



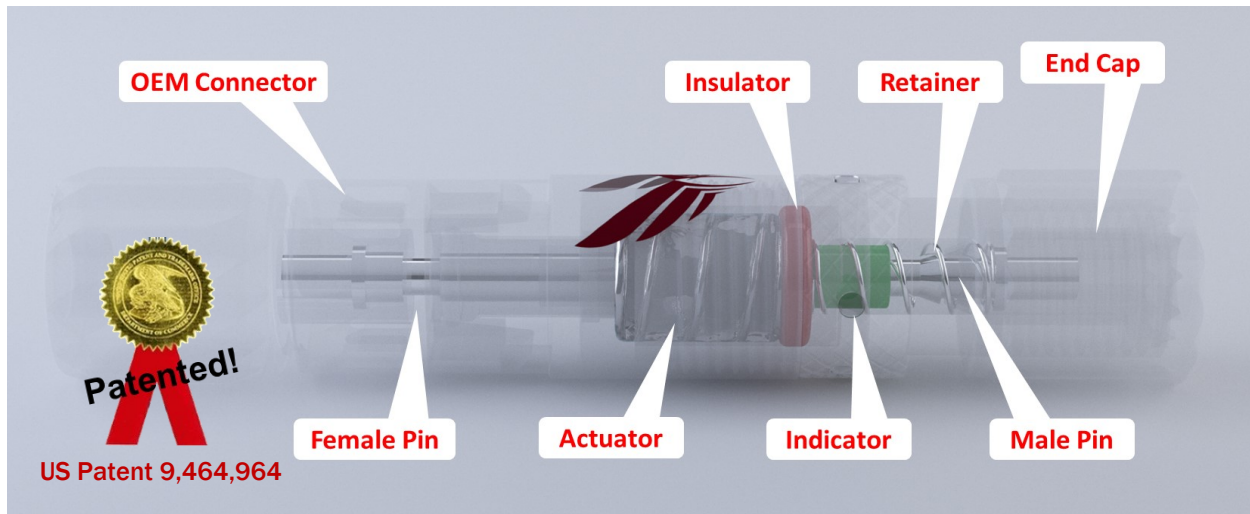
Solar Guardian



Innovative Solutions to Prevent Fires in Photovoltaic Arrays

Technical Challenge

Solar arrays installed today do not have any built-in protection from the fires and human hazards of DC electrical faults because there is no product on the market that complies with Article 690-11 of 2017 National Electrical Code (NEC), requiring systems to “detect and interrupt arcing faults resulting from a failure of system components.”



Approach

The Solar Guardian PV connector contains a dielectric material that expands as temperatures rise to unsafe levels, disconnecting electricity and preventing arc faults in solar arrays. This technology is different from current technologies in that it can pre-indicate when an arc-fault may occur by warning home and plant owners of degradation or incorrect installation that causes overheating of the connector.



Solution

Guardian Sensors, Inc. (GSI) is a wholly-owned subsidiary of Management Sciences, Inc. (MSI) and was created to commercialize MSI's solar technology products. GSI's first product is the Solar Guardian®, which pre-detects, mitigates, and indicates arcing faults **BEFORE** they happen! A national laboratory evaluated and confirmed Solar Guardian's “unique ability” to pre-detect electrical faults and prevent fires in solar arrays. It locates and shuts off only the defective solar panel, connector, or cable; providing continued production of electricity by the array. The Solar Guardian alerts owners and maintainers to replace the faulty panel or cables, for quick restoration of full production. This patented technology exceeds the 2017 NEC requirement.



Solar Guardian

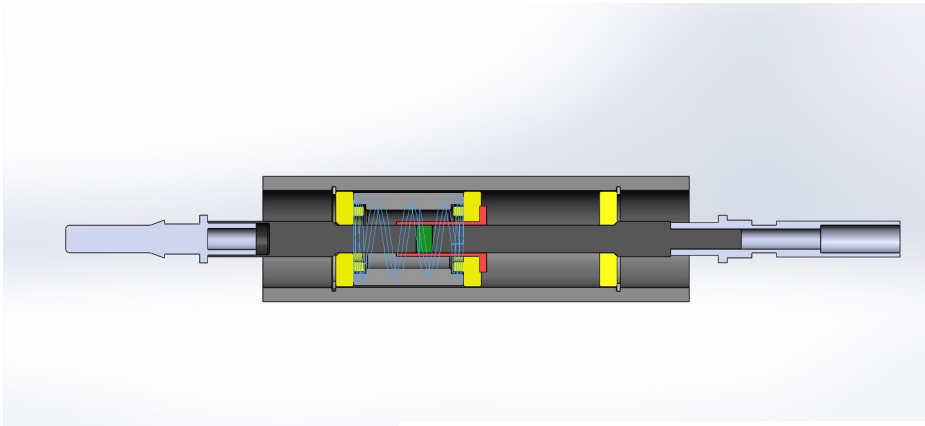


Guardian Sensors, Inc.

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US Patent 9,464,964

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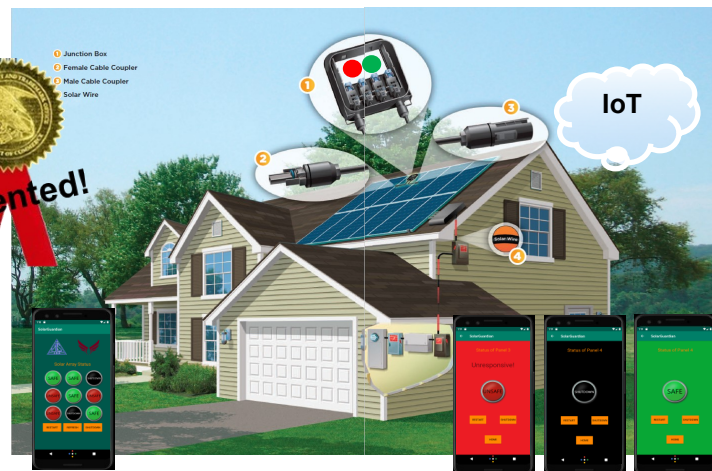
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The Solar Guardian™ Rapid Shutdown System

A patented, Module-Level Power Electronic (MLPE) that offers features for rapid shutdown of strings per 690.12 with wired or wireless Internet of Things paradigms to protect installers, homeowners, firemen, inspectors, and service personnel from electrocution.

US Patent
9,816,877

International Patent
Chinese Patent:
ZL-2015-08-0053040.5



Features/Capabilities

- A module that can be placed anywhere on the solar panel line (beginning or end for location ease)
- Deactivation of the entire solar array via deactivation of each individual solar panel
- A safe indicator for each solar panel fail that is triggered for removal when the component is above its UL-rated temperature
- Whole array or individual panels can be specified to be shut-off

Benefits

- Solar array protection from overheating by automatically removing defective panels
- Safe disconnection of solar array for maintenance and emergency situations
- Automatic monitoring for overheating fail-safe trigger notification
- Automatic logging of shut-downs and start-ups to audit inspections and repair

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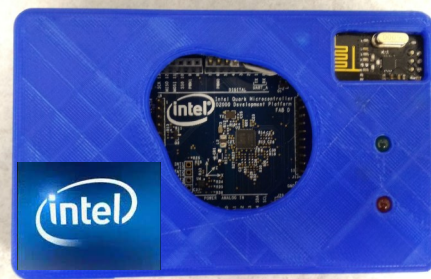
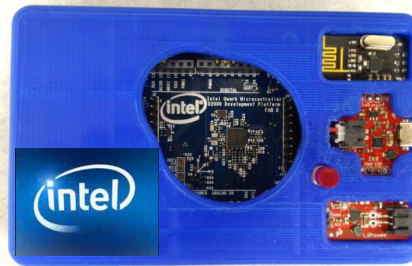
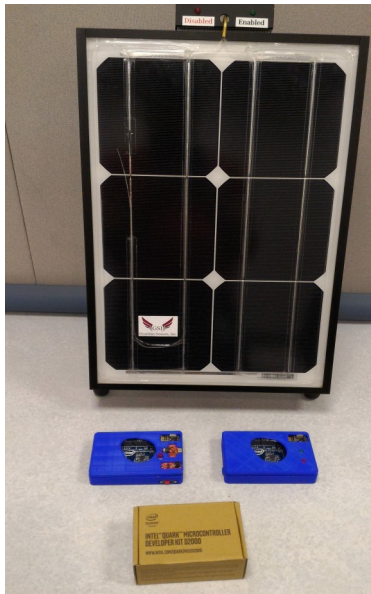
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Benefits

- Potential secondary arcs quenched
- Affected panels are disconnected
- Unaffected panels continue to operate
- Maximum return on Investment
- NEC compliant
- In-panel, pre-arc detection
- Provide owners peace of mind
- Constant monitoring to prevent fires
- Patented rapid shutdown solution

Markets - Monitoring and Control of Electric Infrastructure

- Solar and Electrical Power Generation and Transmission
- Aircraft and Vehicle Electrical Systems
- Natural Gas and Oil Production and Refinery
- Chemical and Industrial Applications



An arcing-fault is “source side” and continues to arc until the sun sets or the panel is covered with an opaque material. Solar Guardian products will monitor the array and disconnect faulted panels or cabling. Solar Guardian will protect consumers and Investments, in addition to notifying first responders who are called upon to fight fires on buildings with solar arrays installed, by disconnecting the source-side electricity and the illuminating indicators that show solar power generation is off.

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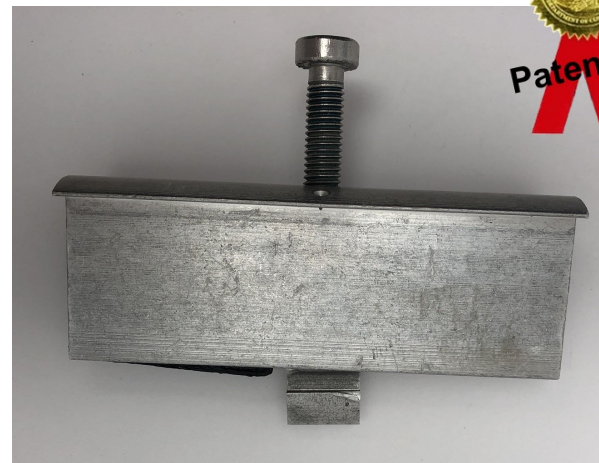
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The Solar Guardian™ Solar Theft Protection

Solar Guardian® anti-theft products offer a low-cost solution to the problem of catching solar panel thieves by detection with a tiny, hidden IoT sensor that sends an alert to security team cell phones when the attaching bolt is removed before the panel is taken off the rack.

“Solar plant theft is an increasing problem for the solar industry. Since 2011, solar panel prices and installation fees have decreased. Solar panel availability increased simultaneously. This shift will lead to more solar plants and an increase of solar panel theft or property vandalism.”

<http://stealthmonitoring.com/blog/solar-panel-theft-crime-increases/>



Problem

Solar systems are a costly investment. As with most of the things that are both expensive and valuable, solar panels have created a market for solar panel thieves. Installing solar panels takes some time, but cutting a fence and taking them down is simple. Module installers generally install modules with just little clips on the edges, with bolts through mounting holes in the back of the modules.

Solution

The patented Solar Guardian® does not inform the thieves who are blissfully unaware that armed security has been notified. Instead, it sends a cell phone alert with location code when a mounting bolt has been removed. The armed response team knows the location and can take necessary precautions to make an arrest. Even when the thieves get away with the panel, the Solar Guardian sends the GPS location so the rustlers can be caught when they reach their destination.