



**AE321**

**Solar Tracking Starter Kit**

**V1.0.23.12.18**

# Preface

## Our Company

KUONGSHUN Electronic Company is a supplier and manufacturer of electronic components, it is committed to board and starter kit for Arduino, Raspberry PI, Smart Robot Car, 3D printer. It is also a collection of scientific research, design, production, maintenance and sales of high-tech enterprises, in the field of automation with professional standards and mature technology, we rapid rise in the field of foreign trade.

Relying on technology and development, continuing to provide users with high-tech products, is our constant pursuit. Fully introduction of foreign advanced technology to enhance the value of our products.

Company gains users' praise for supplying first-class quality product and superb technical services, has now become the first choice of domestic and international procurement company.

Official Website: <https://www.kuongshun.com>

## Our Tutorial

This course and learning kit is designed for 8+ children and teenagers to Arduino-compatible boards, shields, sensors, and components. If you just start making with Arduino, this kit could provide the knowledge and components to create innovative projects.

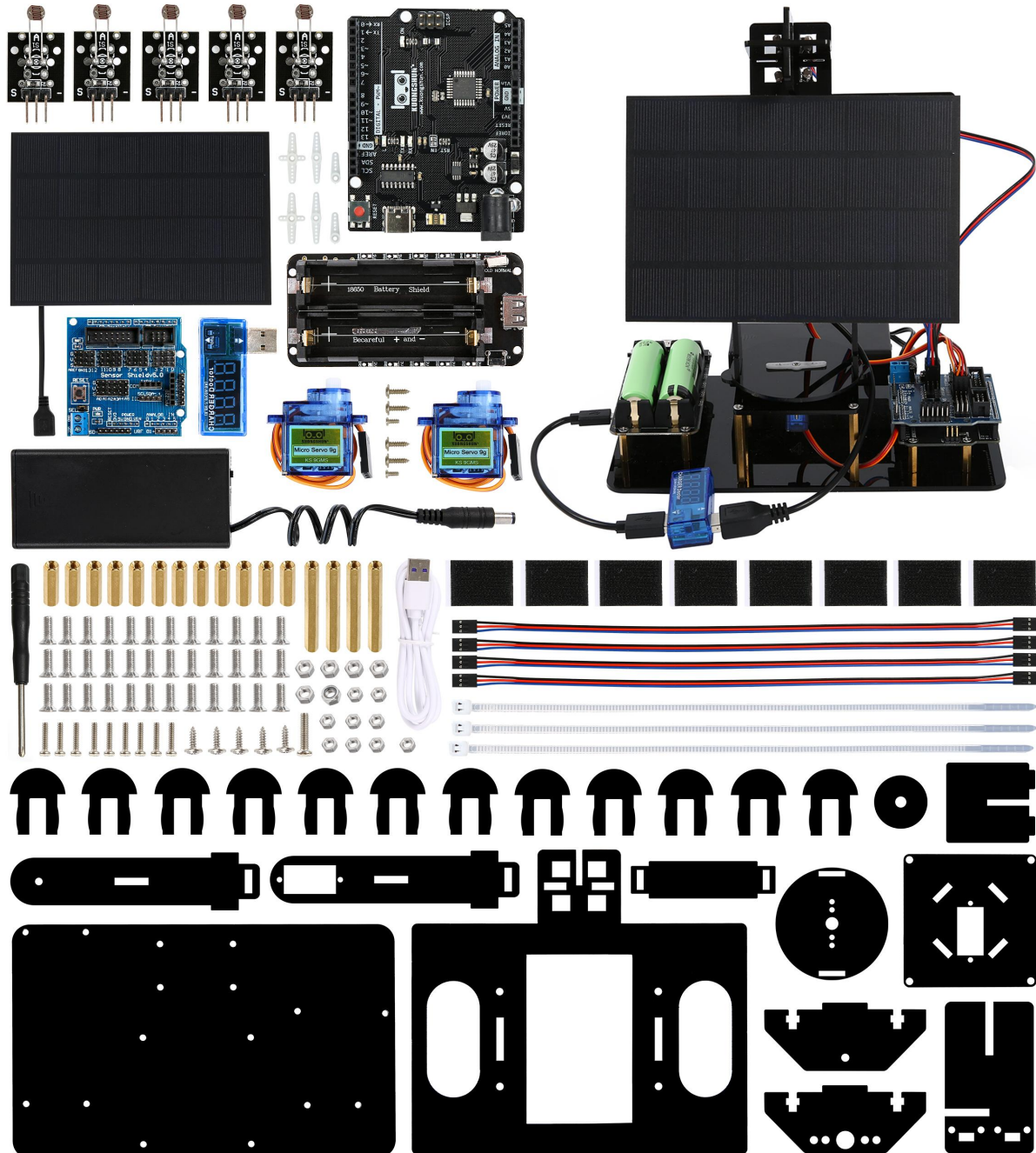
## Customer Service

As a continuous and fast growing technology company we keep striving our best to offer you excellent products and quality service as to meet your expectation and you can reach out to us by simply drop a line at [info@kuongshun.cn](mailto:info@kuongshun.cn) We look forward to hearing from you and any of your critical comment or suggestion would be much valuable to us.

And any of problems and questions you have with our products will be promptly replied by our experienced engineers within 12 hours (24hrs during holiday)

we pursue the policy of "progressive, Truth, Rigorous and Unity", keeping innovation, paying attention of technology as the core, committing to quality and putting customer's satisfaction on the priority, dedicated to provide you with the most cost-effective high-tech products and attentive service.

# Packing list

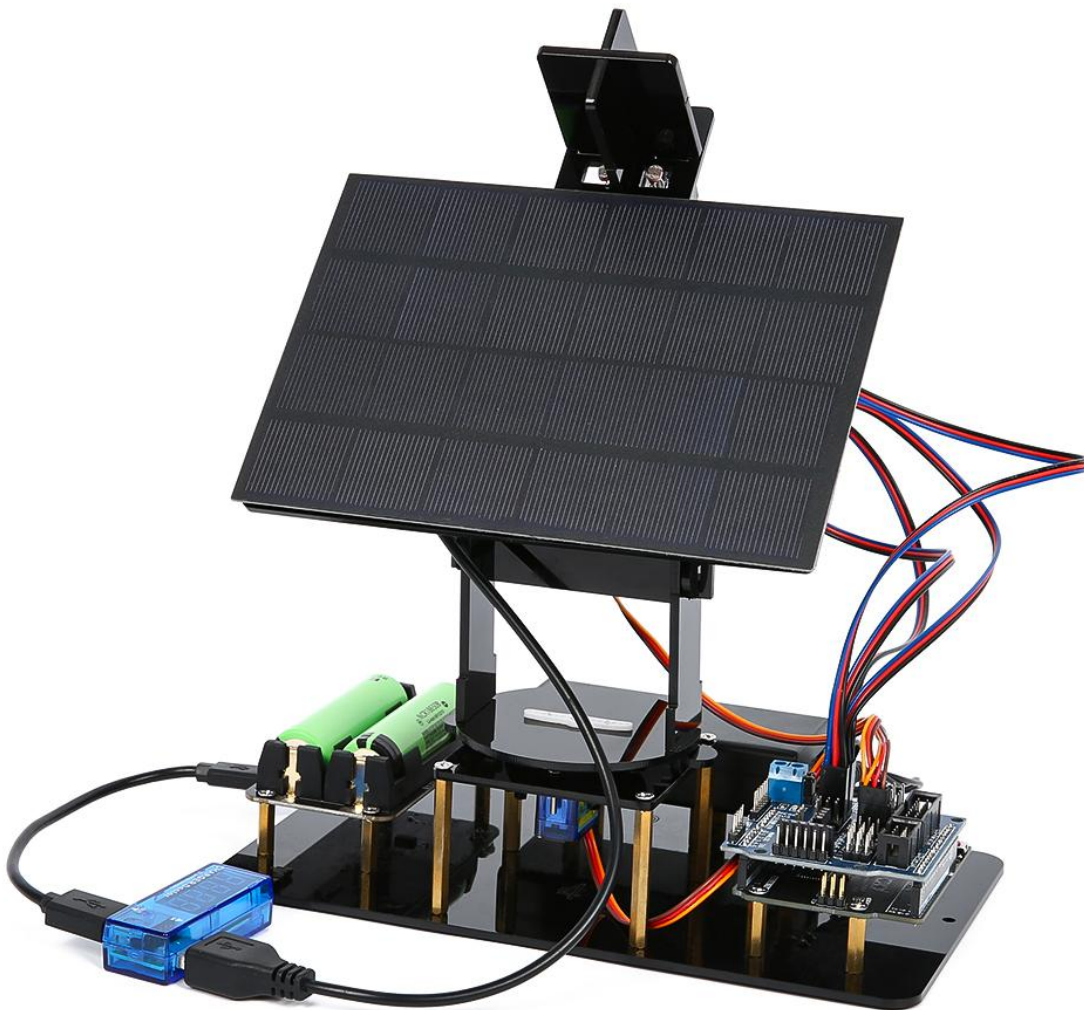


# Content

<b>Part 0 Preparation .....</b>	<b>5</b>
<b>Part 1 Servo Angle Installation and Calibration .....</b>	<b>7</b>
<b>Part 2 Upload Solar Tracking Code .....</b>	<b>12</b>
<b>Part 3 Energy Storage and Release .....</b>	<b>17</b>

## Part 0 Preparation

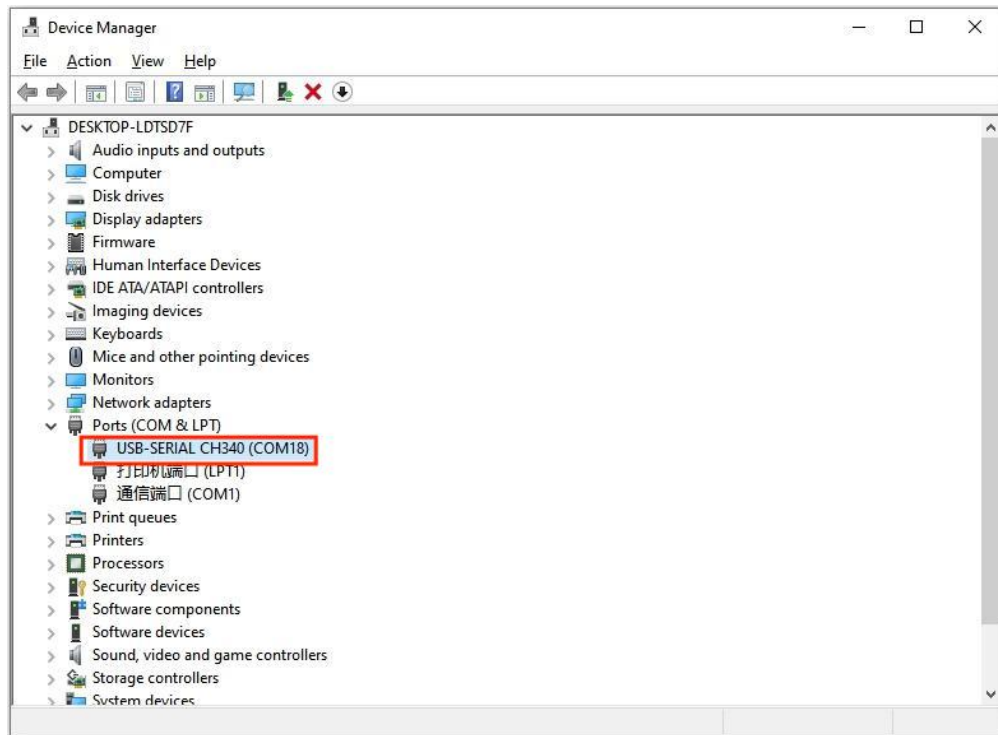
Before proceeding with this tutorial, make sure you have finished putting the model together in “1\_Assembly\_Guide” (If you buy the version without batteries, please prepare four 18650 batteries locally).



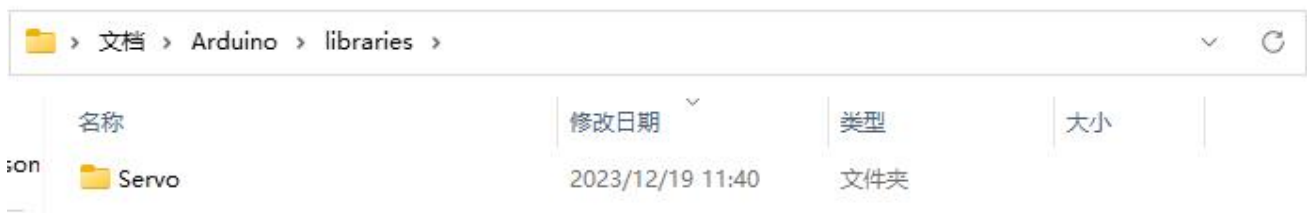
Please also complete the ARDUINO software download:



CH340 driver installation:



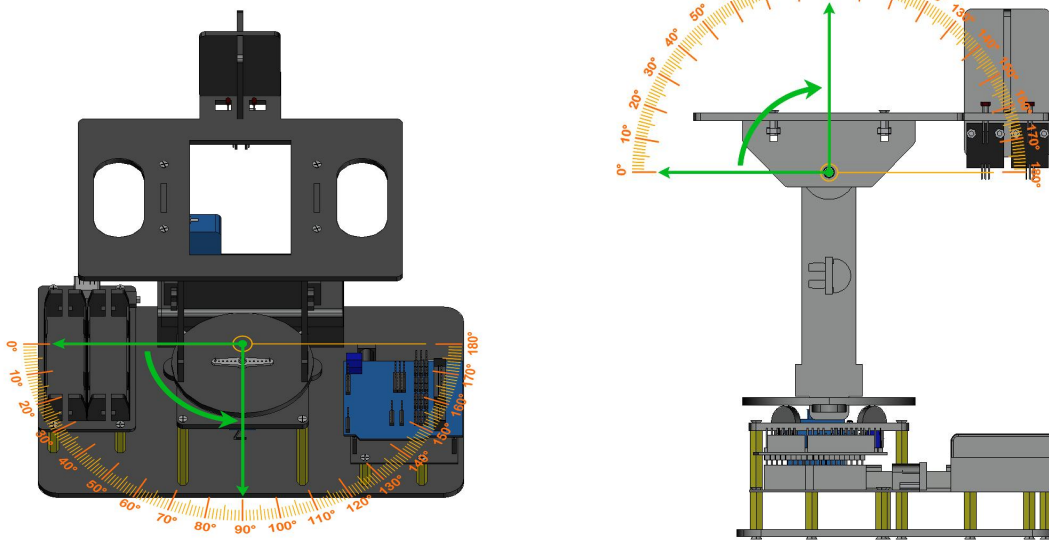
and library addition in "2\_Programming\_Preparation".



If any step has not been completed, refer to "1\_Assembly\_Guide or 2\_Programming\_Preparation".

## Part 1 Servo Angle Installation and Calibration

We set that when the servo motor is turned to 90 degrees, the object is in a centered and horizontal state, as shown in the figure.



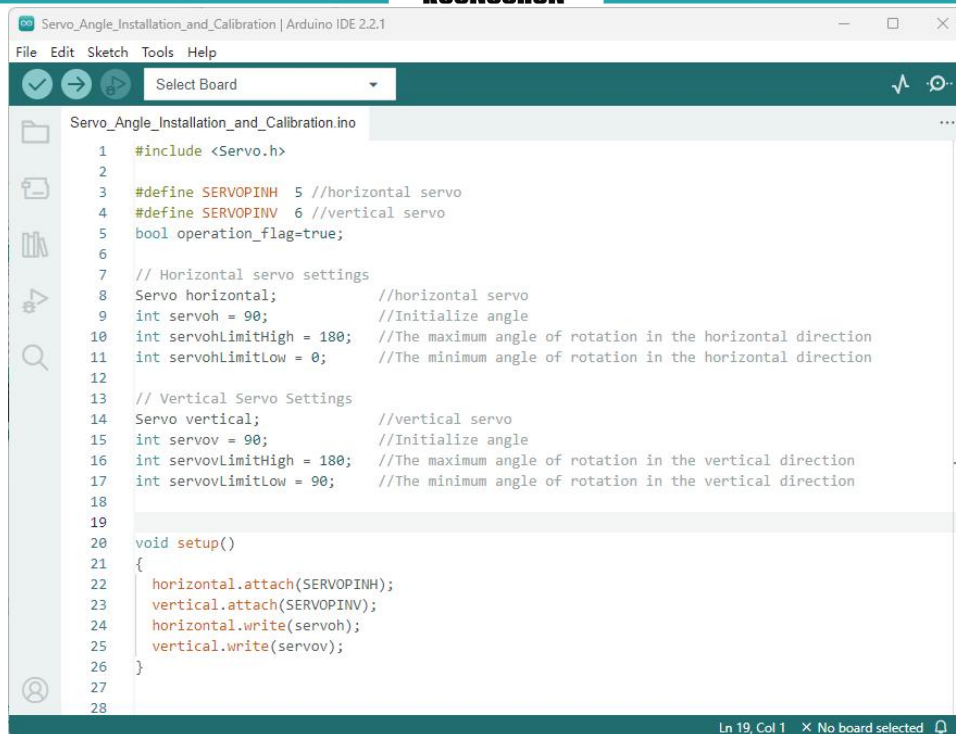
But in fact, when installing the servo motor, the program Angle and the actual Angle are often inconsistent.

So we can use a servo motor correction program to see if the Angle of the servo motor is the same as the Angle we installed:

①Go to the following path and open the program

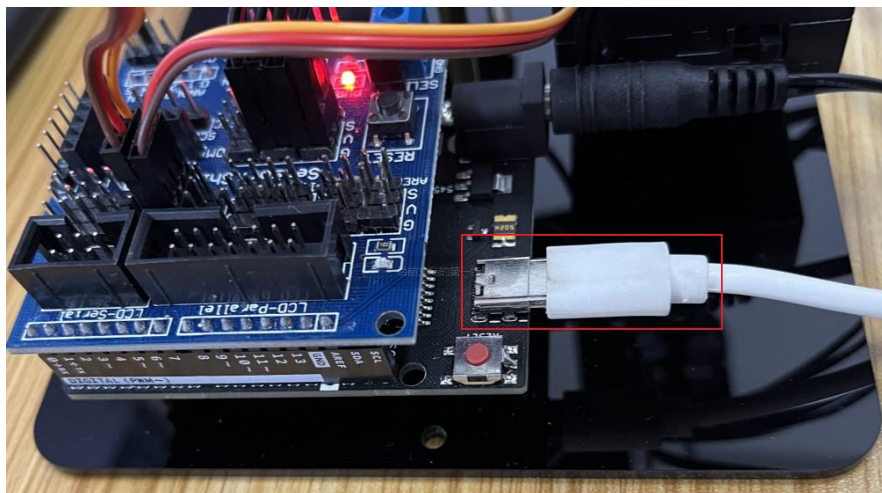






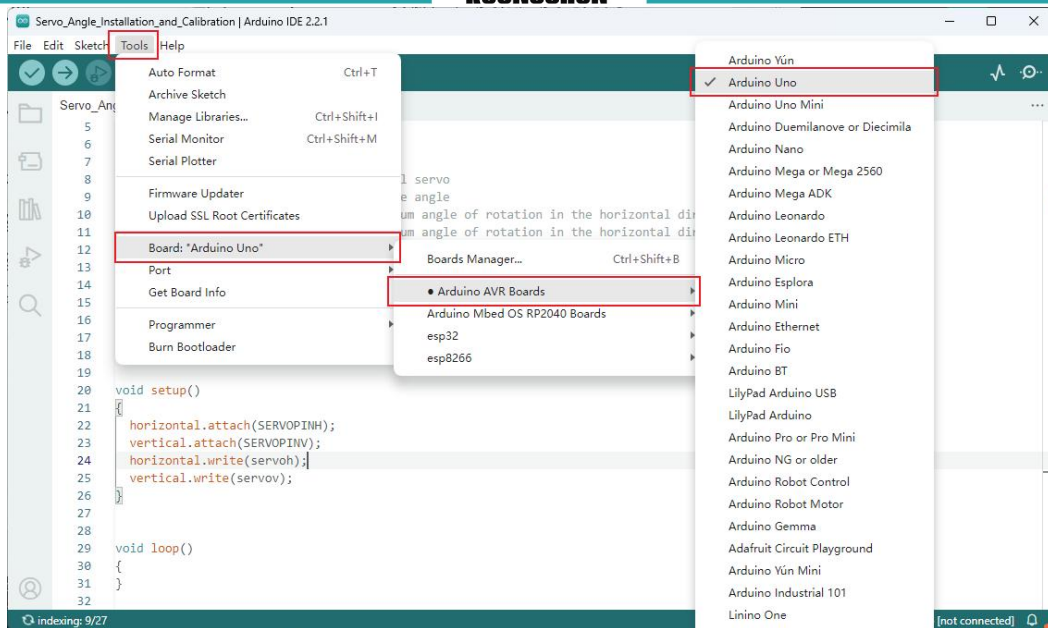
```
1  #include <Servo.h>
2
3  #define SERVOPINH  5 //horizontal servo
4  #define SERVOPINV  6 //vertical servo
5  bool operation_flag=true;
6
7  // Horizontal servo settings
8  Servo horizontal;    //horizontal servo
9  int servoh = 90;     //Initialize angle
10 int servohLimitHigh = 180; //The maximum angle of rotation in the horizontal direction
11 int servohLimitLow = 0;  //The minimum angle of rotation in the horizontal direction
12
13 // Vertical Servo Settings
14 Servo vertical;      //vertical servo
15 int servov = 90;     //Initialize angle
16 int servovLimitHigh = 180; //The maximum angle of rotation in the vertical direction
17 int servovLimitLow = 90;  //The minimum angle of rotation in the vertical direction
18
19
20 void setup()
21 {
22   horizontal.attach(SERVOPINH);
23   vertical.attach(SERVOPINV);
24   horizontal.write(servoh);
25   vertical.write(servov);
26 }
27
28
```

② Connect the Arduino board to your computer with a TYPE-C cable

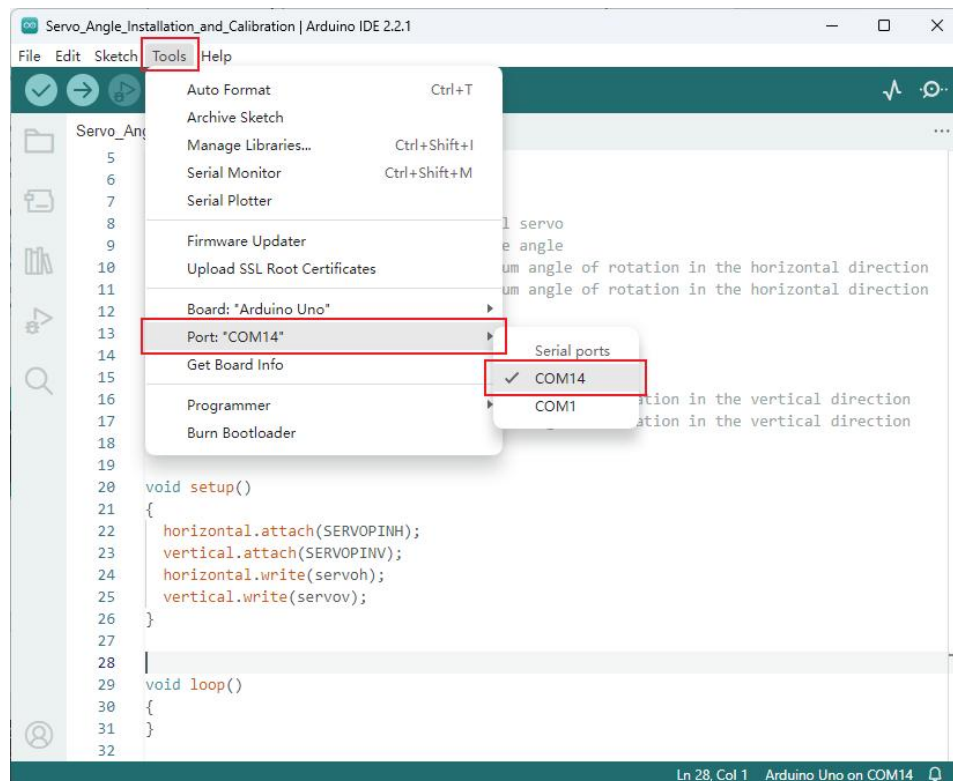


③ Select your Board in Tools > Board >>>>Arduino UNO



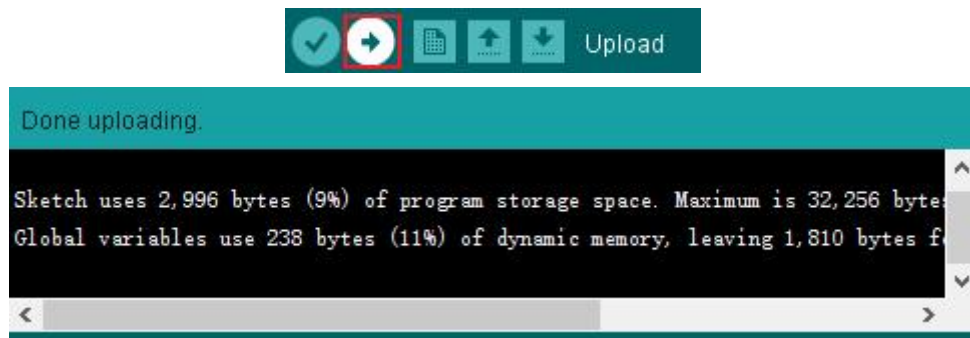


④ Select the Port. (The COM port number of each computer may be different, and the port number that appears is your port number) (If you do not see COM ports other than COM1 in Arduino IDE, you need to refer to the installation of CH340 driver in "2\_Programming\_Preparation" and install it)





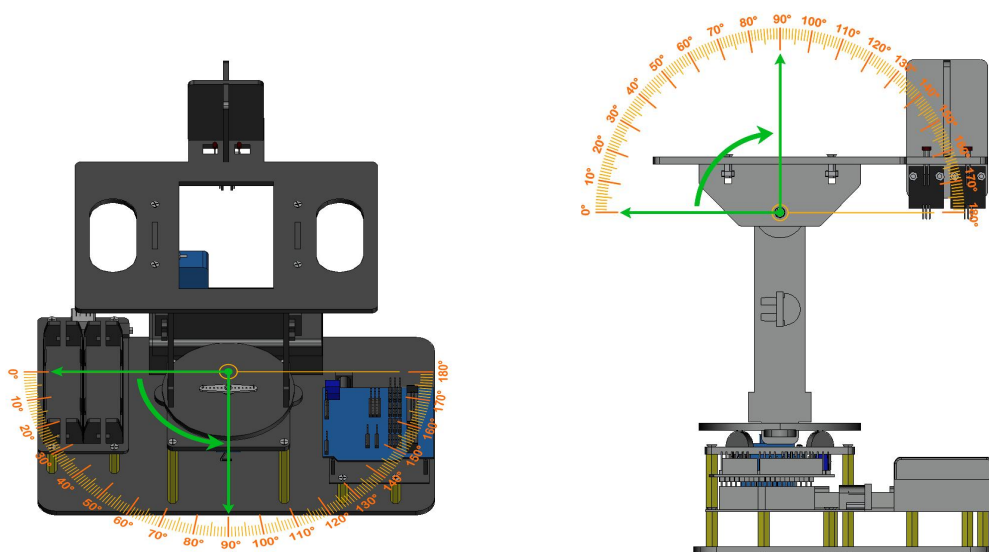
⑤ Upload the program to the UNO controller board.

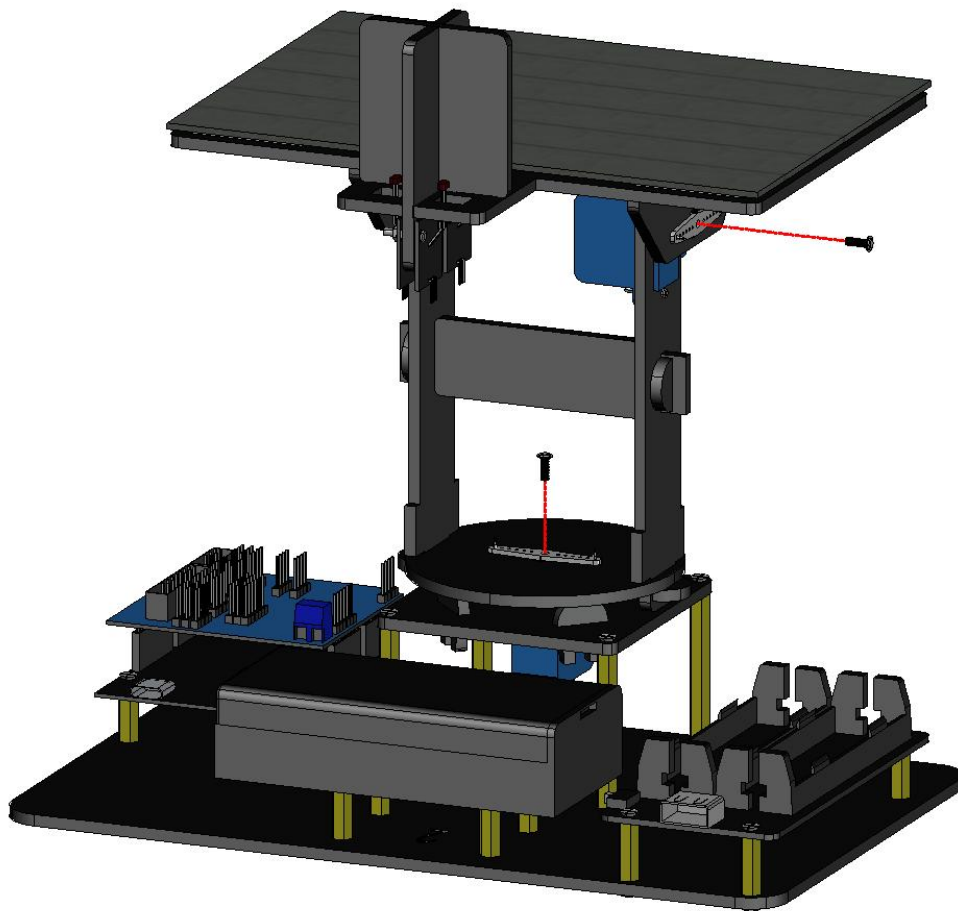


The picture above shows that it is uploaded successfully.

⑥ After uploading the code successfully. Both the horizontal and vertical servos will turn to the initial angle of 90, and you should see the following state.

If the servo motor Angle is not consistent with the picture after the program is uploaded, please separate the steering pitman arm from the servo motor, and then turn it to be consistent with the picture and then cover it. Then screw on the small reinforcement screws that the servo motor bag carries.

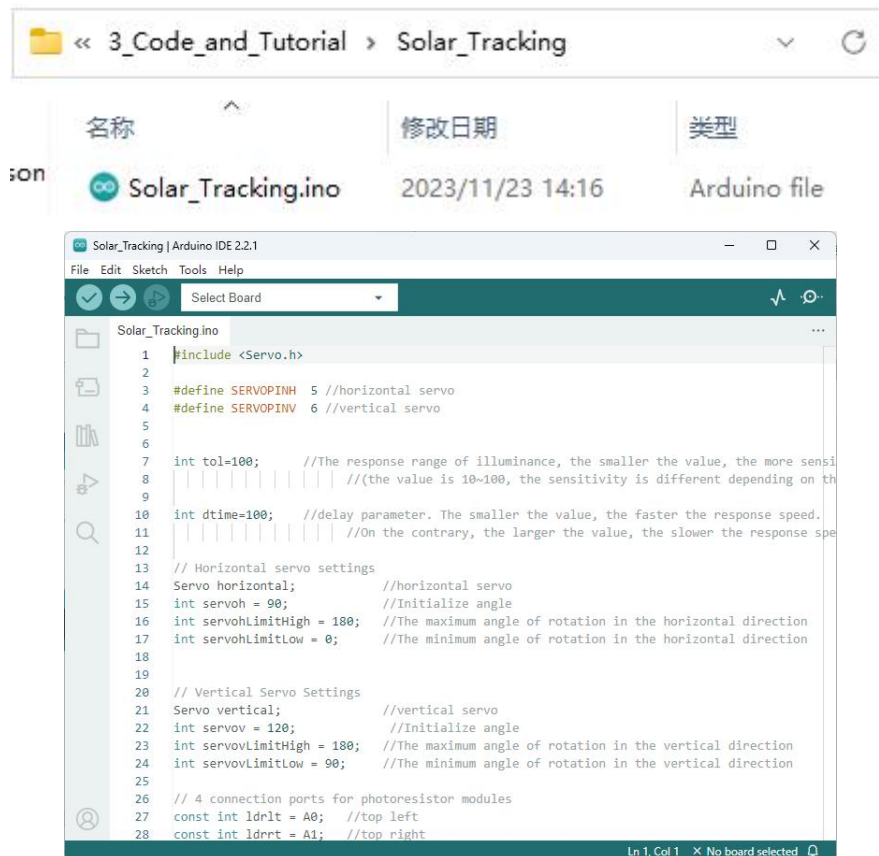




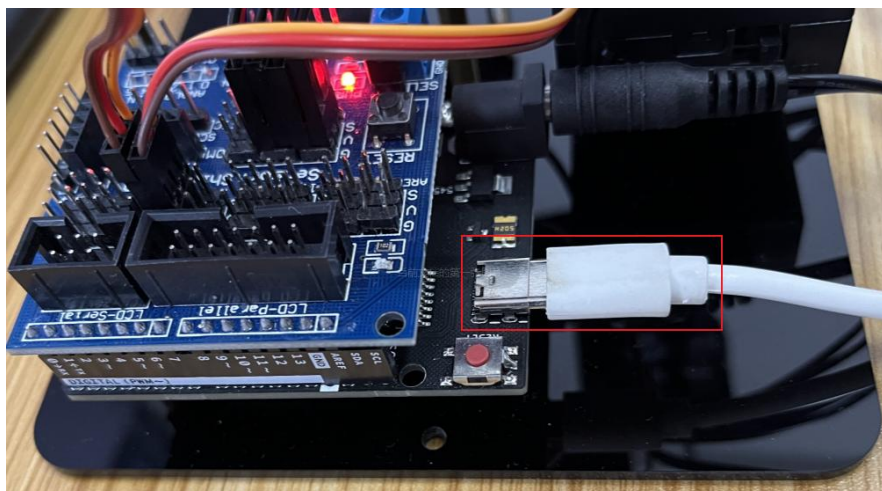
## Part 2 Upload Solar Tracking Code

Once we've corrected the servo motor Angle, we can upload the main solar tracking program.

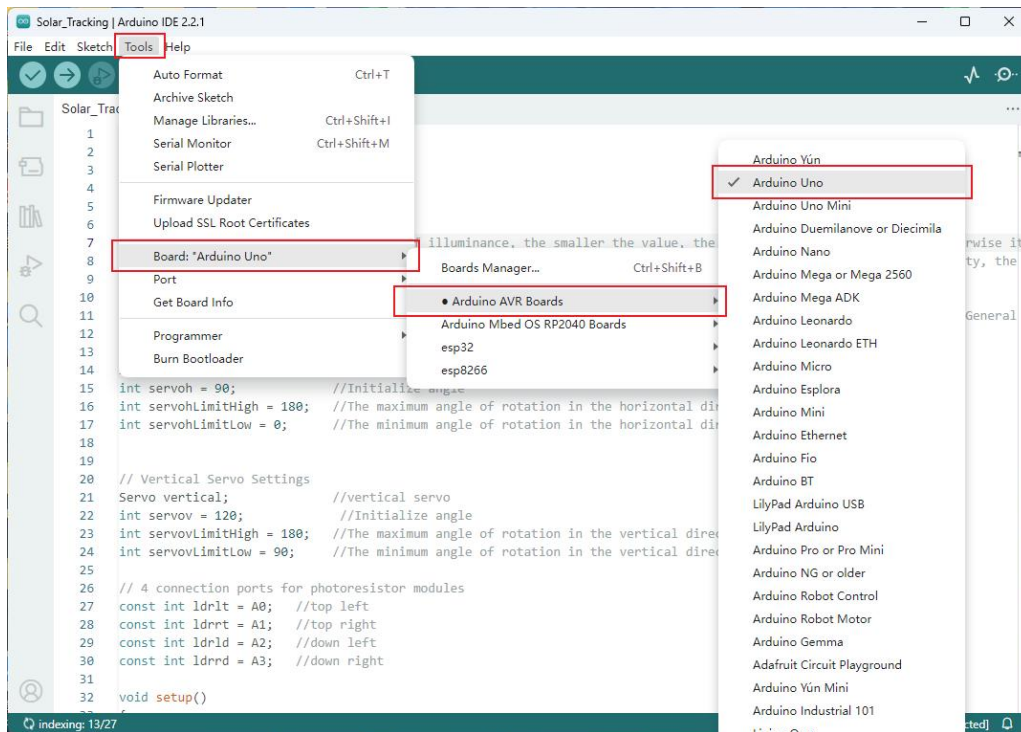
① Find the following path and open the program



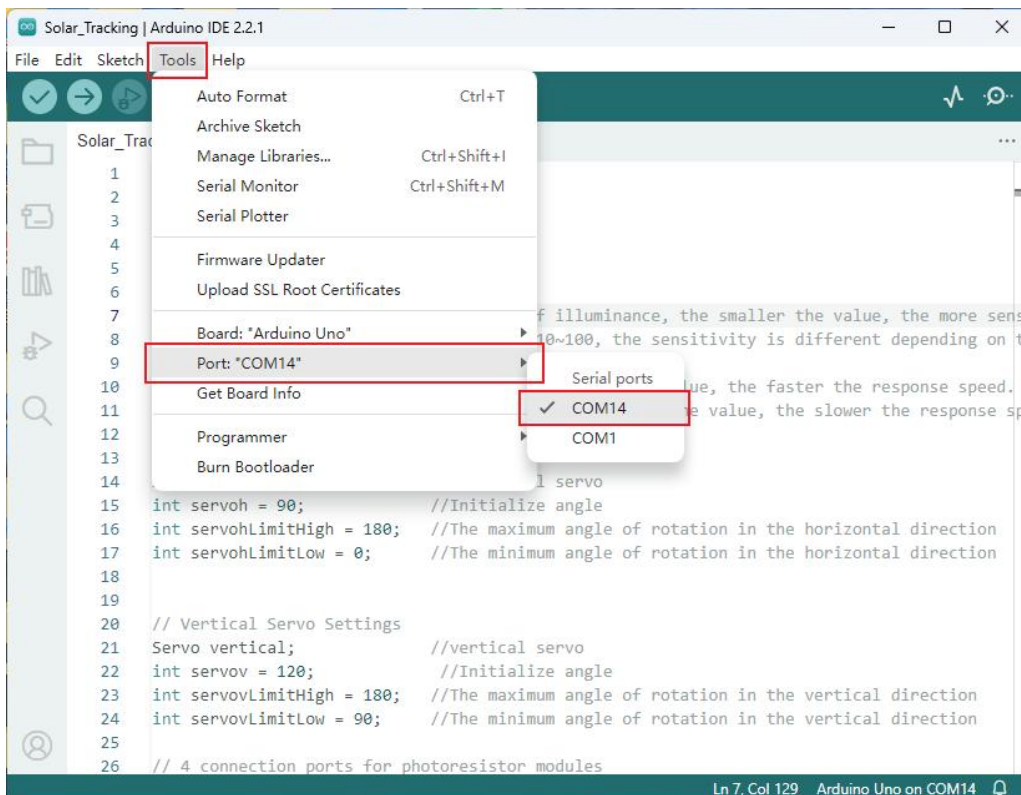
② Connect the Arduino board to your computer with a TYPE-C cable



### ③ Select your Board in Tools > Board menu>>>>Arduino UNO



### ④ Select the Port





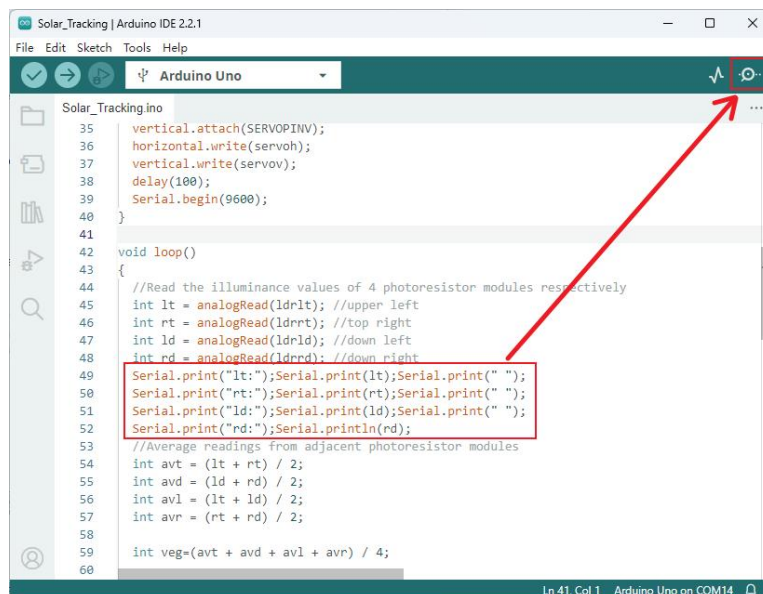
⑤ Upload the program to the UNO controller board.



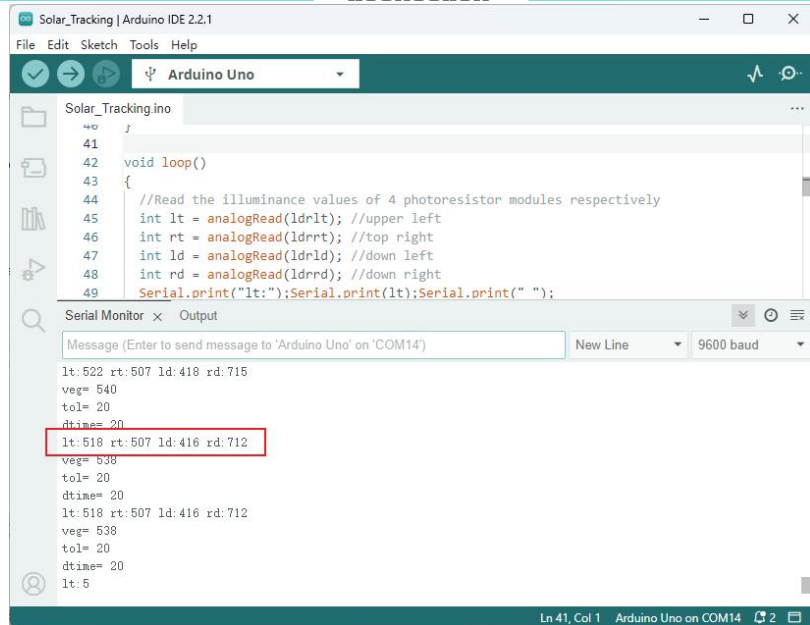
The picture above shows that it is uploaded successfully.

⑥ When you have successfully uploaded the code, turn on the power switch. The solar panels will point in the direction of the brightest light in the environment.

Click the icon in the upper right corner of the Arduino IDE and set the baud rate to 9600. You can open the serial monitor to view the real-time value (0~ 1024) of each photosensitive sensor. "0" represents the maximum brightness, and "1024" represents the darkest brightness.







The screenshot shows the Arduino IDE 2.2.1 interface. The sketch 'Solar\_Tracking.ino' is open, displaying the following code:

```

41
42 void loop()
43 {
44   //Read the illuminance values of 4 photoresistor modules respectively
45   int lt = analogRead(ldrLt); //upper left
46   int rt = analogRead(ldrRt); //top right
47   int ld = analogRead(ldrLd); //down left
48   int rd = analogRead(ldrRd); //down right
49   Serial.print("lt:");Serial.print(lt);Serial.print(" ");

```

The Serial Monitor is open, showing the output of the sketch. The output is as follows:

```

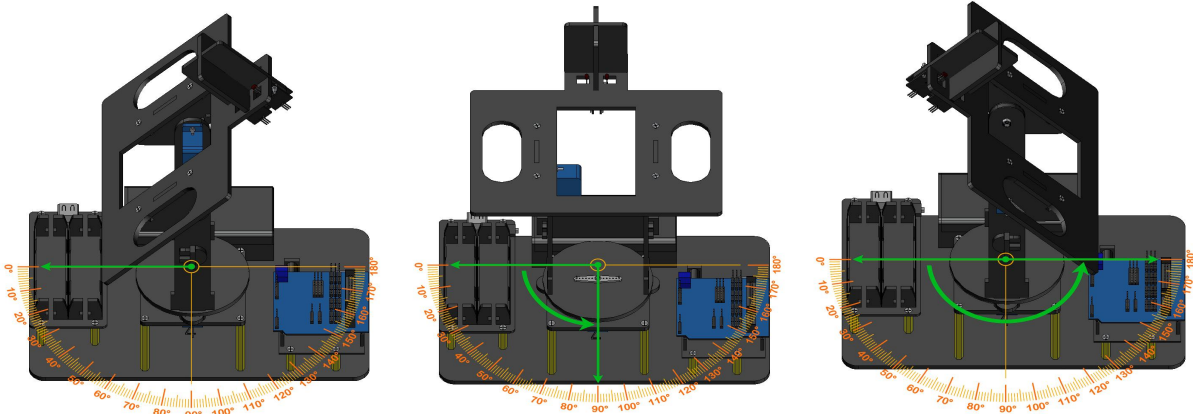
lt:522 rt:507 ld:418 rd:715
veg= 540
tol= 20
dtime= 20
lt:518 rt:507 ld:416 rd:712
veg= 538
tol= 20
dtime= 20
lt:518 rt:507 ld:416 rd:712
veg= 538
tol= 20
dtime= 20
lt:5

```

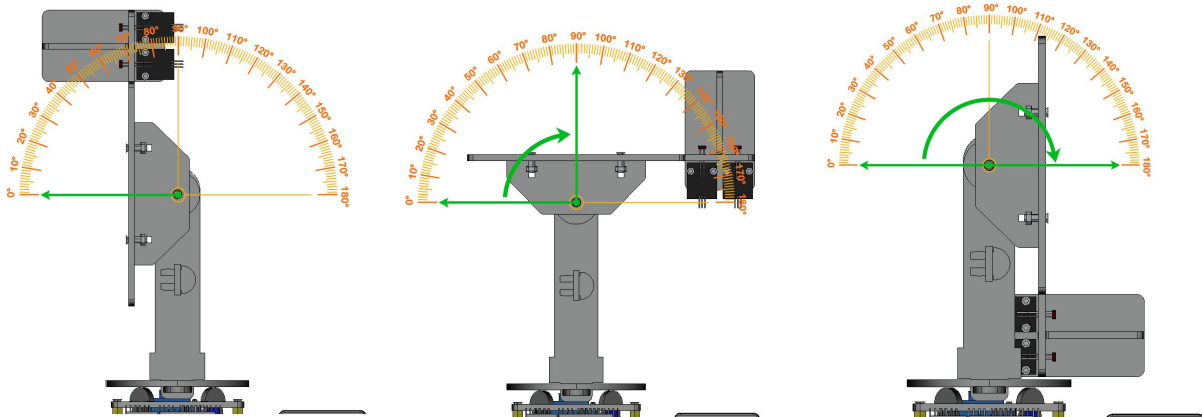
The line 'lt:518 rt:507 ld:416 rd:712' is highlighted with a red box.

Important Parameters	Function
<b>tol</b>	The response range of illuminance, the smaller the value, the more sensitive the response, otherwise it is slow (the value is 10~100, the sensitivity is different depending on the ambient light intensity, the indoor light source changes greatly, you should set the "tol" number higher; the change is smaller under the sun.You should set the "tol" value a little smaller.)
<b>dtime</b>	delay parameter. The smaller the value, the faster the response speed. On the contrary, the larger the value, the slower the response speed. Unit: milliseconds General value (10~100) .

The angle the servo can turn in the horizontal direction. Min=0,Max=180。



The angle the servo can turn in the vertical direction. Min=0, Max=180。



## Part 3 Energy Storage and Release

### Solar Panel

Solar panels use the photoelectric effect to directly convert solar radiation into electrical energy. The photoelectric conversion efficiency of monocrystalline silicon solar panels is only about 15%, and the highest is 24%, which is the highest photoelectric conversion efficiency among all types of solar panels.



**6V 3W**

【Model】 : 6V 3W monocrystalline solar panel

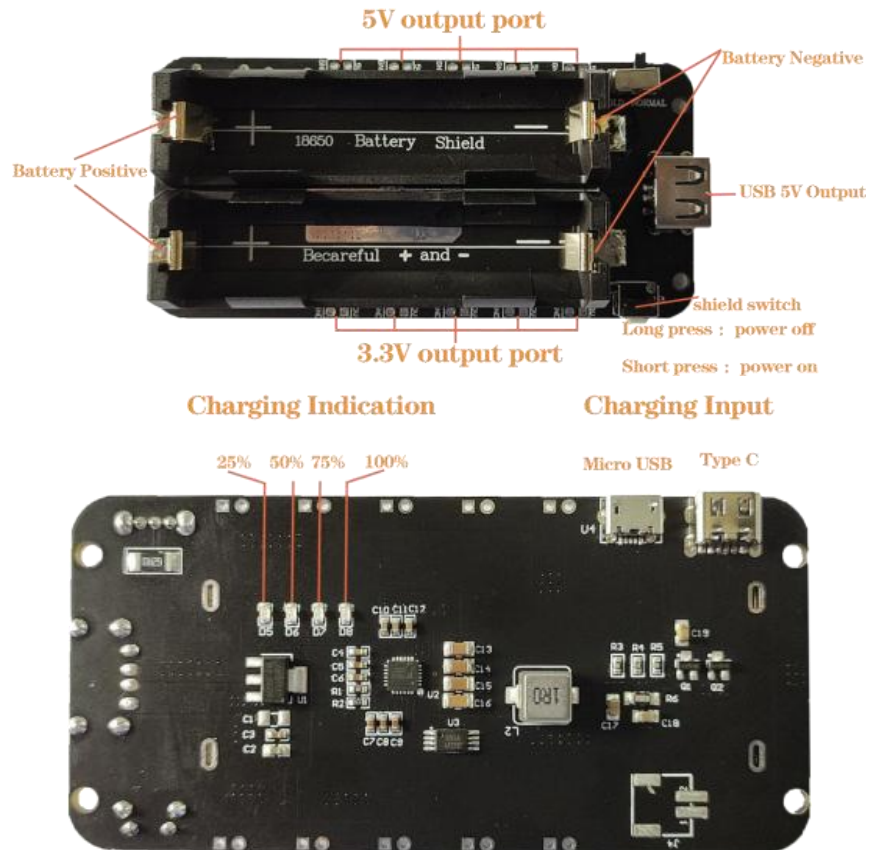
【Maximum open circuit voltage】 : 7V

【Current】 : 0~400MA

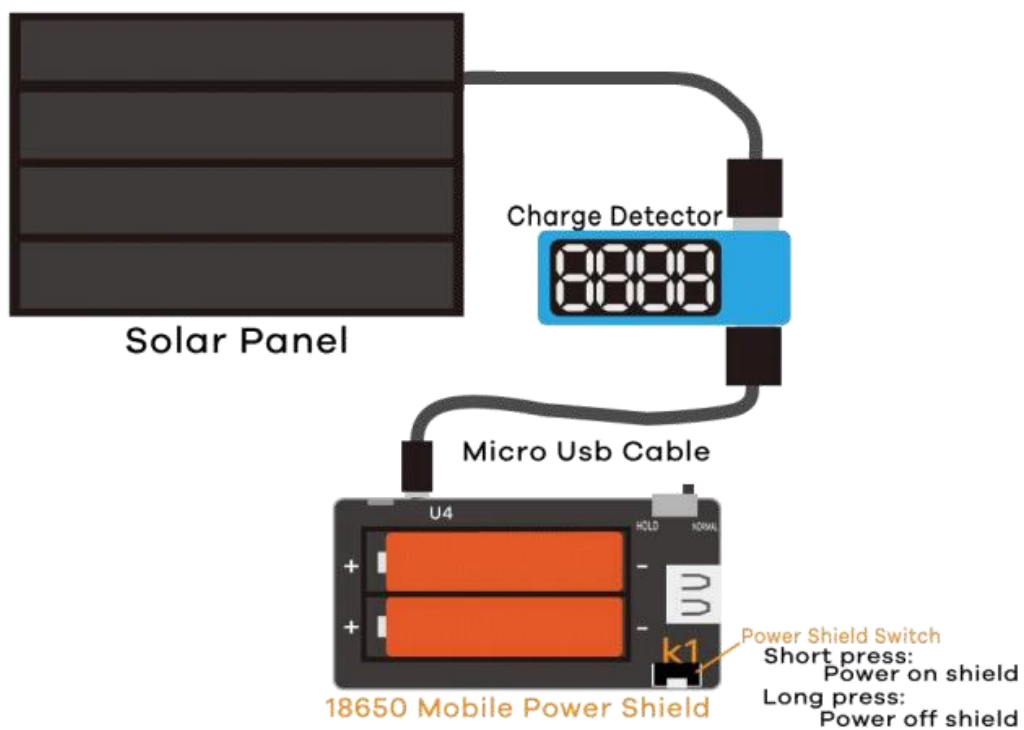
【Size】 : 110\* 162\*2mm

Note: Solar panels have high requirements on light intensity. The nominal power is the peak value under direct sunlight at noon. The sunlight in the morning and evening and the sunlight that is not strong cannot reach the nominal value. So if you want to store electricity faster, you should take advantage of the highest intensity sunlight at noon. The charging efficiency in the morning and afternoon will be very low.

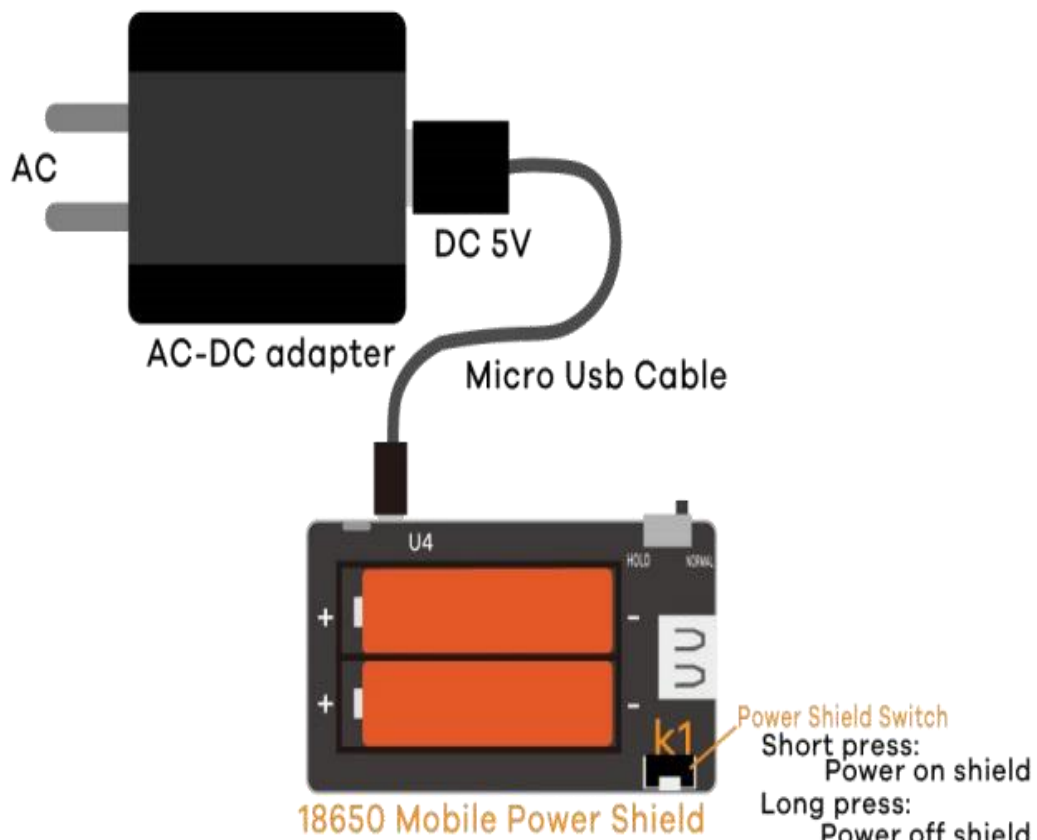
## 18650 Mobile Power Shield



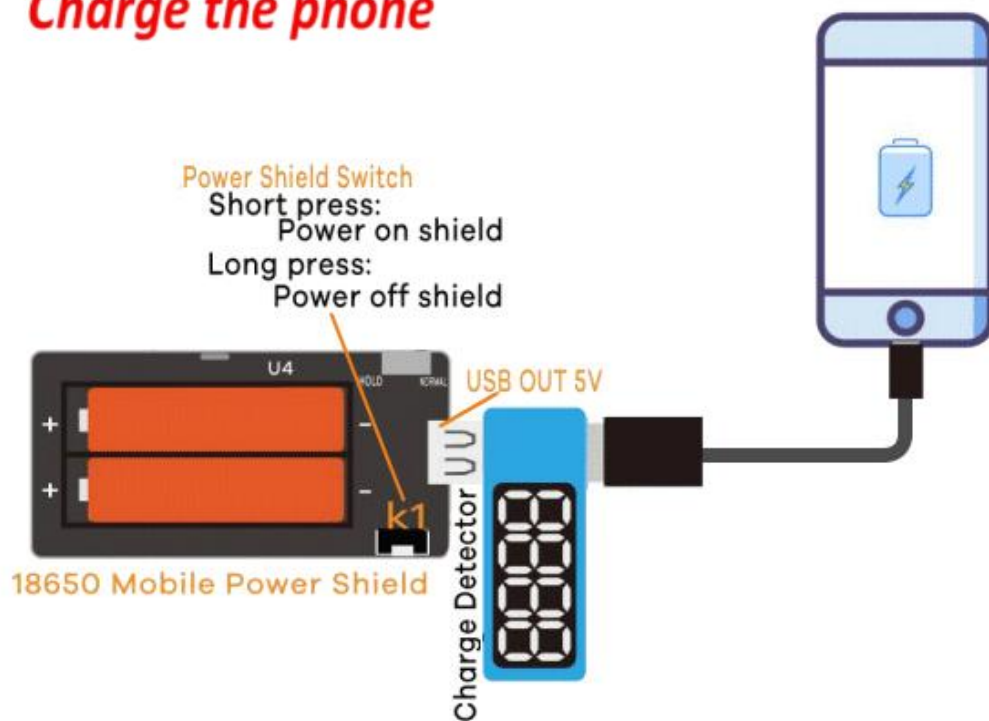
### Solar Charging



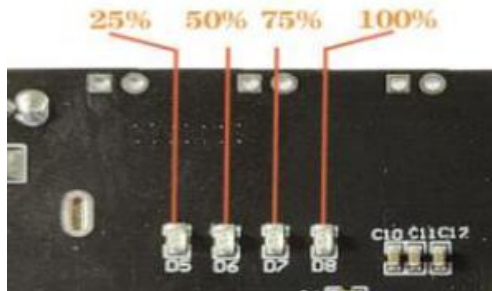
## DC Adapter Charging



## Charge the phone



### Charging Indication



The LED indicator will flash when charging. When charging is complete, all four LED lights will light up. We can see these lights in the reflection of the acrylic plate.

**k1 Power Shield Switch**  
 Short press:  
 Power on shield  
 Long press:  
 Power off shield

### Charge your phone

When you want to charge your phone via the USB 5V OUT connector, connect the voltage display to the usb port on the charging pad, and then connect the phone to the voltage display. At the same time, the shielding switch K1 is turned on, so that the internal 18650 battery can provide a stable charging current to the phone.

Due to the instability of the strong sunlight, the current provided by solar energy is relatively small. It is not recommended that you use USB 5V OUTPUT to charge your phone while using solar power.



 <p><b>Charging Input</b></p> <p>Micro USB Type C</p>	<p>Although it is a green energy source, due to the low energy efficiency of solar cells, it may take several days to complete the charging if it encounters cloudy days or weak sunlight. You can choose to charge the 18650 Mobile Power Shield using a 5V DC adapter.</p>
 <p><b>Charge Detector</b></p> <p><b>current :0.31A</b></p> <p><b>voltage :4.83V</b></p>	<p>The voltage and current are displayed cyclically. When connected to the solar panel for charging, the charging voltage and current are detected. The greater the intensity of the sun's rays, the more current the solar cells produce and the faster they charge. Usually when the noon sunlight is strong enough, the charging current generated by the solar cell is more than 0.3A. If the sun is very weak, the charge detector may not show any value.</p>



Pay attention to the installation direction of the positive and negative poles of the battery.

Important: If the battery is removed and then installed again, the Mobile Power Shield cannot be woken up by the K1 switch. You need to activate Mobile Power Shield. Activation method: Charge the Mobile Power Shield for a few seconds using a solar battery or DC adapter.