

# Dual Axis Solar Tracker Controller Box

## User Manual

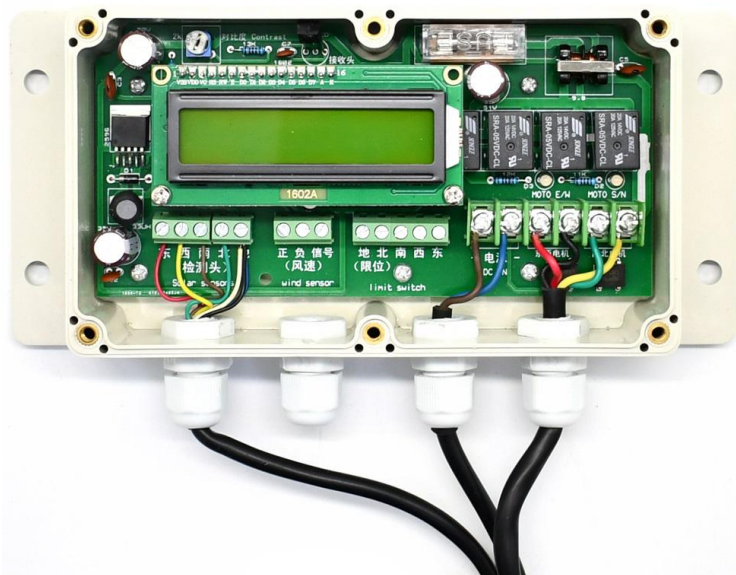
This controller is a two-axis sun tracking controller, using the dedicated four-quadrant silicon crystal azimuth detection head to detect the sunlight angle, through the controller, and analyzing the detecting head signal control platform execution trace the process of the sun.

It also has met the wind flat, returning to the east at night, and other functions. By using English LCD display corresponding parameter and infrared remote control buttons, it can be used all kinds of parameters set free.

The platform corresponding to this controller requires a two-degree-freedom platform. The driving motor of the platform is a DC brush motor. The voltage of the two motors is 12 or 24V, and the total current is less than 6A. Limit switches shall be provided in all four directions of the platform.

The controller consists of the following main components:

### 1. Main Controller Box



- Mounting hole 6MM
- Left and right distance: 182MM
- Up and down distance: 51MM

The main controller adopts IP65 waterproof box as its shell and has four waterproof interfaces for wiring connection.

All wiring on the main-board adopts terminal wiring, and the upper cover is transparent so that the corresponding parameter status can be observed in real-time.

## 2. Azimuth Detection Head



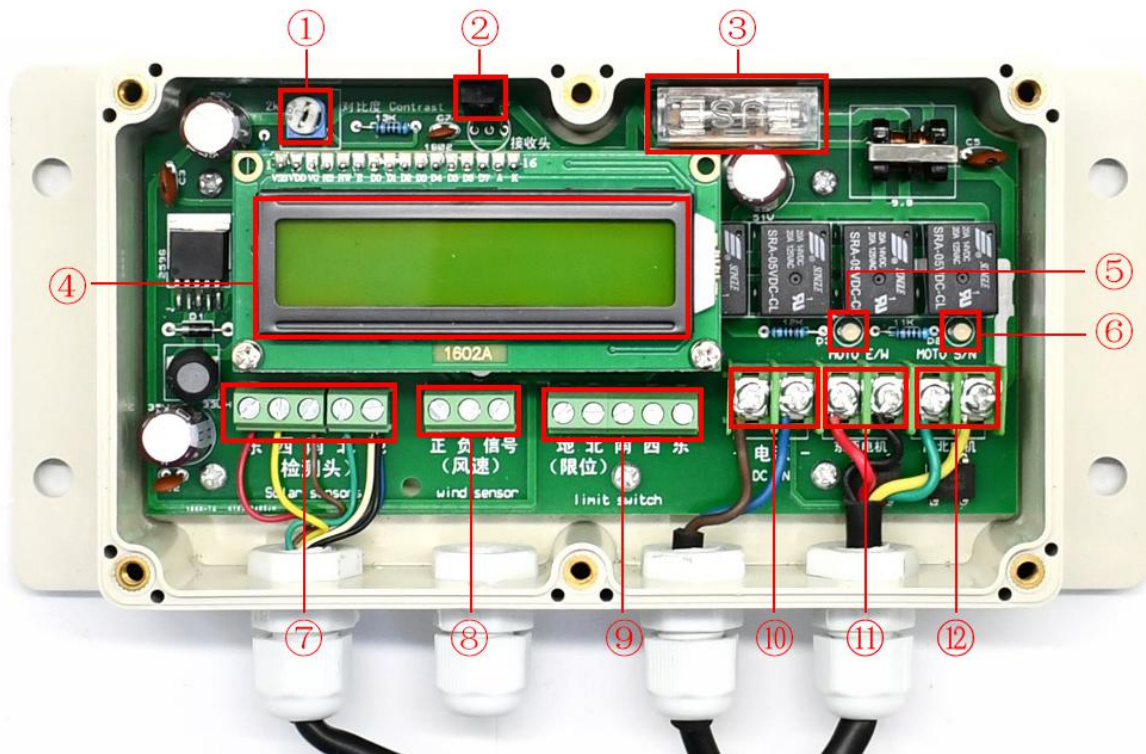
The detection head is a unique four-quadrant silicon crystal type, which generates four different solar radiation voltages in four directions and transmits them to the motherboard via 5-core cable. The installation method is M6 bolt fixation. All parts are made of aluminum and stainless steel. The silicon crystal plate is made of solar glue board production process, and the back welding line is covered with waterproof silica gel, which can meet the service life of ten years.

## 3. Infrared Remote Control



- Effective distance: 8m
- Use two No. 7 batteries

## Detailed description



The functions of the control board are as follows:

- |                                           |                                                         |
|-------------------------------------------|---------------------------------------------------------|
| ① - Display Contrast                      | ⑦ - Azimuth Detection Head Interface                    |
| ② - Infrared Remote Receiver              | ⑧ - Wind Speed Sensor Interface                         |
| ③ - Fuse                                  | ⑨ - Limit Terminal Interface                            |
| ④ - Lcd                                   | ⑩ - Power Input (12-24V Dc, Left Positive And Negative) |
| ⑤ - East-West Axis Output Indicator       | ⑪ - East-West Shaft Motor Output                        |
| ⑥ - North And South Axis Output Indicator | ⑫ - North And South Axis Motor Output                   |

\* Wind speed sensor interface: Fs is 0-5v wind speed voltage signal input, + is power supply voltage - ground.

\* Please refer to the logo on the circuit board for details

## Installation method

### 1. Detection head

Mount the detection head on the platform so it can follow the movement. Put it in the middle of the platform and make sure perpendicular it to the surface. The east direction of the detection head should correspond to the geographical east.

It shall be installed at the east edge of the north side of the platform as far as possible.

### 2. Main control box

The main control box should be installed near the base column of the platform, without following the movement of the platform, to ensure that it will not be affected by rain, exposure to the sun and other influences. The outlet hole should face downward to prevent water from flowing in. Easy observation and operation are preferred.

### 3. Wind speed sensor(**optional**)

The wind speed sensor should be installed near the platform where it can be effectively affected by the wind. Do not go near the wall or the ground. Use a pillar to support the installation.

Connect the wire of the detection head and the wind speed sensor into the control box according to the mark, leave the room and install firmly.

If the wind speed sensor is purchased from other manufacturers, it should be distinguished V+, negative and signal, then access it according to the instructions.

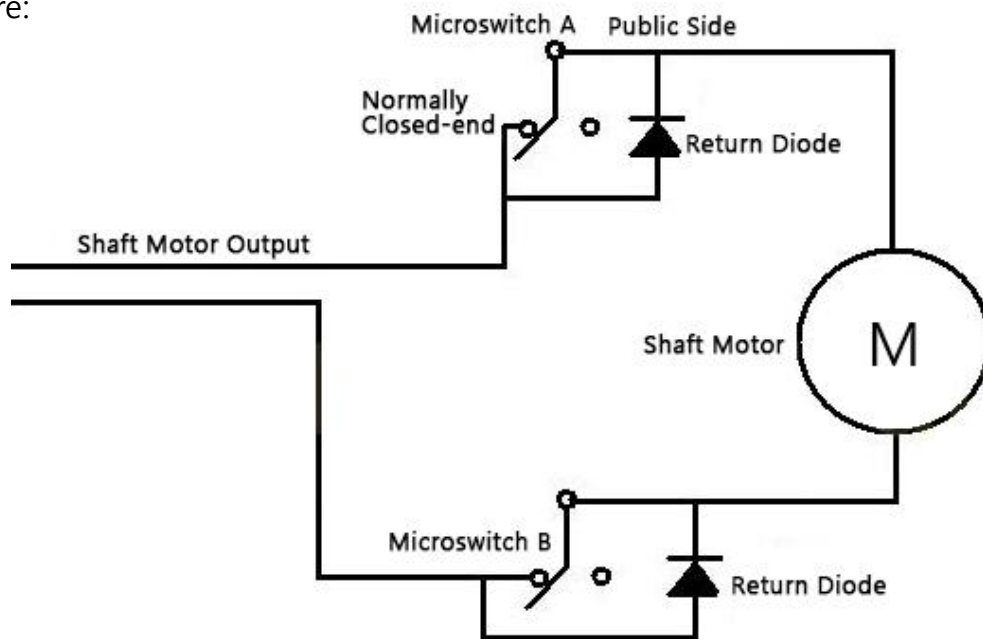
The wind speed sensor terminal V+ on this control board is the power supply voltage (12-24v).

### 4. Limit switch wiring

The limit switch is indispensable. It is recommended to use the external limit switch control method to achieve the limit. If the electric linear actuator is used, the internal built-in limit function is generally adopted.

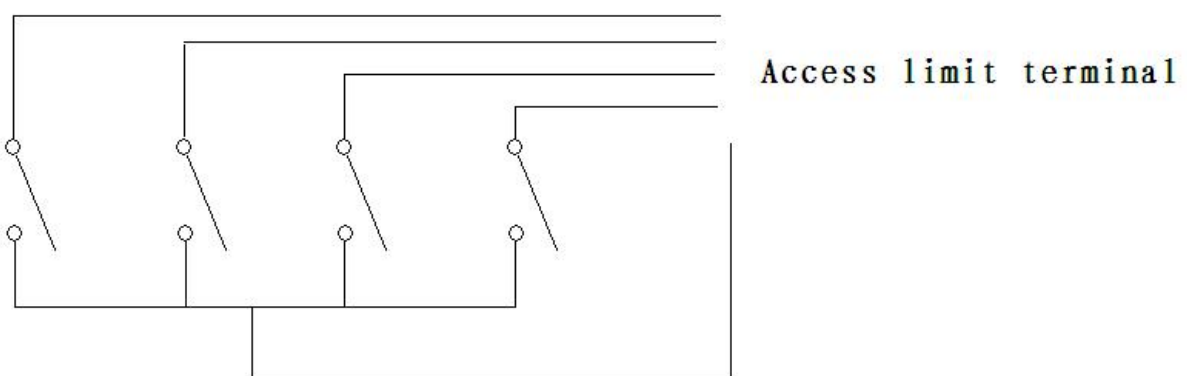
The external limit method is: The micro-switch with the normally closed contact is arranged at four positions where the platform needs to be limited, and the power supply loop of the

corresponding motor is directly controlled to realize the limit, as shown in the following figure:



*\* Need to pay attention to whether the limit switch carrying current capacity is enough.*

If the limit signal is introduced into the controller to realize the limit, the limit switch with normally open contact should be used. When the limit is reached in a certain direction, the switch is pushed to the top, the switch is closed, and the ground of the limit terminal is shortened to the terminal in the corresponding direction, and the output in this direction will stop.



The two-axis drive motor, if not connected to the control board and powered separately, should be able to move without an abnormal drive platform within the corresponding range. In this case, the motor can be connected to the corresponding shaft motor on the control board. On the terminal. Be careful not to connect the east-west motor and the north-south axis motor by mistake.

## Debugging

1. After the azimuth detection head, wind speed sensor, limit, and shaft motor are all connected in place, the power can be connected to the control board for debugging. The power supply voltage is 12 or 24V (subject to the rated voltage of the motor in use), and the power supply current should be enough to meet the maximum current requirements of the two motors.

Connect power to the controller. At this time, the controller should work with electricity. The display screen should show:



2. If the display cannot be displayed, maybe the display contrast is not enough, adjust the contrast adjustment button, or turn on the backlight (long press QUIT for five seconds to control the turn on and off of the backlight). Then the controller will enter various states according to specific sensor feedback parameters.

But at this time, we should first test whether the direction of the motor is correct, so you must first enter the manual test. Press SET once, and the following manual page will enter:



3. At this time key " → / ← / ↓ / ↑ " can respectively control the platform to the east/west/south/north four directions of movement, while the display screen will show "E/W/S/N" to show. If the movement direction of the platform is inconsistent with the direction of manual control, the corresponding wiring can be replaced. All the activity range of the manual function test platform, including the limit status function, should be tested normally before pressing QUIT to exit manual operation.

After confirming that the motor wiring is correct, we then enter the parameter settings. It is very important to perform necessary checks and settings on some parameters. Press and hold the SET button for five seconds and release it, and you will be taken to the parameter setting page:



4. This page means to display the east/west voltage output value of the azimuth detection head, and calculate its corresponding ratio X0, is for reference, can not be adjusted, press " ↓ / ↑ " to turn the page, will enter the next page:



5. This page means to display the voltage output value of the south/north of the azimuth detection head and calculate its corresponding ratio Y0. It is used as a reference. It cannot be adjusted. Press ↓ / ↑ to turn the page and it will go to the next page:



6. Set V3 value, V3 meaning is sunny and cloudy day resolution threshold value, its meaning is when the azimuth detection head four direction of the sun radiation voltage value are lower than V3, considered cloudy, any direction higher than V3, considered sunny. Key →/← can realize the addition and subtraction of parameters.



7. Set V2 value, V2 means the threshold value of wind speed exceeding the limit. It means that when the signal voltage value output by the wind speed sensor exceeds V3, the current wind speed is considered to be a threat to the platform, and the controller needs to perform protection action on the platform. Key →/← can realize the addition and subtraction of parameters.



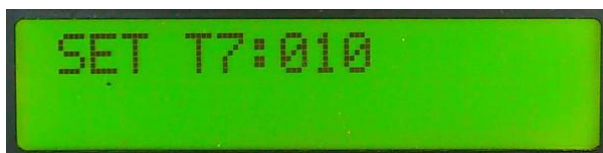
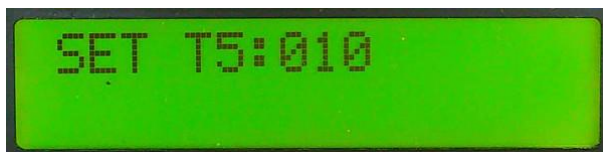
8. Set V1 value, which means the tracking accuracy value. It means that when the difference in the solar radiation voltage between the east and west and the south and north of the azimuth detection head is lower than this value, it is deemed to align with the sun; otherwise, it is not aligned and needs to drive the platform action to align. The minimum value can be set to 0. Key →/← can realize the addition and subtraction of parameters.





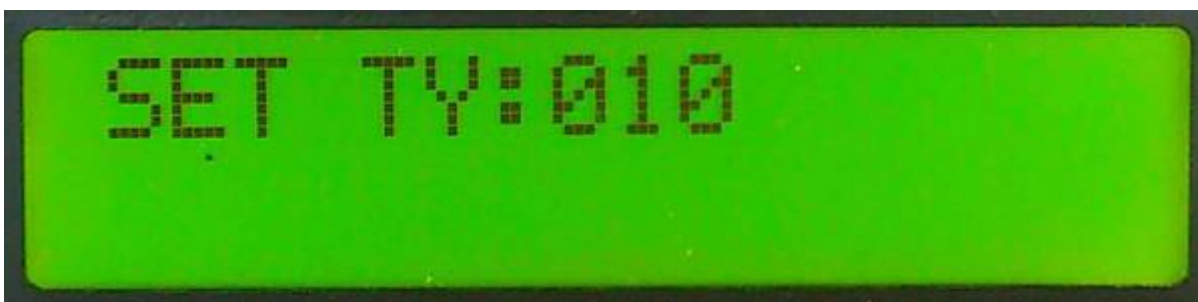
9. The time parameter of T8/9/10/11/12/13 is when it is cloudy or at night, that is, when the sunlight intensity is lower than a certain level, the platform performs a series of actions, as follows:

- **T8:** when the solar radiation voltage value in any direction of the detection head is lower than V3 value, the controller will consider that the current sunlight is weak and has no tracking value. At this time, it will hibernate in place, and the time of dormancy in place is T8.
- **T9/10/11/12:** if the sunlight does not return within T8 time of in-situ dormancy, perform the required action to drive the platform to a desired position. The process is T9 time to the east of the execution platform, then T10 time to the west, and T11 time to the north of the execution platform, then T12 time to the south.
- **T13:** if the sunshine is restored during the above process, it will enter into T13 time. If the sunshine is restored for a sustained time up to T13 time, it will be considered that the sunshine is indeed restored and it will exit the above state.



10. T3/4/5/6/7: wind speed protection related parameters, its specific meaning is:

When the signal voltage from the wind speed sensor is higher than V2, it will enter the wind speed protection control state, which will immediately drive the platform to the east T3 time and then execute the platform to the west T4 time. Meanwhile, the execution platform faces north for T5 time, and then executes south for T6 time. After the above process, T7 time is the holding time, during which the device remains standby. If the wind speed continues to exceed V2 value, it will overflow again at T7 time; if the wind speed is lower than V2 value, it will exit the wind speed protection state at the end of T7 time.



11. TX/TY parameter meaning is: in the process of automatic tracking the sun, when the aim at the sun, to avoid frequent repeat tracking tiny light change device, set up an intermittent time, after which aim at the sun, the shaft into the sleep time, waiting for the test again after the time the sun position tracking, movement is very slow at ordinary times, the sun sets the interval time can also save power.

- TX: interval waiting time entered when the east-west axis is aligned.
- TY: interval waiting time entered when the north-south axis is aligned.



12. When all parameters are set, press QUIT to save and exit.

After exiting the parameter device, the controller will judge the data returned by the sensor for automatic control, which can be divided into the following situations:

**A: If the voltage in any direction detected by the azimuth detection head is higher than V3 value, the automatic tracking state will be entered:**



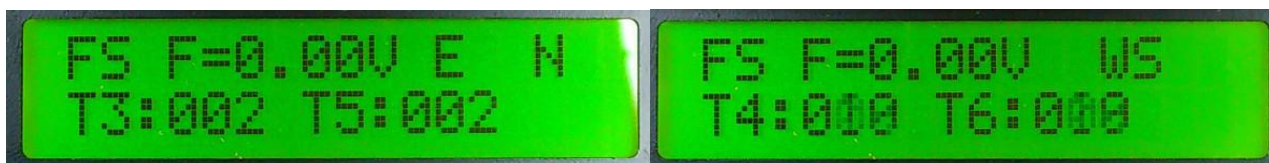
- In this state, the controller will compare the voltage values of the azimuth detection head east and west as well as south and north, and control the platform. When an axis is aligned, the TX/TY intermittent waiting time will be entered. After the time countdown is over, repeat the comparison and control. To implement the platform tracking process.

**B: If the voltage in any direction detected by the azimuth detection head is lower than V3, the following state will be entered :**



- In T8 time, if it is higher than V3, it will exit from this state. If it lasts for less than T8 time, it will execute the specified action, namely T9 time to the east and T10 time to the west, and T11 time to the north and T12 time to the south.
- After the execution, enter the state of waiting for sunshine.

**C: When the wind speed value detected by the wind speed sensor is higher than V2, it enters the following state:**



After the specified actions of t3/4 (east-west axis) and t5/6 (north-south axis) are executed, the lock delay waiting state will enter:



- In the locking delay state, if it is night or cloudy, SL LOCK will be locked and displayed all the time, and T7 will be placed at 100. If the wind speed exceeds the limit again, the timing will be retimed and FS LOCK will be displayed. If the wind speed has not exceeded the limit all the time during this time, the timing will exit after completion.

## Explanation of the code meaning of various parameters:

In T8 time, if it is higher than V3, it will exit from this state. If it lasts for less than T8 time, it will execute the specified action, namely T9 time to the east and T10 time to the west, and T11 time to the north and T12 time to the south.

After the execution, enter the state of waiting for sunshine.

Code	Explanation
AT	Automatic Tracking State, which the device automatically tracks the sun.
TX	When the <u>east-west</u> axis is aligned in the automatic tracking state, it enters the waiting period. During this period, the device will not move.
TY	When the <u>north-south</u> axis is aligned in the automatic tracking state, it enters the waiting period. During this period, the device will not move.

Code	Explanation
E/W/S/N	East/West/South/North (Indicating the device moves in the corresponding direction)
FS	The wind speed exceeds the set value and enters the state of flat and neutral in case of wind.
F	Real-time wind speed voltage value, in V.
G	Test the total voltage of silicon chip in the four directions of the head, for reference to the current total sunshine intensity.
MT	Manual operation. In this state, the 1/2/3/4 key of the remote control corresponds to manual movement in the north/south/west/east direction.
SL	The sunlight is weak, which means the current controller thinks the sunlight is weak. It will enter the dormant state and wait for the sunlight to appear again.
SL WAIT	Enter the weak sunlight dormancy state.
T8	Weak sunshine cumulative timing.
T3	The time value for the device to drive eastward when the specified action of wind speed exceeding the limit is performed.
T4	The time value of the drive to the west after T3 when the specified action of exceeding the wind speed limit is performed.
T5	The time value of the device driving northwards when the specified action of overspeed is performed.
T6	The time value of the drive to the south after T5 when the specified action of overspeed is executed.
T7	Self-locking time of the controller after the execution of the specified action of wind speed exceeding the limit. This function is to prevent the impact of wind speed from being intermittent and causing frequent action/tracking of the device. Within the self-locking time, if the wind speed again exceeds the value, the time shall be re-timed immediately to prevent the device from frequent action.
T8	Weak sunshine duration delay value.

Code	Explanation
T9	Time value for the device to drive eastwards when performing a sun-weak specified action.
T10	The time value of the drive to the west after T9 when the specified action of weak sunlight is performed.
T11	Time value for the device to drive northward when performing the specified action of weak sunlight.
T12	The time value of driving device southward after T11 when performing the specified action with weak sunlight.
T13	Set the duration delay time of sunshine recovery after the sunshine weak state occurs.
V1	Tracking accuracy setting, the value is the voltage value in the tracking accuracy interval, that is, when the voltage difference between east/west and south/north silicon wafer is V, the controller thinks that the device needs to be moved or aligned with the sun. The smaller the value, the higher the accuracy; otherwise, the lower the accuracy, which needs to be set according to the characteristics of the platform.
V2	Voltage value of wind speed starting control, which is the threshold value of wind speed set by the controller. When the voltage output by the wind speed sensor is higher than this value, the controller thinks that it is necessary to specify the action immediately to protect the platform.
V3	Weak starting voltage value of the sun, the value for the controller set the sun weak threshold value, when the detection head four directions silicon chip voltage value no one higher than this value, the controller that the current sun weak, no power generation value, cancel tracking, delay T8 time after the delay if not restored to the sun, then perform the specified action.
SUMMER	Northern hemisphere sun flip function activated.

**The company reserves the right to change the hardware and software design of the model controller without notice.**