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Communication interruption of photovoltaic combiner box in winter



Overview

When the solar combiner box is grounded incorrectly, it results in electrical faults and equipment damage.

Key Takeaways

Winter-related communication interruptions in PV combiner boxes are often caused by loose connections, moisture ingress, temperature-induced stress, or faulty meters affecting signal transmission.Common Causes

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1. Loose or Corroded Connections Cold temperatures cause metal components to contract, which can loosen terminal screws or connectors over time. Thermal cycling from day-night temperature changes exacerbates this effect, leading to intermittent voltage drops or signal loss in communication lines . Corrosion on terminals or busbars due to condensation or humidity can further degrade contact quality . 2. Faulty or Aging Solar Meters Many combiner boxes rely on meters or monitoring devices to communicate system performance. In winter, low temperatures can affect meter electronics, and older meters may fail to maintain stable communication. Additionally, meters dependent on cellular or internet connections may experience signal loss due to weather-related network issues . 3. Environmental Stress and Moisture Snow, ice, and condensation can infiltrate poorly sealed enclosures, causing short circuits or intermittent contact in fuses, breakers, or communication wiring. Even minor water ingress can disrupt data transmission from the combiner box to the monitoring system . 4. Fuse and Breaker Issues Cold weather can increase resistance in fuses and breakers, potentially causing nuisance trips or partial disconnections. A tripped breaker or blown fuse may not only reduce power output but also interrupt communication signals if the monitoring circuit is affected .

Diagnostic Steps
• Visual and Physical Inspection: Check for loose terminals, corrosion, or moisture inside the combiner box. Gently wiggle cables to detect intermittent connections .

• Voltage and Signal Measurement: Use a multimeter to verify DC voltage stability and a communication tester to ensure data lines are intact .

• Meter Functionality Check: Confirm that meters are operational and compatible with current network protocols, especially if using cellular or internet-based monitoring .

• Thermal Imaging: Identify cold spots or areas of high resistance that may indicate poor connections or failing components .
Preventive Measures
• Tighten and Torque Terminals: Ensure all connections are properly torqued to manufacturer specifications to withstand thermal contraction .

• Seal Enclosures: Use IP-rated combiner boxes and weatherproof gaskets to prevent moisture ingress .

• Regular Maintenance: Inspect combiner boxes before and during winter for corrosion, loose wires, and proper fuse/breaker operation .

• Upgrade Meters and Communication Devices: Replace aging meters and ensure compatibility with current network standards to reduce winter-related communication failures .

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• Environmental Protection: Consider installing heaters or insulation for combiner boxes in extremely cold climates to maintain stable operating temperatures. By addressing these factors, PV system operators can minimize winter-related communication interruptions, maintain reliable monitoring, and ensure consistent energy production.

Article Content

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PV Next combiner box

Our flexible and compact PV Next combiner box was honored with the German Design Award 2023 in Gold. A modular design, safe

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