



**APPLICATION NOTE**

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**Update: 2014 National Electrical Code (NEC)**

**Compliance for Article 690.12 Rapid Shutdown with the Bentek Rapid Shutdown System (RSS)**

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**Introduction**

The 2014 version of the National Electrical Code (NEC) contains a significant change to the 2011 version that applies to photovoltaic (PV) systems. NEC 2014 article 690.12 addresses Rapid Shutdown requirements of PV source circuits that apply to both commercial and residential buildings.

This application note provides an update on how PV systems can be designed to meet NEC 2014 article 690.12 using Bentek Rapid Shutdown Systems (RSS) solutions.

This application note focuses on the NEC 2014 article 690.12 Rapid Shutdown requirements and is not intended to address all NEC compliance requirements.

PV System designers are encouraged to check with local Authorities Having Jurisdiction (AHJs) to ensure compliance with all NEC 2014 pertinent regulations.

# Designing and Installing NEC-Compliant PV Systems with the Bentek Solar Rapid System (RSS)

The purpose of NEC article 690.12 is to allow first responders the ability to rapidly de-energize a building's PV source circuit so they can safely address emergency issues. These emergencies could include fire, earthquakes, floods and other natural disasters. The Bentek RSS solution allows the first responders to safely enter the building and begin to address the emergency immediately, without the concern of live electrical wiring and electrical components. It is important to note that these Bentek solutions are cost effective and allow residential string inverters to compete with micro inverters, which are exempt from Article 690.12 requirements.

## Bentek Rapid Shutdown System (RSS) for Residential PV Systems:

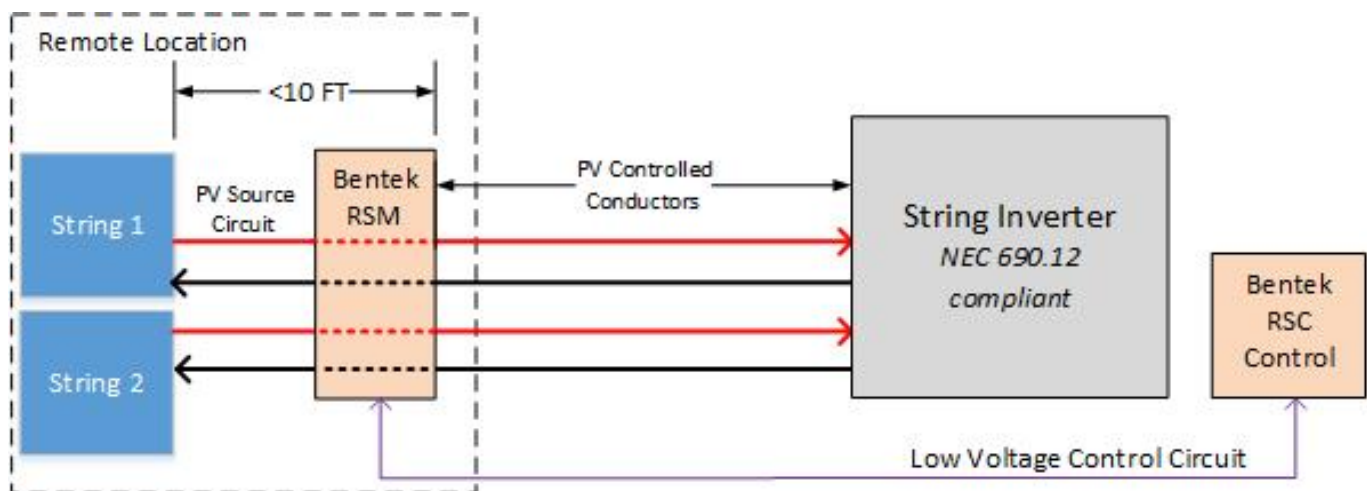
The Bentek RSS is a two-part system:

- 1) The Bentek Rapid Shutdown Controller (RSC) is accessible at ground level and controls the Bentek Rapid Shutdown Module on the rooftop.
- 2) The Bentek Rapid Shutdown Module (RSM) is located on the roof within 10 feet of the PV array and, when activated by the RSC, disconnects the PV source circuit; For a NEC 2014 690.12 non-compliant inverter a second RSM can be located next to the inverter.

### How the Bentek RSS works:

#### Case 1: NEC 2014 690.12 compliant inverter

Diagram 1 shows a representation of a typical installation using the Bentek RSS solution and a compliant inverter.

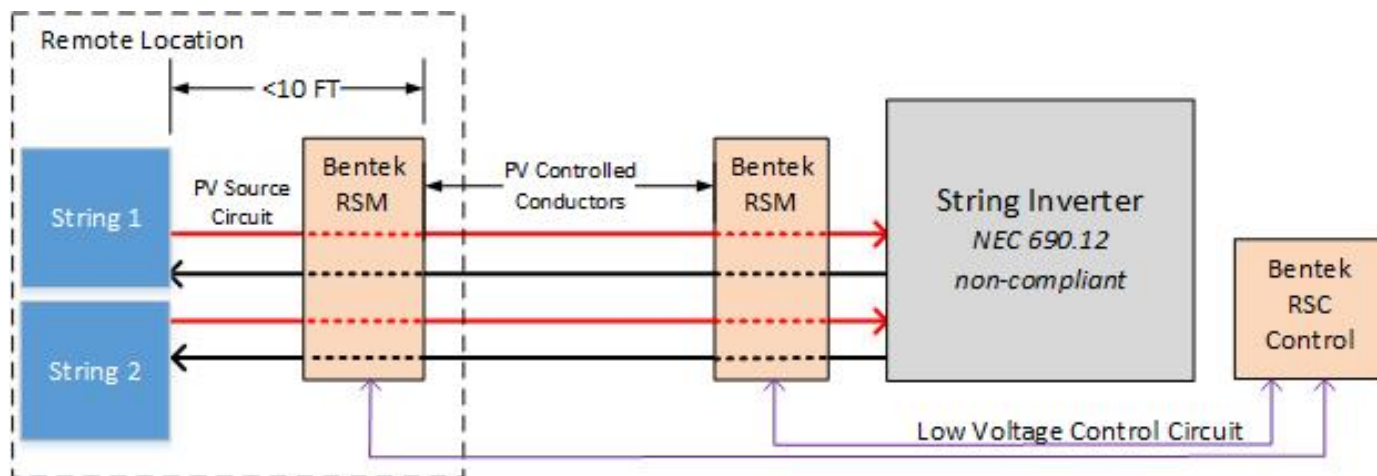


When first responders arrive at the scene of the emergency, the PV source circuit is disconnected by activating the ground-level Bentek Rapid Shutdown Controller (RSC). The first

responder opens the clear cover of the RSC and pushes the red EMO button. The LED indicator switches from “Solar On” green to “Solar Off” red. The RSC opens a contactor located in the Bentek Rapid Shutdown Module (RSM) mounted on the rooftop. Once the contactor is open, the entire PV source circuit is disconnected from the inverter within seconds of activation. After activation the compliant inverter will dissipate the input DC capacitor charge to less than 30V or 240VA between any two conductors and conductor ground within 10 seconds, meeting article 690.12 Rapid Shutdown requirements.

**Case 2: NEC 2014 690.12 non-compliant inverter**

Diagram 2 shows a representation of a typical installation using the Bentek RSS solution and a non-compliant inverter.



When first responders arrive at the scene of the emergency, the PV source circuit is disconnected by activating the ground-level Bentek Rapid Shutdown Controller (RSC). The first responder opens the clear cover of the RSC and pushes the red EMO button. The LED indicator switches from “Solar On” green to “Solar Off” red. The RSC opens a contactor located in the rooftop mounted RSM and a contactor located in the RSM installed next to the inverter. Once the contactors are open, the PV source circuit and Inverter DC input capacitor bank are disconnected within seconds of activation. After activation the controlled conductors will be less than 30V or 240VA between any two conductors and conductor ground within 10 seconds, meeting article 690.12 Rapid Shutdown requirements.

# Conclusion

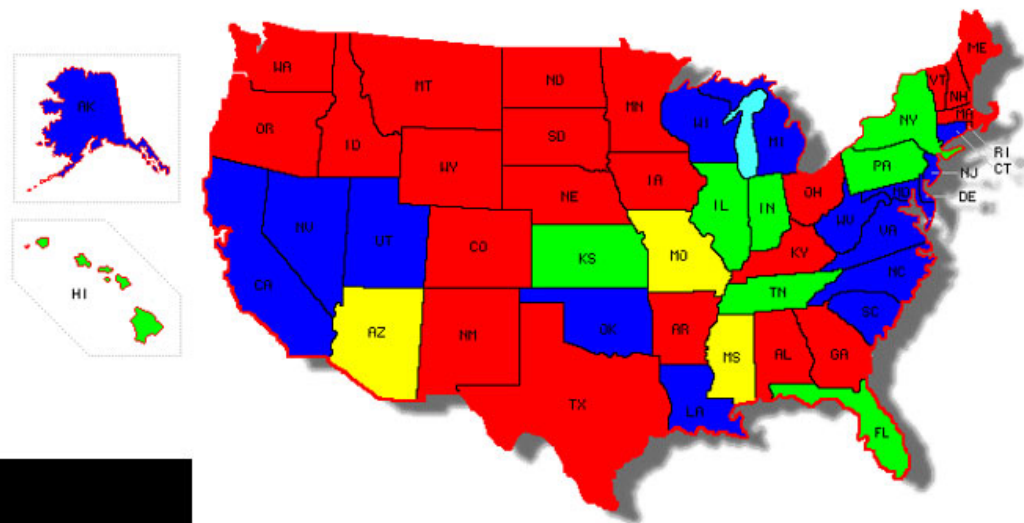
Safety is the purpose of the National Electrical Code, and the 2014 version enhances first responder safety with a new provision that is applicable to Residential and Commercial buildings and PV systems throughout the 50 states. The NEC compliant Bentek solution provides integrators with a low cost and easy to integrate solution. Because NEC enforcement varies greatly by region and state, system designers and installers are encouraged to consult with the local AHJs.

These new NEC requirements mandate changes to all residential and commercial PV systems to ensure Rapid Shutdown article 690.12 requirements are met.

Bentek will be monitoring these changes and will provide regular updates about additional Bentek SafeAccess Rapid Shutdown solutions.

Additional information about NEC compliance and other design considerations can be obtained by calling Bentek at (866) 505-0303 or by visiting our website at [www.bentek.com](http://www.bentek.com)

## NEC® in Effect 1/1/2015



**2014 NEC®**  
**2011 NEC®**  
**2008 NEC®**  
**No Statewide NEC® Adoption**

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