Application Note

Rapid Shutdown of Inverter AC Output

Objective

This document provides a brief background on PV rapid shutdown requirements as well as guidance on how to use the OutBack Power Rapid Shutdown Initiator (RSI) to shutdown the AC output of Radian and FXR inverters, which is required by some interpretations of the 2014 National Electric Code (NEC).

Background

The 2014 edition of the NEC introduced requirements for remotely shutting down PV circuits. The text is found in section 690.12 and states:

PV system circuits installed on or in buildings shall include a rapid shutdown function that controls specific conductors in accordance with 690.12(1) through (5) as follows.

(1) Requirements for controlled conductors shall apply only to PV system conductors of more than 1.5 m (5 ft) in length inside a building, or more than 3 m (10 ft) from a PV array.
(2) Controlled conductors shall be limited to not more than 30 volts and 240 volt-amperes within 10 seconds of rapid-shutdown initiation.
(3) Voltage and power shall be measured between any two conductors and between any conductor and ground.
(4) The rapid-shutdown initiation methods shall be labeled in accordance with 690.56(B).
(5) Equipment that performs the rapid shutdown shall be listed and identified.

There are numerous articles, documents, and discussions for the reasons for these requirements and the various interpretations of each, however this document will focus on one specific interpretation. That interpretation is that the phrase “PV system conductors” includes both AC and DC conductors, rather than just the DC conductors between the PV array and the rest of the system. Adopting this view of the code means that in addition to the PV circuits being disconnected in the OutBack Integrated Combiner Box Plus (ICS Plus) combiner box, the inverter output needs to be reduced to less than 30V/240VA within 10 seconds of activating a rapid-shutdown switch.

Solution

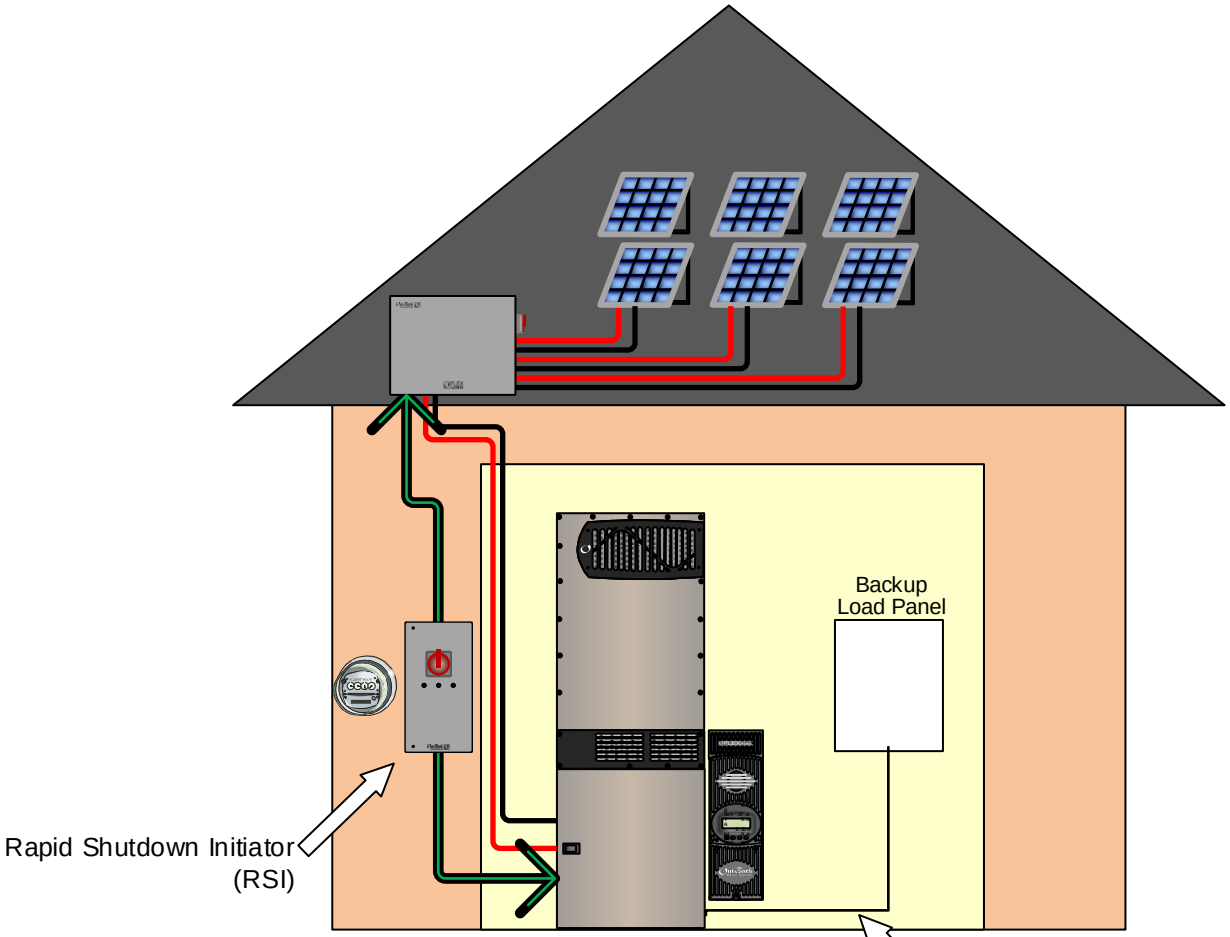
The OutBack Power Rapid Shutdown Initiator (RSI) has an output terminal that can be used for shutting off the *Invert* function of Radian and FXR inverters when the RSI switch is opened. To setup this configuration there are only two steps, which are also shown in the diagram on the following page:

1. Remove the *ON/OFF* jumper on the inverter control board. On Radians this is labelled $\frac{ON/OFF}{INV}$ while on FXR units it is labelled INVERTER ON/OFF
2. Connect #16AWG wires between the J3 terminals of the RSI and the *Switch INV* terminals in the Radian. For FXR inverters, connect #16AWG wires between the J3 terminals of the RSI and the Inverter and ON/OFF terminals in the FXR.

Now when the RSI switch is opened, contact between the *Switch INV* terminals is broken and the Radian stops inverting.

Note: OutBack Power does not take a stance on the validity of this or any NEC interpretation. This application note is offered as a resource for those whose inspector, permitting department, or other Authority Having Jurisdiction (AHJ) requires AC output disconnection of the inverter upon activation of a rapid shutdown device.

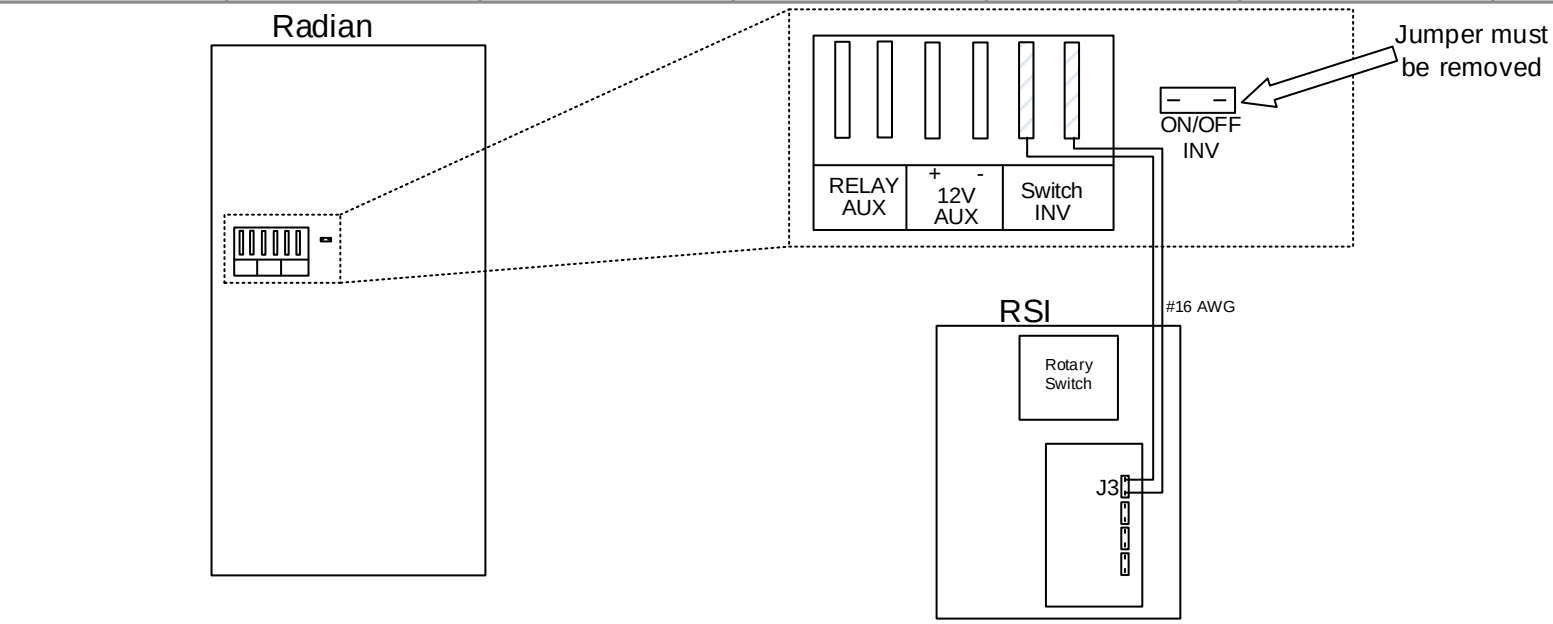
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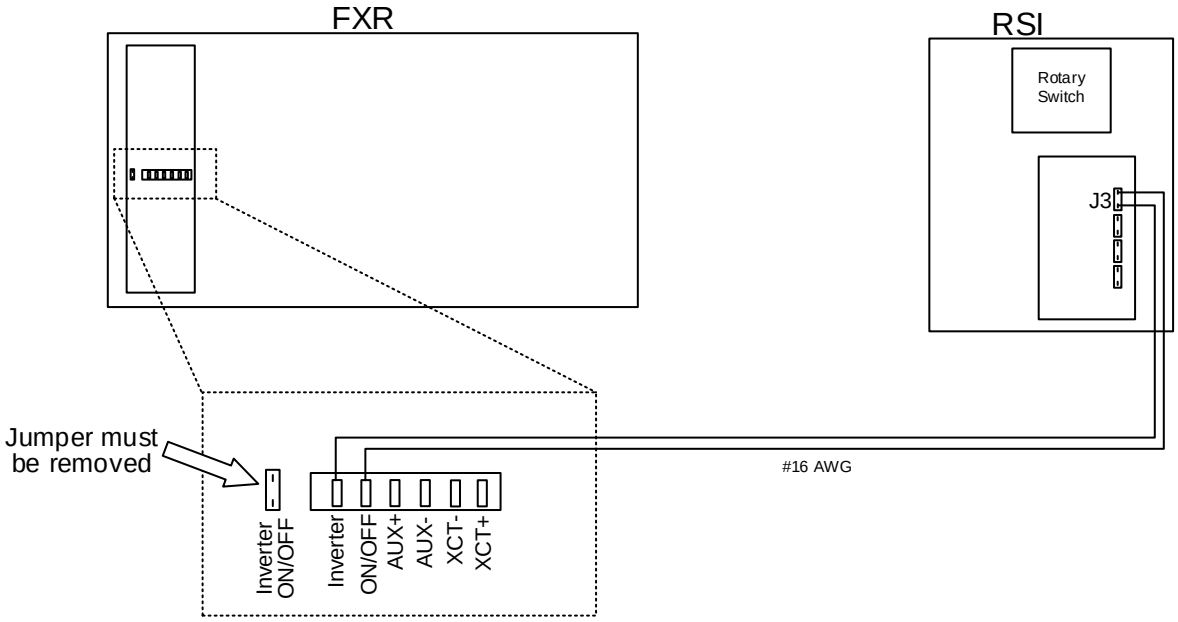


Notes:
1) For drawing clarity, only pertinent conductors are shown.
2) OutBack does not take a particular stance on interpretations of NEC requirements

TITLE	SHEET TITLE					
Inverter Output Rapid Shutdown	ICS+ configuration					
FILENAME	**DRAWN BY**	**DATE**	**EDITED BY**	**EDITED ON**	**REV**	**DRAWING**
ICS+ HOUSE.VSD	REX L.	6/14/16			R1	1

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Notes:
1) For drawing clarity, only pertinent conductors are shown.
2) OutBack does not take a particular stance on interpretations of NEC requirements

TITLE	SHEET TITLE					
Inverter Output Rapid Shutdown	Inverter + RSI wiring diagram					
FILENAME	DRAWN BY	DATE	EDITED BY	EDITED ON	REV	DRAWING
INVERTER SHUTDOWN.R1.RL.6-14-2016.VSD	REX L.	6/14/16			R1	2

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OutBack Power Technologies is a leader in advanced energy conversion technology. OutBack products include true sine wave inverter/chargers, maximum power point tracking charge controllers, and system communication components, as well as circuit breakers, batteries, accessories, and assembled systems.

Grid/Hybrid

As a leader in off-grid energy systems designed around energy storage, OutBack Power is an innovator in Grid/Hybrid system technology, providing the best of both worlds: grid-tied system savings during normal or daylight operation, and off-grid independence during peak energy times or in the event of a power outage or an emergency. Grid/Hybrid systems have the intelligence, agility and interoperability to operate in multiple energy modes quickly, efficiently, and seamlessly, in order to deliver clean, continuous and reliable power to residential and commercial users while maintaining grid stability.

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