



Solar Modules Installation and Maintenance Guide



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1. Overview

Thank you for choosing photovoltaic modules (also known as solar panels, hereinafter referred to as “modules”) from Oakridge Power. This guide provides installation methods and safe handling procedures for Oakridge Power modules.

Read and understand this guide before installation, operation, or maintenance. It is for reference only; if any information is missing or unclear, please contact qualified professionals or Oakridge Power’s Sales Department for further clarification.

Oakridge Power modules are designed in accordance with **UL 61215** and **UL 61730**, applicable to publicly accessible systems and systems exceeding 50 DC volts or 240 W. The modules have passed UL 61215 and UL 61730, meeting Class II electrical shock protection requirements.

Before installing PV systems, installers must be familiar with local mechanical and electrical requirements in the United States. Failure to follow the instructions in this guide will void the product’s limited warranty. Keep this guide for future reference.

2. Disclaimer

Oakridge Power assumes no responsibility for patent infringement or other third-party rights arising from the use of Oakridge Power modules.

Because installation, operation, usage, and maintenance of modules are beyond Oakridge Power’s control, Oakridge Power does not assume responsibility for power loss, module damage, casualty, or other costs resulting from improper installation, operation, usage, or maintenance.

This guide is based on Oakridge Power technicians’ experience but does not constitute a warranty, including product specifications and suggestions. Oakridge Power reserves the right to update the installation guide, solar products, specifications, and product information without prior notice.

3. General Safety

Mechanical and electrical installation of PV modules must comply with relevant regulations, including electrical codes (NEC), building laws, and utility interconnection requirements. Contact local authorities for applicable permits. Installers shall conform to all safety precautions and local regulations listed in this guide.

Under normal operating conditions, output power, current, voltage, and other data may differ from STC label values. A PV module may produce higher current and/or voltage than reported at STC. Factors include module temperature, front

irradiance, and for bifacial modules, albedo, row spacing, and height. Accordingly, V_{OC} and I_{SC} (or I_{SC-BSI} for bifacial) marked on the module should be multiplied by a factor of 1.25 when determining ratings for components connected to the PV output. When modules are connected in series, string voltage shall not exceed the maximum system voltage. Maximum number of modules in series = $V_{max} / [CV_{OC} \times V_{OC}]$, where $CV_{OC} = [1 - \beta \times (25 - T_{min})]\%$. T_{min} is the lowest expected ambient temperature. β (%/°C) is the temperature coefficient of V_{OC} (refer to datasheet). For parallel strings, a fuse is required for each string. Refer to local regulations. The safety factor of 1.25 may be adjusted per full system simulation; further guidance is given in **UL 62548**.

Only identical module types may be used in a single system. Inverters, connectors, cables, mounting systems, etc., should be PV-dedicated. Use inverters with integrated PID recovery function at night to avoid PID effects. Observe all component instructions, including wiring, connectors, DC-breakers, mounting hardware, inverters, batteries, etc.

Modules generate DC when exposed to sunlight. Risk of electric shock when touching live parts. Do not touch junction box terminals. Use caution when carrying modules or connecting cables. Do not use mirrors or magnifiers to concentrate sunlight. Cover modules with opaque material during installation.

Do not disassemble modules under load. Disassembly, removal of labels, painting, or marking with sharp objects is prohibited. Avoid scratching or hitting modules. Do not install broken modules. Keep children away from PV system during transport/installation. Module surface shall be smooth, free of sharp edges. Do not expose modules to concentrated sunlight via mirrors or lenses.

4. Transportation, Storage and Handling

Oakridge Power modules must be transported only in supplied packaging and remain packed until installation. Protect packages from damage. Prevent pallets from falling. Do not exceed maximum stack height indicated on pallet. Store pallets in shaded, dry, flat locations. For temporary storage, keep in dry, ventilated room; maximum 36 pieces per metal pallet.



Figure 1 – Pallet of PV modules

Unpack by removing pallet lid and belts, then carefully remove modules in sequence. Do not wear watches or rings when handling to avoid scratches. Prevent bumping; lay modules gently. Do not lift by junction box or cables. Do not stand or step on modules. Do not place heavy objects on modules. Broken glass may cause injury; damaged modules must be properly disposed. Inspect modules for transport damage before installation. Do not disassemble or modify modules – warranty void.

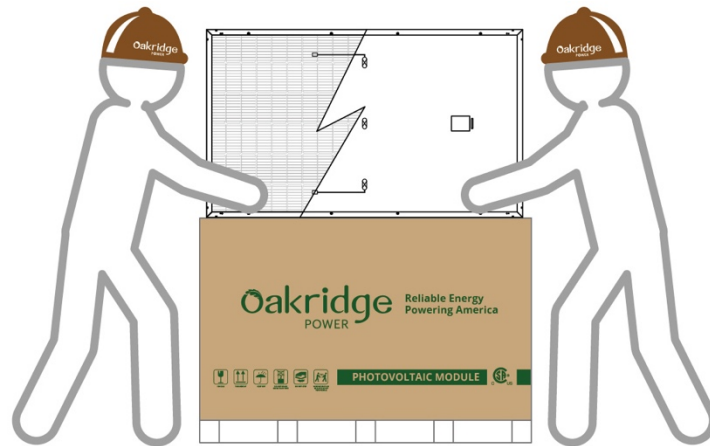


Figure 2 – Removing PV modules from a pallet

5. Product Identifications

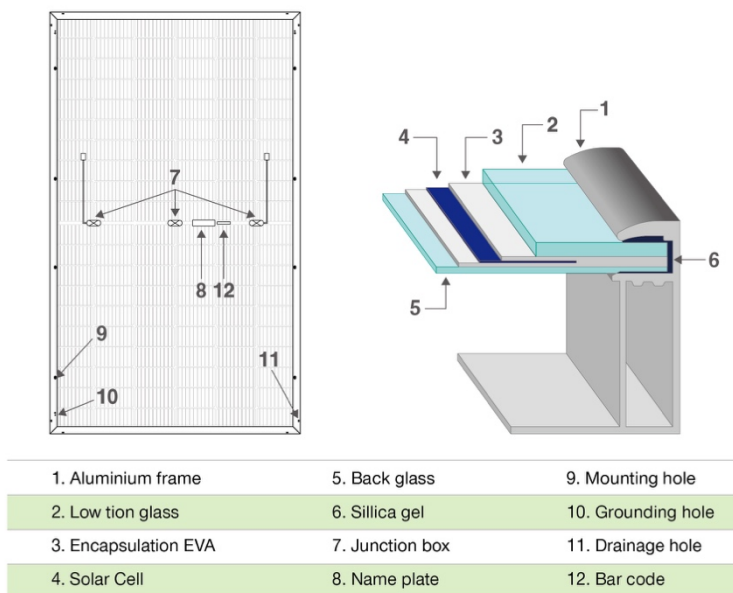


Figure 3 – Oakridge Power PV module structure

Each module has a rear label: product type, rated power, rated current, rated voltage, open circuit voltage, short circuit current, test conditions (STC and BNPI/BSI for bifacial), weight, dimensions, maximum system voltage, fuse rating, etc.

Serial number coding (example): **OP 01 1 AAAA 260101 01 0001**

- OP: Oakridge Power company code
- 01: Factory code
- 1: Production line code
- A: Solar cell type code
- A: Busbar type code
- A: Frame type code
- A: Junction box type code
- 260101: Date code (2026-01-01)
- 01: Workorder flow number
- 0001: Module flow number (0001-9999)

6. Installation Environment

Oakridge Power modules are suitable for ground installation below 2000 m elevation (not for outer space). Working ambient temperature range: -40 °C to the upper limit defined by 98th percentile module operating temperature of 70 °C, humidity <85% RH. Prolonged exposure outside limits may cause early damage. Mechanical load rating: front 5400 Pa, back 2400 Pa, safety factor 1.5. Avoid shaded areas; install in high-irradiation locations. Lightning protection required in thunderstorm-prone areas. Modules passed UL 61701 salt spray corrosion test; corrosion may still occur at contact points. For coastal installations 50–500 m from ocean, use stainless steel or aluminum with anticorrosion measures. Do not install near flammable gas sources or areas with water immersion / spray.

7. Mechanical Installation

7.1 General Rules

Installation requires professional knowledge and licensed tools. Installers assume all risks (electric shock, etc.). Comply with applicable laws and building codes. Obtain necessary electrical permits. Modules are for outdoor ground, rack, or rooftop. Install in dry conditions; stop during rain, snow, or high wind. Do not wear metallic jewelry. Use at least 10 mm spacing between modules. Use pre-drilled mounting holes on frames (4 central holes recommended, 8 holes for high snow/wind regions).

7.2 Installation Direction and Tilt Angle

In Northern Hemisphere, face modules true south (azimuth 180°).
Recommended fixed tilt based on latitude:

Latitude range	Recommended tilt angle	Example regions
25° – 35°	Latitude +5°	Texas, Florida, Arizona
35° – 45°	Latitude +10°	Colorado, Tennessee, Virginia
>45°	Latitude +15°	Minnesota, New York, Washington

Tilt angle must be $\geq 10^\circ$ to allow self-cleaning by rain.

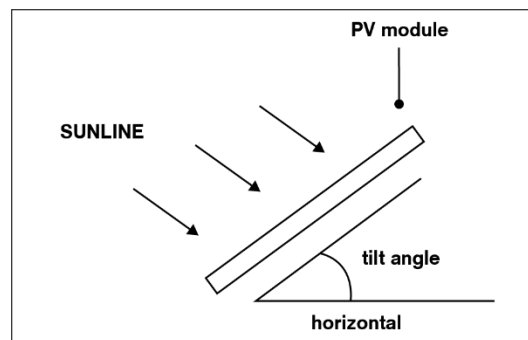


Figure 4 – Tilt angle

7.3 Mounting System Selection

Observe mounting system instructions; ensure load requirements met. Use corrosion-resistant, UV-resistant materials. Do not drill additional holes in frames – warranty void.

7.4 Ground Installation

Ensure adequate height to avoid flooding or snow burial, and avoid shading from plants/obstacles.

7.5 Rooftop Installation

Install under no or light wind; ensure roof structure can withstand wind/snow loads. Properly seal any roof penetrations. Provide minimum 10 cm ventilation gap under modules for cooling.

7.6 Installation Methods

7.6.1 Bolt mounting (through pre-drilled holes). Each module has 8 mounting holes; use M8 bolts. Mechanical load: 5400 Pa front, 2400 Pa back.

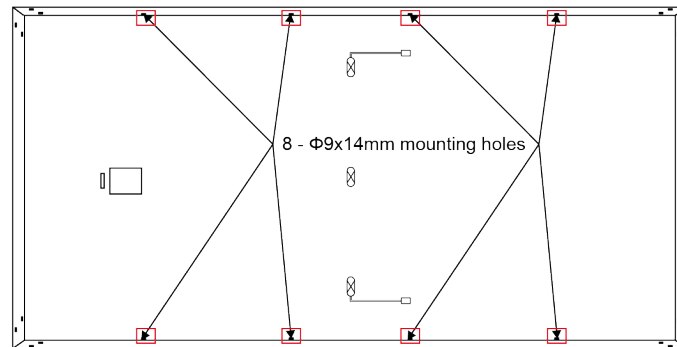


Figure 5 - 8 mounting holes on the frame

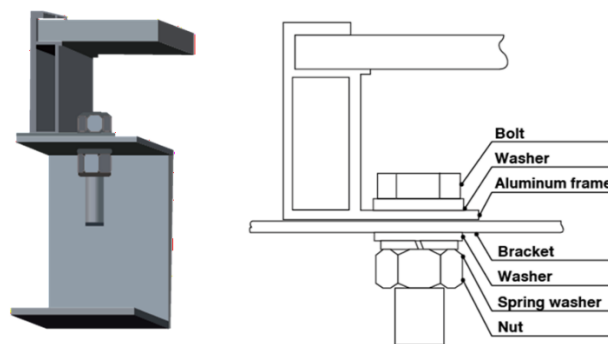


Figure 6 - Mounting methods

7.6.2 Transversal bolt mounting - beam perpendicular to long sides; distances per module type (refer to detailed tables). Recommended accessories: M8 bolt (full thread), 2 flat washers (≥ 1.5 mm thick, OD 16mm), spring washer, M8 nut, material Q235B/SUS304. Torque 12-16 N·m.

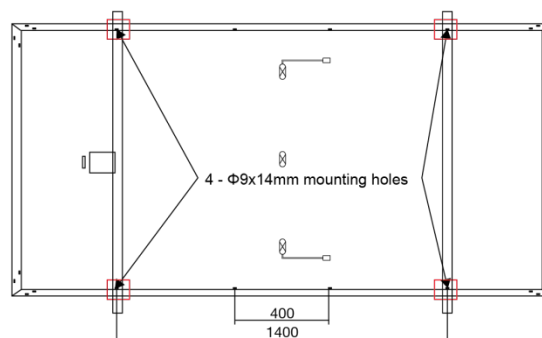


Figure 7 - Installation with bolts into 4 outer holes

7.6.3 Clamp mounting. Clamp must not touch glass or deform frame; overlap 8–11 mm; at least four clamps per module; torque 16–20 N·m. Clamp size ≥ 50 mm; $L/4 - 50 \leq D \leq L/4 + 50$.

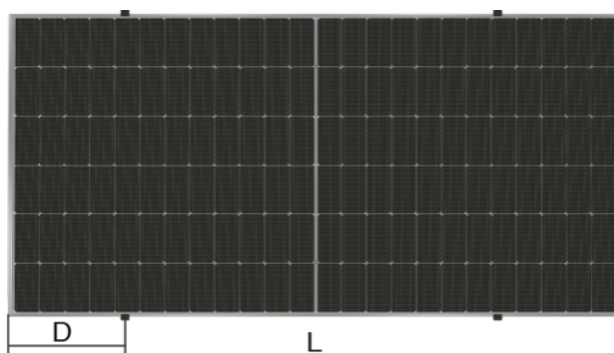


Figure 8 – Mounting position

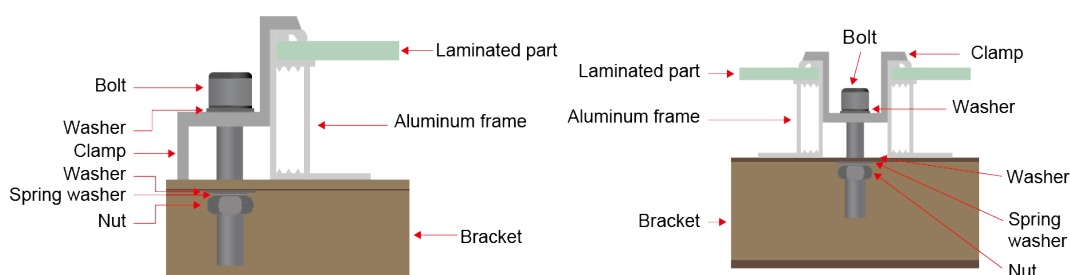


Figure 9 – Mounting methods

8. Electrical Installation

8.1 General Installation

Modules may generate more than STC power in normal conditions. Consider actual environment when selecting equipment ratings. Disconnect all electrical components before installation. Follow NEC for wire sizing; cross-sectional area and connector capacity must prevent overheating. Modules come with 1×4.0 mm² cable certified to **UL 4703** (PV wire). Connectors certified to **UL 6703**.

Lightning arresters required in high lightning areas. Avoid mechanical damage to cables. Fix cables using UV-resistant ties; avoid direct sunlight immersion.

8.2 Grid-connected Electrical System

DC generated can be inverted to AC for grid connection. Local utility policies vary; consult qualified engineer and obtain approval from public utility/authority.

8.3 Electrical Connect Methods

Series connection adds voltages; parallel connection adds currents. Max series quantity: $1500V / (V_{oc} + CV_{oc} \times V_{oc})$. Overcurrent protection per string: $1.25 \times I_{sc}$.

Standard cables 4mm², temperature range -40°C to 85°C. Use identical connector types; keep clean and tight. Do not use connectors to turn circuit on/off.

8.4 Grounding

Module frames must be grounded before operation (NEC 250). Use grounding holes (Ø4) on aluminum frames with stainless steel screw, toothed washer, and grounding conductor. Ground screw should pass through grounding hole with Ω-shaped conductor. For anodized frames, toothed washer ensures reliable bond. To avoid PID effect, ground DC negative electrode of array as recommended.

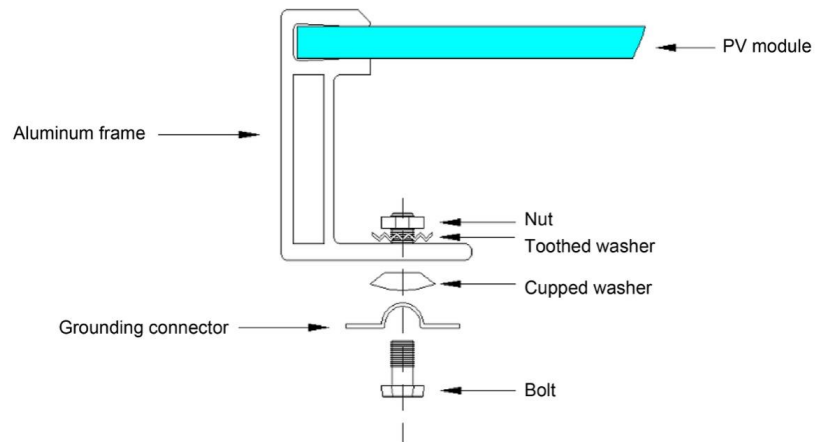


Figure 10 – Grounding methods

8.5 Fusing and Temperature Coefficient

Overcurrent protection rated for DC use per local NEC. If reverse current exceeds Max Series Fuse rating, install overcurrent protective device. More than 2 parallel strings require string fuses. Fuses rated at max DC voltage, connected to ungrounded poles (both positive and negative for ungrounded systems).

9. Adjustment and Maintenance

Qualified personnel should inspect electrical and mechanical connections at least every six months. Clean modules at least once a year, especially in low rainfall areas, using soft sponge/cloth and water (non-abrasive cleaners like ethyl alcohol for stubborn dirt). Do not use high-pressure or high-mineral water. Avoid cleaning during strong sunshine. Do not touch glass with bare hands. If snow accumulates, do not scrape forcibly. Do not clean broken modules or with exposed cables. If issues arise, arrange qualified personnel.

10. Disposal

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities. Contact local government for collection systems. Retailers are obligated to take back old appliances free of charge.

11. Disclaimer of Liability

Because the use of this manual and the conditions or methods of installation, operation, use, and maintenance of Oakridge Power photovoltaic modules are beyond Oakridge Power's control, Oakridge Power does not accept any responsibility and expressly disclaims liability for any loss, damage, or expense arising out of or in any way connected with such installation, operation, use, or maintenance, including but not limited to property damage, personal injury, power loss, or any other incidental or consequential damages.

No responsibility is assumed by Oakridge Power for any infringement of patents or other rights of third parties that may result from the use of the modules. No license is granted by implication or otherwise under any patent or patent rights owned or controlled by Oakridge Power.

The information contained in this manual is based on Oakridge Power's knowledge and experience at the time of publication and is believed to be reliable. However, such information, including product specifications (without limitation) and suggestions, does not constitute a warranty, express or implied, including any warranty of merchantability or fitness for a particular purpose. Oakridge Power reserves the right to modify this manual, the PV modules, electrical specifications, or product information sheets without prior notice.

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