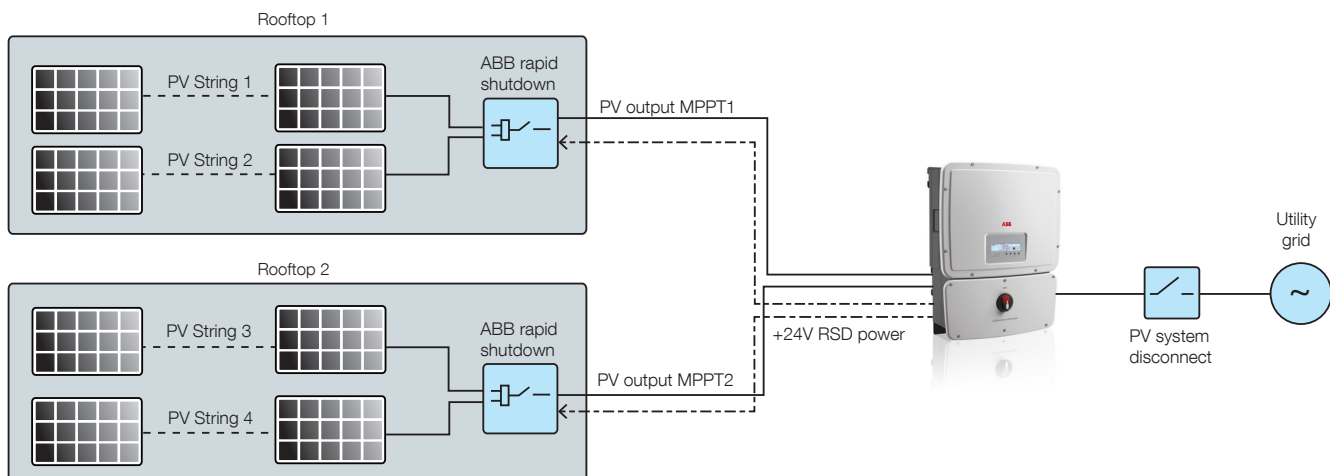


Diagrams

RSD 4-string wiring diagram



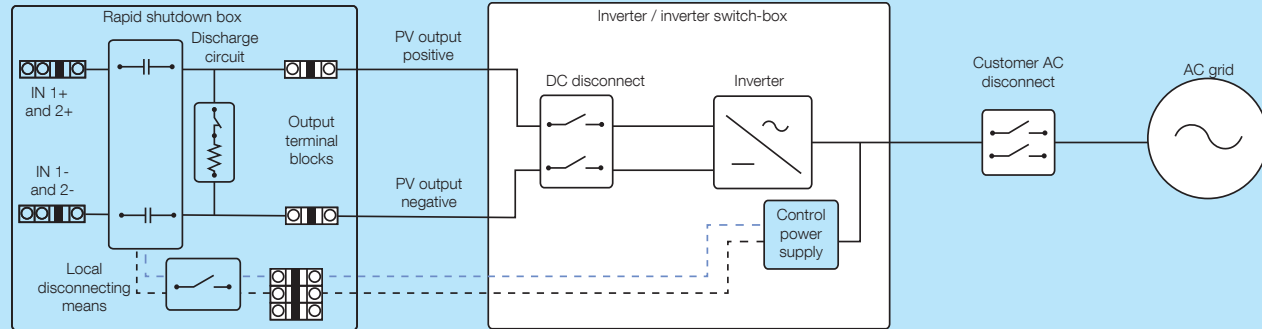
RSD wiring diagram: 2-RSD system



Two RS2-1CN6 boxes may be powered by one power supply. For PV systems requiring two RSD boxes, order the RS2-1CN6 kit and one additional RS2-1CN6 box.

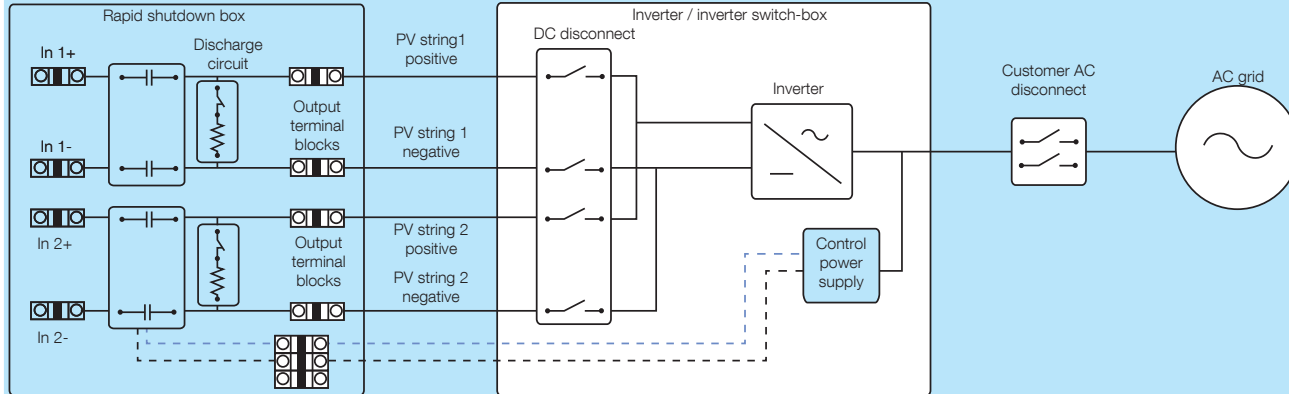
RSD model block diagrams

RS2-1CN6 two strings in, one PV output



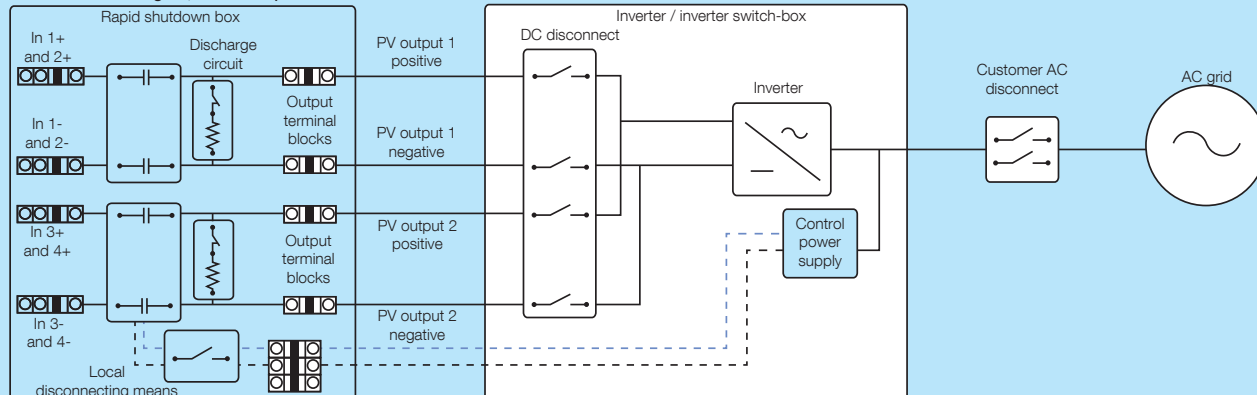
This 2-string model combines the strings to one PV output circuit. The RS2-1CN6 includes a disconnect switch on the front cover to disconnect the PV output conductors from the equipment down stream. Auxillary terminals are provided for connecting an emergency stop button, if desired.

RS2-2PN6 two strings in, two strings out



The RS2-2PN6 is a 2-string pass-through with no string combining and no local disconnecting means included. Auxillary terminals are provided for connecting an emergency stop button, if desired.

RS4-2CN6 four strings in, two PV outputs



This 4-string model combines 2-strings together in two separate PV output circuits. The RS4-2CN6 includes a disconnect switch on the front cover to disconnect the PV output conductors from the equipment downstream. Auxillary terminals are provided for connecting an emergency stop button, if desired.

Technical data and types

Type code	2-String pass-through	2-String combined	4-String combined
PV source conductor input			
Max input current (per string)		11.25A	
Max input voltage		600V	
Number of input strings	2	2	4
Conductor size		14 - 8 AWG	
PV output conductors output			
Number of output circuits	2	1	2
Conductor size		12 - 6 AWG	
DC disconnect	N/A	Yes	Yes
Control power			
Power consumption		15W, 24V/0.65A	
Maximum power conductor size		12 AWG	
E-stop button		Optional	
Environmental			
Mounting angle		0-90°	
Dimensions (HxWxD)		10.54" x 8.54" x 5.32" (without mounting bracket)	
Weight	6 lb	5.8 lb	6.2 lb
Operating temperature range		-25°C to +70°C	
Enclosure rating		NEMA 4X	
Certifications		UL1741:2010, FCC Part 15 Class B	
Warranty			
Standard warranty		10 Years	
Available models			
Rapid shutdown kit	RS2-2PN6-kit	RS2-1CN6-kit	RS4-2CN6-kit
Rapid shutdown rooftop box for 2-box system	N/A	RS2-1CN6	N/A
Optional emergency stop		1SFA611821R1026	

Information in this document is subject to change without notice



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Further information

For more information on ABB products and services for solar applications, navigate to www.abb.com/solarinverters

Contact us

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Rapid Shutdown (RSD) system for residential and small commercial - product manual
BCG.00884.0AP NA Rev AC
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