

Solar inverters

Quick installation guide

Rapid Shutdown (RSD) system for residential and small commercial



In addition to what is explained in this guide, the safety and installation information provided in the technical manual must be read and followed. The technical documentation and the interface and management software for the product are available at www.abb.com/solarinverters.

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IMPORTANT SAFETY INSTRUCTIONS: This Quick Installation Guide (QIG) 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.

LABELS: The labels on the RSD box carry the markings, main technical data and identification of the equipment and manufacturer.

ELECTRICAL WARNINGS

a. The ABB RSD system is designed to comply with the 2014 NFPA 70 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. Personal Protective Equipment (PPE) must be worn at all times when servicing this equipment.

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

c. For suitable wire size (AWG), refer to National Electrical Code, Table 310.15(B)(16) for U.S. applications. 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.

d. 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.

e. The DC operating current and voltage MUST NOT exceed the limits documented in the technical specifications found in section 5 of this QIG.

f. For models containing a disconnect switch on the cover of the RSD box; this switch disconnects the PV output conductors from the PV source circuits (strings) entering the RSD box. It does not disconnect the current or voltage entering the RSD box via the PV strings.

SAFETY AND HAZARD SYMBOLS

	RISK OF ELECTRICAL SHOCK. HAZARDOUS VOLTAGE WILL CAUSE SEVERE INJURY OR DEATH. NO USER SERVICEABLE PARTS INSIDE. ONLY TRAINED SERVICE PERSONNEL ARE ALLOWED ACCESS.
	RISK OF ELECTRICAL SHOCK. MULTIPLE VOLTAGE SOURCES ARE TERMINATED INSIDE THIS EQUIPMENT. EACH CIRCUIT MUST BE DISCONNECTED BEFORE SERVICING.
	WHEN THE PHOTOVOLTAIC ARRAY IS EXPOSED TO LIGHT, IT SUPPLIES DC VOLTAGE TO THIS EQUIPMENT.
	VERIFY THE CORRECT CONNECTION OF THE STRINGS TO THE INPUT TERMINALS. POLARITY REVERSAL MAY CAUSE SERIOUS DAMAGE. REFER TO THE INSTRUCTION MANUALS FOR MORE DETAILS.

LIST OF COMPONENTS

Qty	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	Quick Installation Guide	BCM.00357.0AP_AB	Kit only

RSD INSTALLATION LOCATION

a. 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.

b. Install the RSD box on the PV module mounting rail, racking system, the roof, or in the attic below the PV array.

c. The RSD box may be installed at angles from horizontal to vertical.

d. Ensure sufficient working area around the RSD box to allow easy access for maintenance and/or servicing of the PV system.

e. In the full product manual located at www.abb.com/solarinverters, see Technical Data, section 14, to check the environmental parameters to be observed (degree of protection, temperature, etc.).

f. Maximum operational ambient air temperature must be considered when choosing location.

Exposure to direct sunlight is permitted; installation under a module is preferred.

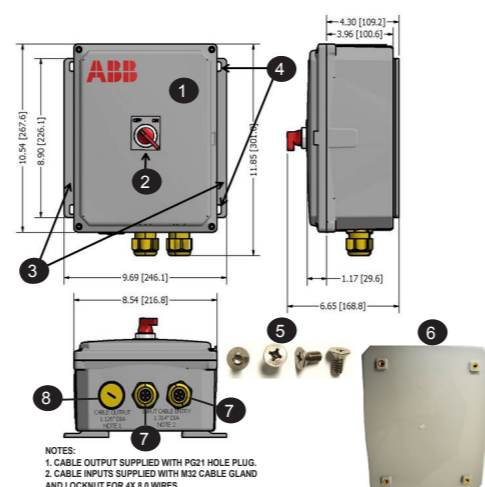
1 MOUNTING THE RSD BOX

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

b. When mounting the RSD to the PV module mounting rack, use the racking manufacturer's components to secure the mounting bracket **3** to the racking structure through the rail mounting holes **6** provided on the bracket. At least two mounting holes must be used.

c. 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.

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 (five inputs per gland)
8	Output conductor opening



2 WIRING THE RSD BOX

a. Ensure power is not present on the conductors to be connected, wear appropriate PPE and insulated tools when working with this equipment.

b. To access the wiring terminals in the RSD box, the cover **1** must be removed by loosening the four screws. When connection operations are complete, re-install the cover **1** and tighten the cover screws with 1.13 Nm (10.0 in-lbs) torque to maintain waterproof sealing.

c. 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.

d. The PV source circuits (strings) enter the RSD box via the cable glands. The cable glands accept PV Wire sizes of 14 AWG – 10 AWG. If conduit is preferred, the cable glands may be removed and

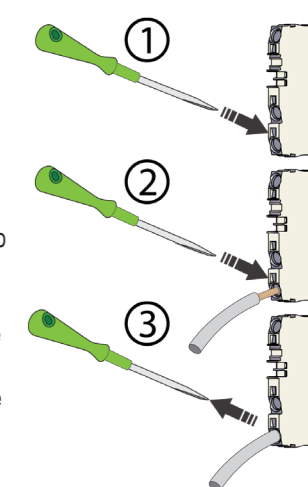
1" conduit can be connected in its place. If removing the cable glands on the input side in order to use with conduit, the maximum size PV source conductor allowed is 8 AWG.

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

ii. Strip 0.49" of insulation from the end of the conductor to be terminated, and twist the strands.

iii. Use a small (approximately 1/4" wide) flat blade screwdriver to open the pressure contact.

See the diagram to the right 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.

e. The PV output circuits exit the RSD box via 3/4" conduit opening.

i. The PV output terminals are labeled +IN# and -IN# to denote "+ inverter" and "- inverter" and the output circuit number (1 or 2, if available).

ii. The terminals accept wire ranges from 12 AWG – 6 AWG.

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

iv. Repeat the steps above to connect the conductors to the output terminals.

f. Control power connections exit the RSD box via the same 3/4" conduit used for the PV output conductors.

i. The +24V power conductor is connected to the blue terminals labeled +CW1 and -CW1 denoting "- Control Wire 1" and "+ Control Wire 1".

ii. 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. For e-stop installation instructions, see the product manual at www.abb.com/solarinverters.

iii. These terminals accept wire ranges of 26 AWG to 12 AWG.

iv. Strip 0.49" of insulation from the end of the conductors to be terminated and twist the strands.

v. Repeat the steps above to connect the conductors to the control wire terminals.

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.

Where used, 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.

3 WIRING THE POWER SUPPLY

a. 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.

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

c. 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.

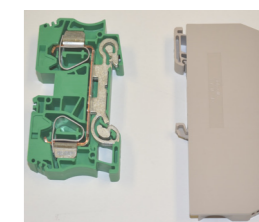
The Rapid Shutdown kit is NOT compatible with a 277V grid connection. It must only be used with a 208V or 240V grid connection.

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.

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 picture 1 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. Picture 2 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.



Picture 1

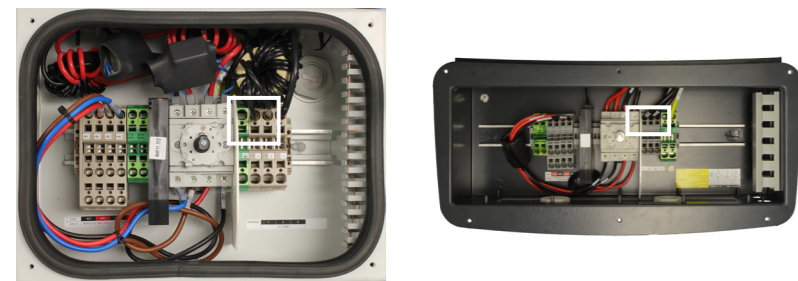


Picture 2

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.



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

UNO-7.6/8.6

Step 2: Install the power supply on the DIN rail.



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

UNO-7.6/8.6

Step 3: Using the small screwdriver remove and replace terminal 1 and 2 with the provided terminals. Be sure to install the terminal block cover on the terminal 1 prior to mounting it on the DIN rail (PVI models only). The photos below show the two terminal blocks in place.



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

UNO-7.6/8.6

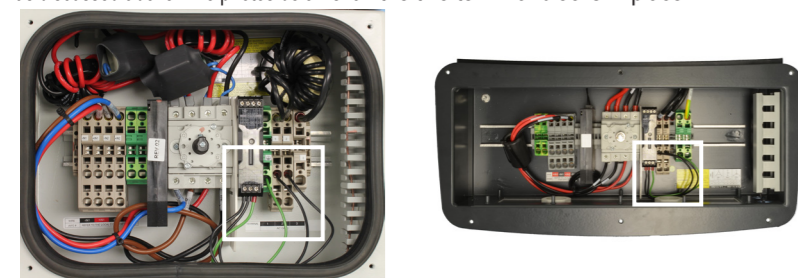
Step 4: Replace the inverter conductors in the top positions of the terminal blocks using the same procedure used to remove the conductors.



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. The photos below show the two terminal blocks in place.



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).

4 MULTIPLE RSD INSTALLATION

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. See the manual at www.abb.com/solarinverters for examples of when more than one RSD box is required.

5 OPERATION

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

6 SYSTEM TESTING

Testing Rapid Shutdown within the PV system

Once the PV system has been installed, test the RSD 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 previously listed 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.

7 CHARACTERISTICS AND TECHNICAL DATA

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	

Type code	2-String pass-through	2-String combined	4-String combined
Environmental			
Mounting angle		0-90°	
Dimensions (HxWxD)	10.54" x 8.54" x 5.32" (without mounting bracket)		
Weight	6lb	5.8lb	6.2lb
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

Contact us
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