Wiring the Rapid Shutdown Switch with IQ System Controller 2

Overview

The Enphase rapid shutdown switch/Enphase system shutdown switch (EP200G-NA-02-RSD) provides rapid shutdown capability, as required by NEC standard, for IQ8 Microinverters when used with IQ System Controller 2 (EP200G101-M240US01). The Rapid Shutdown Switch and IQ System Controller 2 are certified to the UL1741 PVRSE requirement.

Currently there are 4 issues with the rapid shutdown switch wiring and installation.

1. Installers are having queries on when they need to use the rapid shutdown switch/ Enphase system shutdown switch (EP200G-NA-02-RSD) . There has been frequent queries from installers on if they should use the component when they are using a non IQ8 microinverter (IQ6/7) with IQ System Controller 2
2. Many installers are wiring (or re-wiring) the rapid shutdown switch AFTER powering ON the IQ System Controller 2. During the wiring the loose ends of the live wire , which carries 3.3VDC current, touches metal surfaces or ground or neutral bars leading to a current surge and failure of the IQ System Controller components. This is not a safety issue, but this leads to product failure and delayed installations.
3. The wiring scheme for the Rapid Shutdown Switch depicted in the installation guide does not apply to some IQ System Controller 2 units manufactured prior to December 8, 2021. Instead, distributors and installers must follow the wiring scheme as described in this document. Note that the incorrect wiring scheme shown in the installation guide does not result in a safety issue, but it will prevent IQ System Controller 2 from exiting the rapid shutdown state and from being commissioned correctly. The installation guides with incorrect wiring scheme have a revision of 140-00236-02 or lower.
4. After successful wiring (or re-wiring) of the rapid shutdown switch, installers toggle the switch to ON position before energizing the IQ System Controller 2. This prompts the device to go into manual over ride mode, which forces installers to follow the process to remove the IQ System Controller from manual override mode. This is not a safety issue, but it leads to delayed installations.

Rapid shutdown function when using IQ6/7 microinverters with IQ System Controller 2

For legacy microinverters (like IQ6, IQ7) when used with IQ System Controller 2 the Enphase Energy System Shutdown switch (EP200G-NA-02-RSD) should not be used as a rapid shutdown initiator. Rapid Shutdown operation for these microinverters can be initiated in one of three ways

a. The AC circuit breaker installed within the IQ-Combiner
b. The AC circuit breaker installed within IQ System Controller
c. Or a dedicated AC disconnect switch located in series with the combined PV inverter circuit

These provide shutdown for PV Micros as required by the NEC code

In addition to enable the system to operate installers need to short the RSD auxiliary contacts of IQ System Controller 2 which are meant for wiring the shutdown switch only when installing IQ8 micros.

The cable header assembly (which is a part of the System Controller 2 Lit-Kit) must be wired to the NC3 and NC4 contacts. A 12 AWG wire should be used to connect terminal 1 of NC3 with terminal 2 of the NC3 contact. The same procedure must be repeated with the NC4 contacts.

The wiring is illustrated below:

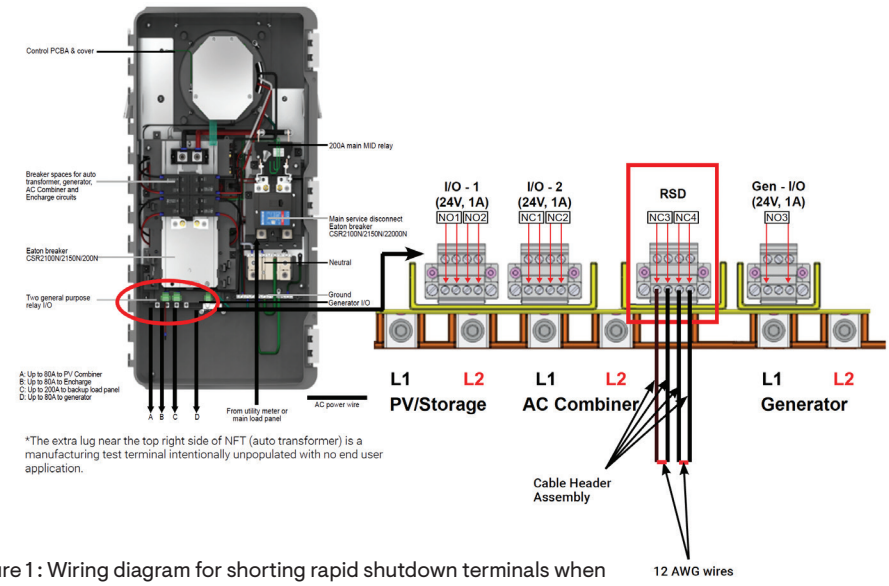

Figure 1 : Wiring diagram for shorting rapid shutdown terminals when using IQ System Controller 2 with IQ6/7 microinverters

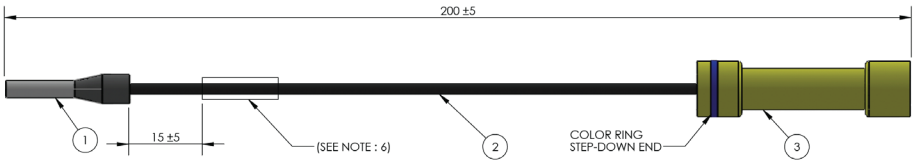

Figure 2 : Cable header assembly

The Enphase rapid shutdown switch (EP200G-NA-02-RSD) is to be used when an IQ8 microinverter is installed with an IQ System Controller 2

The rest of the memo will deal with wiring rapid shutdown switches for systems with IQ8 microinverters and IQ System Controller 2

Pre-Installation instruction

The rapid shutdown switch is to be wired BEFORE ENERGIZING the IQ System Controller 2. The rapid shutdown switch should not be wired while the IQ System controller 2 is powered.

If IQ System Controller 2 is already energized, it should be completely discharged before wiring the rapid shutdown switch. The instructions for discharging the IQ System Controller 2 can be found in Annexure 1.

If the installer has already wired the rapid shutdown and suspect that the wiring is not correct, please follow the instructions in the section titled “Verifying installation” before discharging the IQ System Controller 2.

Changing the wiring of rapid shutdown switch without discharging the IQ System Controller 2 is very likely to damage the IQ System Controller 2 and installers MUST avoid doing it.

Verifying installation

After installing the Rapid Shutdown Switch and energizing the IQ System Controller 2

1. Ensure the Rapid Shutdown Switch is turned ON.
    a. Check the voltage across the two screws of the NC3 terminal (refer to Figure 3).
        - If the voltage across the pins is ~3.3 Vdc then the switch is NOT wired correctly.

Fix the wiring per instructions below.

- If the voltage across the pins is ~0 Vdc then the switch is wired correctly.

b. Check the voltage across the two screws of the NC4 terminal (refer to Figure 3).

- If the voltage across the pins is ~3.3 Vdc then the switch is NOT wired correctly. Fix the wiring per instructions below.
- If the voltage across the pins is ~0 Vdc then the switch is wired correctly.

2. Ensure the Rapid Shutdown Switch is turned OFF.

a. Check the voltage across the two screws of the NC3 terminal (refer to Figure 3).

- If the voltage across the pins is ~0 Vdc then the switch is NOT wired correctly. Fix the wiring per instructions below.
- If the voltage across the pins is ~3.3 Vdc then the switch is wired correctly.

b. Check the voltage across the two screws of the NC4 terminal (refer to Figure 3).

- If the voltage across the pins is ~0 Vdc then the Rapid Shutdown Switch is NOT wired correctly. Fix the wiring per instructions below.
- If the voltage across the pins is ~3.3 Vdc then the Rapid Shutdown Switch is wired correctly.

3. Ensure you turn the Rapid Shutdown Switch back ON.

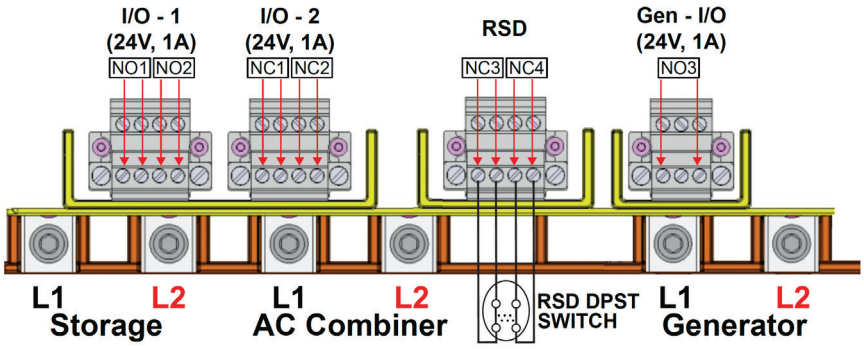

Figure 3 : IQ System Controller 2 terminals

Use the following instructions to correctly wire the Rapid Shutdown Switch to the IQ System Controller 2. If you believe that the Rapid Shutdown Switch wiring complies with below instructions, but the problem persists, please contact Enphase customer support.

Wiring the Rapid Shutdown Switch to the IQ System Controller 2

The wiring diagram shown below is CORRECT. This Wiring is supposed to be done BEFORE powering ON the IQ System Controller.

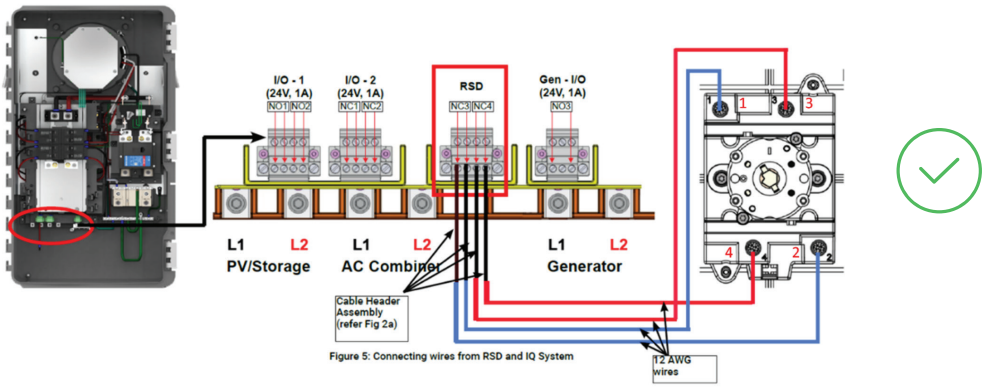

Figure 4 : Correct wiring of Rapid Shutdown Switch to IQ System Controller 2 terminals from latest installation guide.

NC3 terminals on IQ System Controller 2 should be wired to terminals labelled 1 and 2 on the Rapid Shutdown Switch and NC4 terminals should be wired to terminals labelled 3 and 4 on the Rapid Shutdown Switch.

The latest IQ System Controller 2 installation guide has been amended to reflect the correct wiring diagram. The Enphase System Shutdown Switch installation guide also shows the correct wiring diagram. The latest installation guides can be found here: https://enphase.com/installers/storage/iq-system-controller-2

The wiring diagram below is INCORRECT.

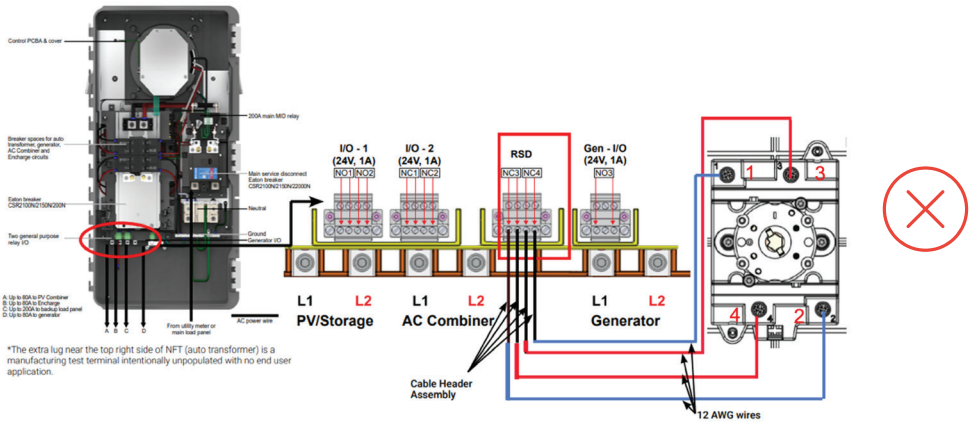

Figure 5 : Incorrect wiring of Rapid Shutdown Switch to IQ System Controller 2 terminals from older installation guide.

Completing the installation

Upon completing the wiring (re-wiring) of the rapid shutdown switch using the correct wiring instruction , the Rapid shutdown switch is to be in OFF position as shown in Figure 6, before the IQ System Controller 2 is Energized.

Correct Position of rapid shutdown switch before powering on IQ System Controller

Figure 6 : Correct position of rapid shutdown switch before powering IQ System Controller 2

The IQ System Controller 2 SHOULD NOT be energized when the rapid shutdown switch is in the position indicated by figure 7.

Wrong Position of rapid shutdown switch before powering on IQ System Controller

Figure 7 : Wrong position of rapid shutdown switch before powering the IQ System Controller 2

The instructions to energize a completely discharged IQ System Controller 2 can be found in Annexure 2.

If Installers inadvertently energized the IQ System Controller 2 with the rapid shutdown in ON position, they can simply toggle the RSD to OFF position (Figure 6) wait for 30 seconds and toggle it back to ON position (Figure 7) to ensure IQ System Controller 2 is not going to manual over ride mode.

Annexure 1 : Instruction to discharge the IQ System Controller 2

a. Turn DC switches in IQ Batteries to off (if Battery is installed) (For instruction on opening IQ Battery cover please refer to the following document https://enphase.com/sites/default/files/2021-04/IQ Battery3-10-QIG-EN-US.pdf).

b. Open IQ Battery breaker in IQ System Controller.

c. Open PV breaker in IQ System Controller.

d. Open the mains breaker.

e. Disconnect the grid source power supply (breaker in main panel).

f. Open generator breaker.

g. Use multi meter to measure AC voltage on all the following terminals –PV, IQ Battery, Grid , Load and Generator. It is safe to work on IQ System Controller only when no voltage is detected on any of these terminals and you have ensured that

all IQ Battery units have DC powered off.

h. Wait for 5 mins before proceeding with wiring the rapid shutdown switch, follow the wiring diagram shared below or in Rapid Shutdown switch QIG.

Annexure 2: Instructions to Energize IQ System Controller 2

After wiring the rapid shutdown switch please follow the following instructions to power on the IQ System Controller 2.

a. You must ensure that all electrical circuits external to IQ System Controller are completed and safe before energizing IQ System Controller in the following order:
   - Turn On NFT breaker
   - Turn On Main breaker
   - Turn On PV breaker
   - Turn On IQ Battery breaker
   - Turn On Generator breaker
   - Turn On Load breaker

b. After IQ Battery breaker is turned ON wait and observe if the IQ Battery red LEDs flash 3 times continuously. Wait for 10 minutes, with the red LED flashing , before turning on the DC switch on IQ Battery. The IQ Battery LED should change to blue or green based on SOC of battery.

c. For closing the cover of the IQ Battery please refer to the IQ Battery QIG (https://enphase.com/sites/default/files/2021-04/IQ Battery3-10-QIG-EN-US.pdf).

d. Energize the circuit feeding the IQ System Controller. If installed, turn the breaker feeding the IQ System Controller to ON position.

e. Close and secure the door of the IQ System Controller.