



Arduino Solar Tracker Shield

Getting Started Guide



Startup, GPS/RTC Synchronization and Shield Operation

At startup, the system enters configuration mode. In this state, the program waits for the operating parameters received via the configurator. Once configured, it switches to automatic operation mode.

When a valid GPS signal is received, the program synchronizes the internal clock and the display shows the local geographic coordinates.

Using the received data (latitude, longitude, local time in UTC format), the algorithm calculates the real-time position of the sun, displaying the azimuth and elevation angles.

Before starting sun tracking, the board automatically performs the zero-position search procedure, which corresponds to solar noon. This function is automatic and identical for both hemispheres.

Automatic sun tracking begins when the elevation exceeds the 1° threshold and ends when the elevation drops below this value. This ensures that the system follows the sun only when it is actually above the horizon.

On the evening of the first startup, the stepper motor (or tracker) will move to the SW Min limit switch, set as a configuration parameter (default: 10°), and not to the azimuth value for the next sunrise, as the program has not yet calculated this value.

On subsequent days, after the initial startup, the stepper motor (or tracker) will move precisely to the calculated azimuth value, ready to begin tracking the sun as soon as its elevation reaches 1°.

The shield generates the STEP and DIR signals required by the driver to move the stepper motor in the correct direction and position.

The zero-position acquisition procedure is a fundamental step for the proper operation of the system. For this reason, a detailed technical description will be provided with the kit at the time of purchase.

Messages displayed on the display

During operation, the display provides real-time information about the system status in the various operating phases, making use simple and intuitive.

At power-on:

"Arduino Solar Tracker Shield" "Waiting from PC configuration data"

Once configured:

"Configuration Ok"

After the boot, while searching for the GPS signal:

"Waiting for GPS data..."

Once the coordinates are acquired:

"GPS Data Acquired:

Latitude: xx.xxx

Longitude: xx.xxx"

During the zero-position search procedure:

"Zero set positioning, please wait..."

During operation (cyclic display every 5 seconds):

"Date/Time (alternating)

Azimuth: xxx.xxx

Elevation: xxx.xxx

Tracker: xxx.xxx"

At the end of tracking, in the evening:

"Positioning for next morning, please wait..."

In the morning, before starting tracking:

"Ready to track. Today we start from Azimuth: xxx.xxx"

Parameter Configurator

The Shield, through its configurator, allows you to set several important operating parameters. This simple and intuitive graphical interface is a small program sent by email at the time of kit purchase.

How to Use the Configurator

Connect the Arduino board to your PC using its USB-B port.

Launch the “arduino_configurator.exe” program on your PC and wait for the configuration page to appear. The default parameters already pre-installed on the board will be displayed.

At this point, you can set the operating parameters of the “Solar Tracker Shield” according to your needs.

- **Motor Micro stepping:** This parameter determines the tracking resolution. While entering the number of micro steps, the configurator displays the resulting resolution in real time, i.e., how many degrees the tracker moves with each step.
- **Gear Reduction Ratio:** If a gearbox is attached to the stepper motor, it is necessary to enter the reduction ratio. The program automatically calculates the number of steps required to achieve the correct angular position.
- **East/West Software Limits:** The configurator allows you to set software movement limits, preventing rotation beyond the desired area to the East and West. As you can see, the configurator accepts software limit values for both hemispheres. The program automatically interprets the configured values, always ensuring consistency and safety in the Tracker’s movements.

Once you have set the operating parameters, before sending the data, you need to select the COM communication port using the “Available serial ports” command.

The dropdown menu will display the ports in use. At this point, simply press the “Send parameters” button.

A window will confirm the successful transmission of the updated parameters.