NBL-W-ATSRM-3

3-in-1 fully automatic tracking solar radiation meter

user manual V4.1

Changsha Zoko Link Technology Co., Ltd.

Listing

I、Overview

The 3-in-1 fully automatic tracking solar radiation instrument is used to measure solar direct radiation, total radiation, and scattered radiation in the spectral range of 0.28μm to 3μm. When the solar direct radiation exceeds 120 W/m², it can be connected to a sunshine duration recorder to directly measure the sunshine duration. Therefore, the 3-in-1 fully automatic tracking solar radiation instrument can be widely applied in fields such as solar energy utilization, meteorology, agriculture, building materials, and ecological research.

Sunshine Duration Definition: The total duration when solar direct irradiance reaches or exceeds 120 W/m², measured in minutes. Sunshine duration is also known as actual sunshine hours.

The 3-in-1 fully automatic tracking solar radiation instrument combines time tracking and light tracking. The solar declination angle is tracked and automatically adjusted, ensuring the solar radiation instrument can track the sun continuously and uninterruptedly throughout the day. At the same time, it guarantees that the scattering device can block the scattered radiation sensor throughout the day. The device is equipped with a GPS module, which can quickly determine the latitude and longitude coordinates and time information of the installation location, making installation and debugging more convenient. The automatic tracking device works in conjunction with a controller. The controller calculates the current position of the sun based on the latitude, longitude, and time obtained from the GPS, then controls the automatic tracking device to rotate it to the sun's position. Due to installation errors, terrain factors, and other influences, tracking errors may occur, but the high-precision four-quadrant sensor provides accurate tracking to ensure the tracking error of the automatic tracking device is less than 0.1°. The instrument consists of a base, bracket, gearbox, motor, microcontroller, direct radiation sensor, power supply, and other components.

The optical tube of the direct radiation sensor consists of a light baffle, inner tube, thermopile (sensitive surface), and desiccant. The sensing component uses a wire-wound, electroplated multi-junction thermopile, with a black coating that has a high absorption rate on its surface. The hot junction is on the sensitive surface, while the cold junction is inside the body. The thermoelectric potential generated within the linear range is proportional to the solar direct irradiance.

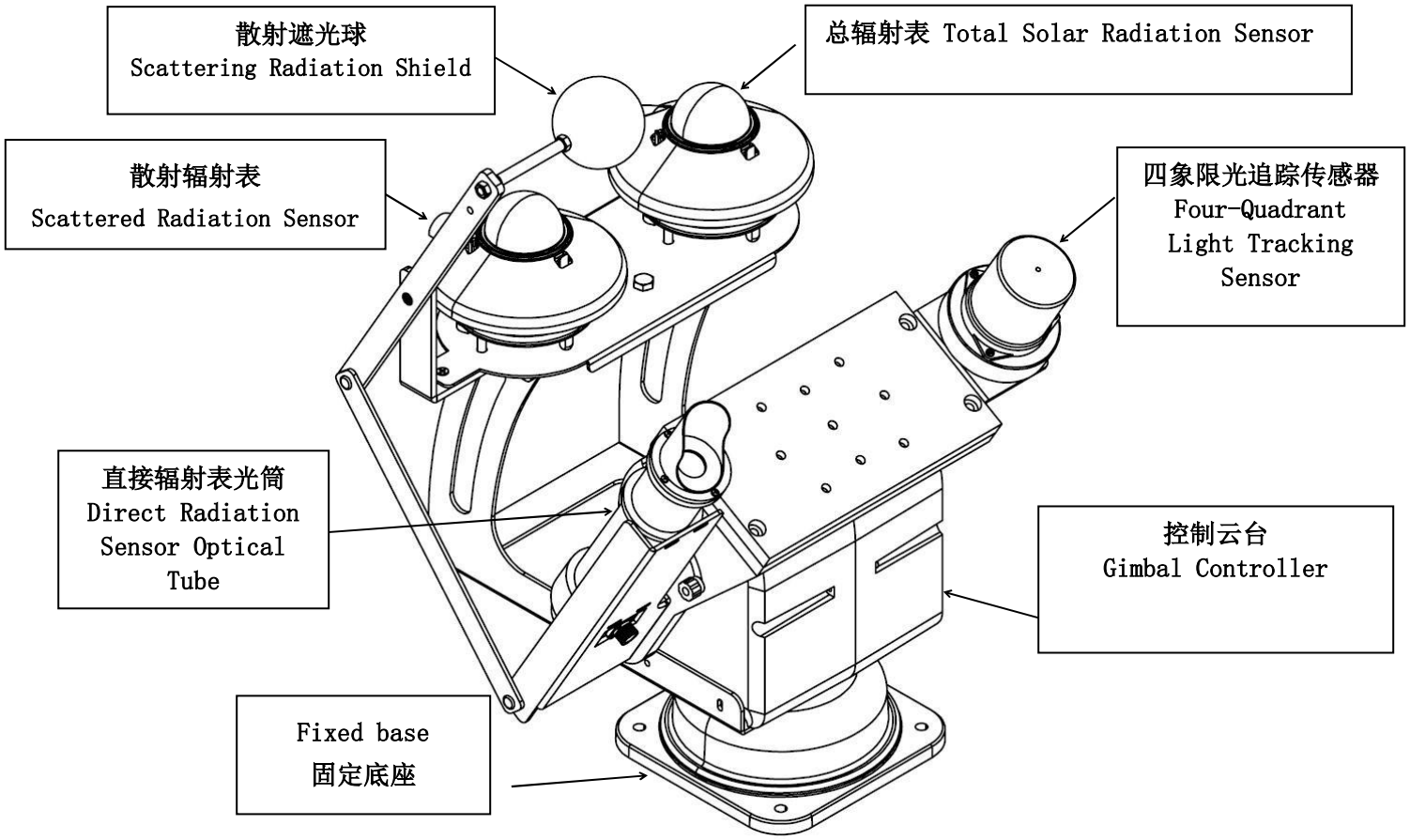
The scattering device rotates with the fully automatic tracking solar radiation instrument and adjusts the shielding angle, ensuring the scattered radiation sensor is consistently shaded by the radiation shield, thus ensuring accurate output of scattered radiation data.

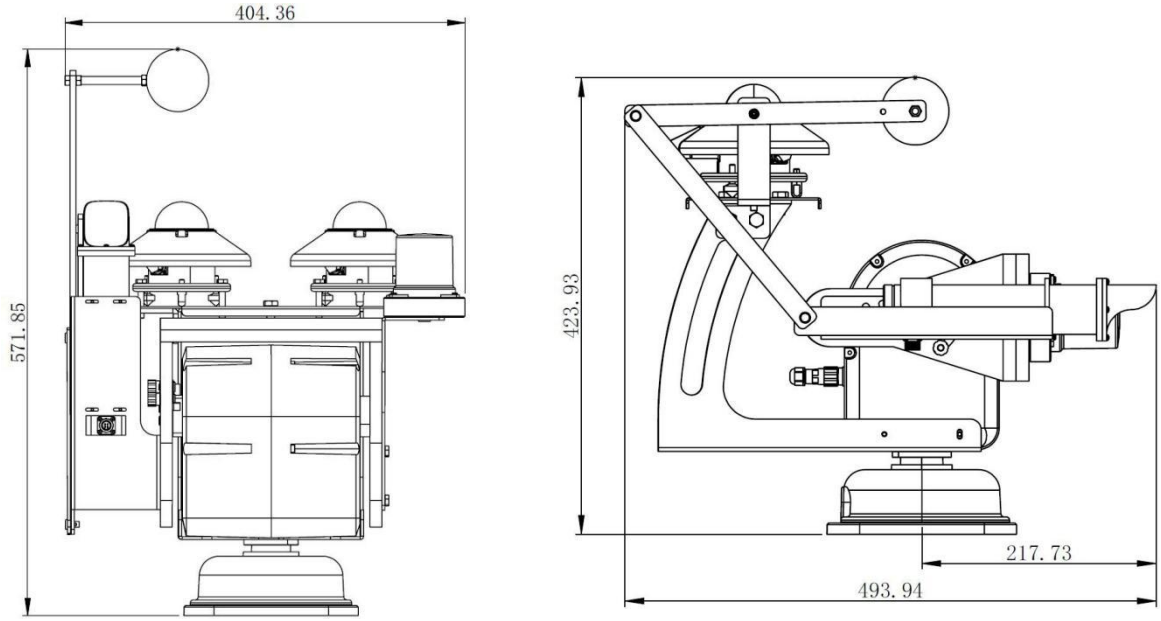
II、Technical specifications

Name		Technical specifications
Tracking device	Tilt angle	0~120°
	Horizontal angle	0~360°
	Tracking accuracy	＜0.1°
Direct radiation sensor tube	Sensitivity	7~14μV/Wm²
	Response time	≤15 second（99%）
	Internal resistance	Approximately 90 Ω
	Stability	±2%
	Temperature characteristics	±2%（-30℃~+60℃）
	Non-linearity	±2%
	Test range	0~2000W/m²
	Spectral range	280~3000nm
Total radiation sensor/scattered radiation sensor	Sensitivity	7~14μV/Wm²
	Response time	≤30 second（99%）
	Internal resistance	Approximately 180Ω
	Stability	±2%
	Temperature characteristics	±2%（-20℃~+40℃）
	Non-linearity	±2%
	Test range	0~2000W/m²
	Spectral range	280~3000nm
Power supply voltage	DC voltage	DC12V
	AC voltage	AC22V

III、Structure and Installation and Commissioning Instructions

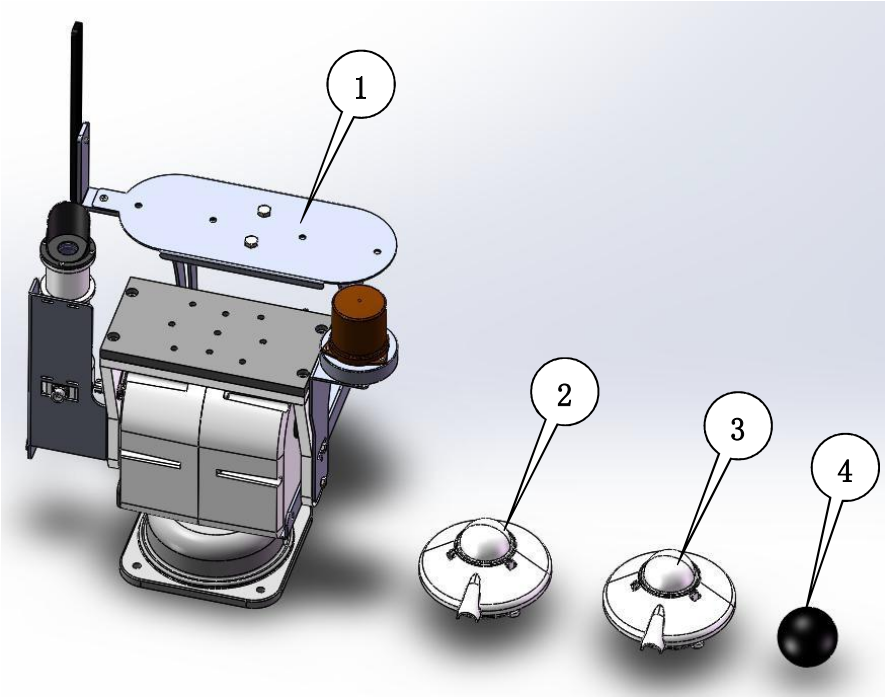
3.1 Composition of the Three-in-One Fully Automatic Tracking Solar Radiation Meter





Note: When installing, ensure that the equipment has sufficient space for rotation.

3.2 Installation of the three-in-one fully automatic tracking solar radiation meter

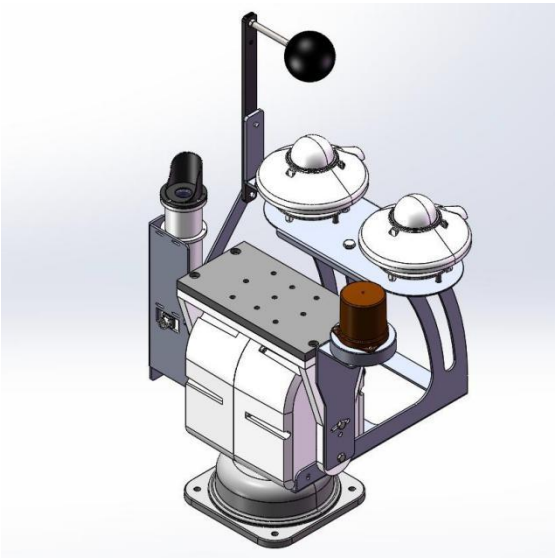


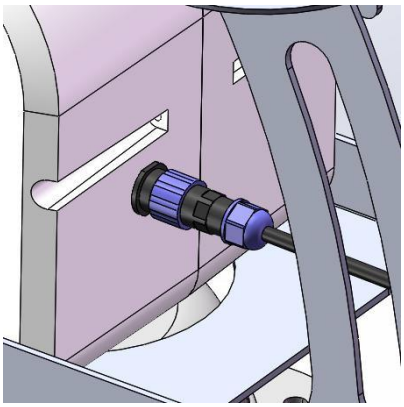
Parts diagram after unpacking

After unpacking, please carefully check the equipment and accessories.

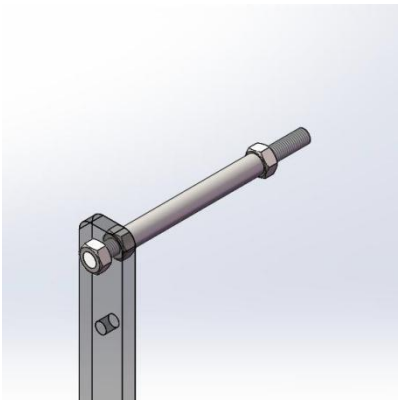
①Automatic tracking of the main body and direct radiation
②Total solar radiation sensor
③Solar scattered radiation sensor
④Shade ball Also included:
①M6x120 threaded rod 1pc;
②M6 nut 7pcs;
③Limit round tube 1pc;
④M6x35 external hexagon screw 4pcs.

Installation completion diagram

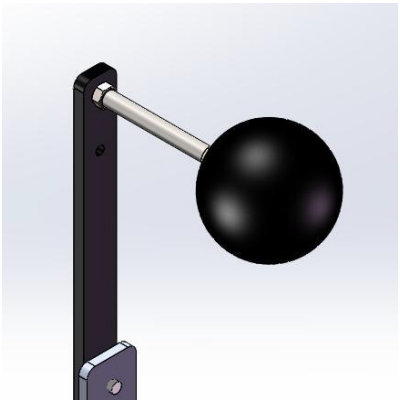




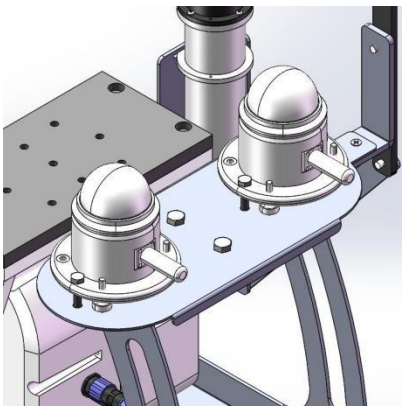
1. Plug the aviation connector of the four-quadrant light tracking sensor into the back of the motor.



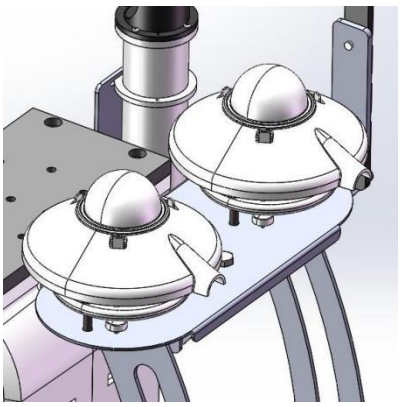
2. Screw the M6 lead screw into the fixed rod, securing both sides with M6 nuts, then insert the positioning rod and secure it with nuts.



3. Tighten the black sphere onto the lead screw.



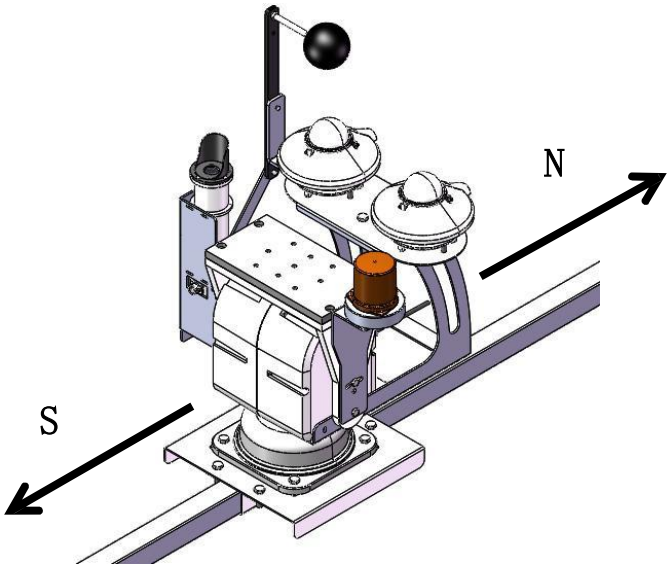
4. Install the scattered radiation sensor onto the bracket below the black sphere, and install the total radiation sensor on the other side. Each radiation sensor is secured with two M6x35 hex screws, and four M6 nuts are used to fix the bracket from the bottom.



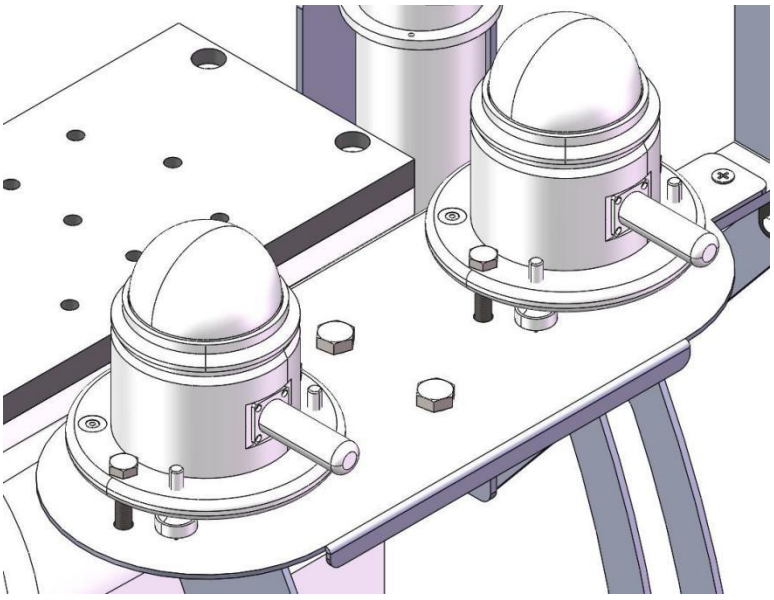
5.Install the radiation shield on top of the radiation sensor.

3.2 3-in-1 Fully Automatic Tracking Solar Radiation Instrument Installation and Debugging

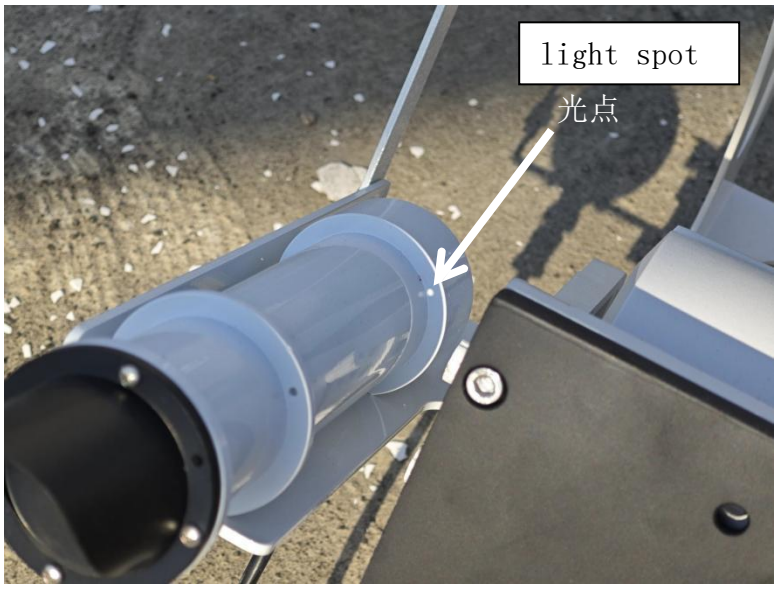
3.2.1 When installing the equipment, ensure that the bottom of the fixed base is facing north. Also, make sure there are no objects blocking the sunlight within 20 meters to the south. Then, use screws to secure the device to the bracket.



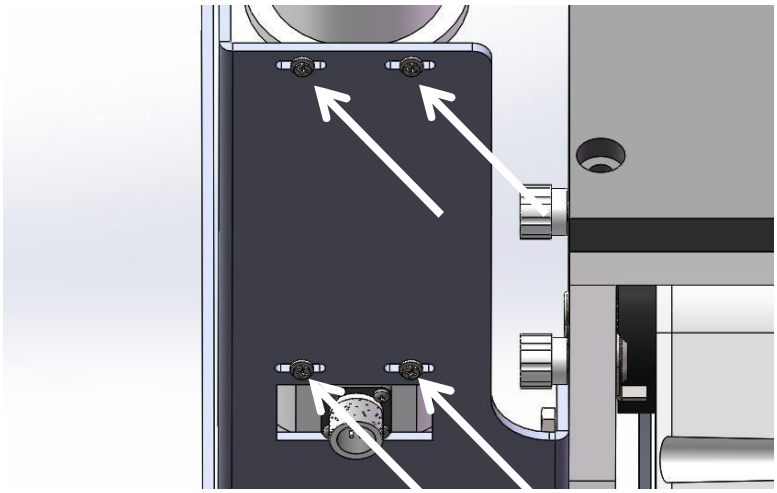
3.2.2 Before starting measurements, remove the radiation shield from the radiation sensor. Loosen the fixing screws and adjust the leveling screws. Use the bubble level to ensure it is in a horizontal position before use.



3.2.3 Adjust the light spot on the optical tube so that the spot passes through the small hole at the top of the tube and projects onto the "cross" light point locator at the bottom, as shown in the diagram.



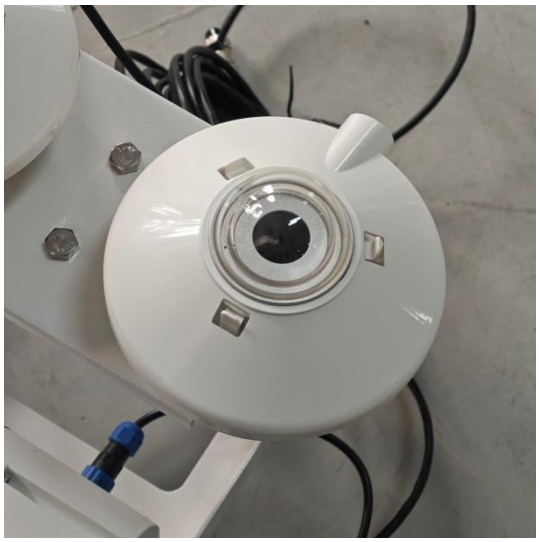
Then tighten the fixing screws on the optical tube mounting plate.



IV、Maintenance Instructions

Regular maintenance of the equipment can extend its service life and reduce the losses caused by faults.

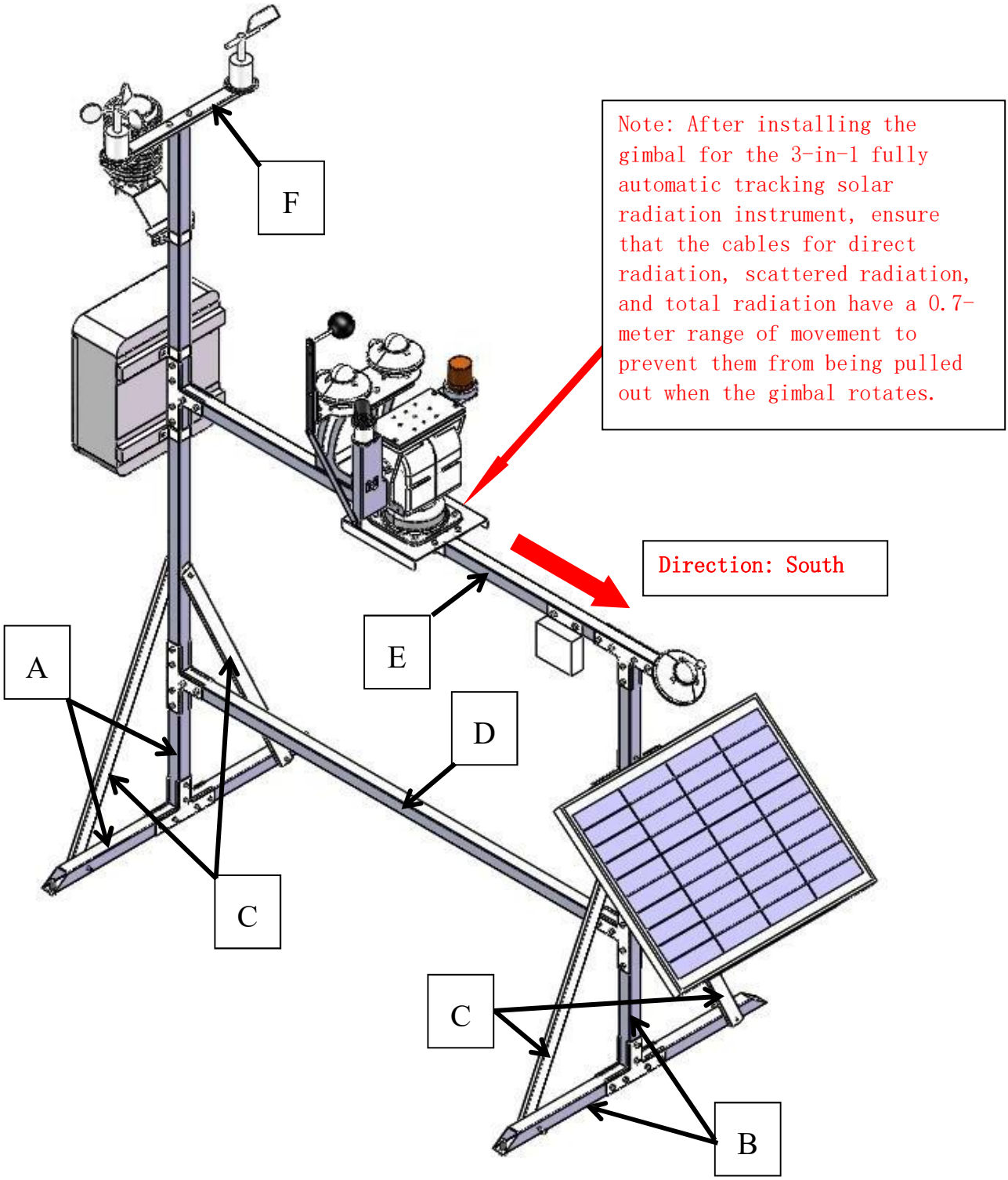
4.1 Regularly clean the dust on the quartz glass of the direct radiation sensor optical tube and total radiation sensor to prevent data deviation caused by dust accumulation. It is recommended to clean them once a month.



4.2 Regularly check if the equipment is operating normally and if the tracking is accurate. If there are any issues, promptly report them to the manufacturer for resolution. It is recommended to check the equipment once a month.

V. Appendix Diagram

Installation Diagram of the Photovoltaic Power Station Environmental Monitoring Instrument



VI. Contacts:

Company: Changsha Zoko Link Technology Co., Ltd.

Tel/WhatsApp/WeChat: +8615367865107

E-mail: sales@niubol.com

Website: www.niubol.com

Address: Room 102, District D, Houhu Industrial Park, Yuelu District, Changsha City, Hunan Province, China