



Solar Tracker Shield

Getting Started Guide



Startup, GPS Synchronization and Shield Operation

Upon power-up, after the startup boot sequence, the Shield enters automatic operating mode using the default configuration settings.

The system waits to receive date, time, and geographic coordinates from the onboard GPS module.

Once the GPS signal is considered valid (a few seconds after the GPS LED starts flashing), the program synchronizes the internal clock and the display shows the local geographic coordinates.

Using the received data (latitude, longitude, and UTC time), the algorithm calculates the Sun's position in real time and displays the Azimuth and Elevation angles.

Before starting solar tracking, the Shield automatically performs the zero-position search procedure, corresponding to solar noon. This function is fully automatic and operates identically in both hemispheres.

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

Solar tracking begins when the Sun's elevation exceeds the threshold of 1° and ends when the elevation falls below this value again. This ensures that the system tracks the Sun only when it is effectively above the horizon.

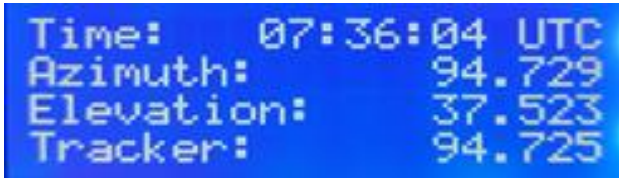
On the evening of the first power-up, the stepper motor will move to the minimum software limit position, defined by the configuration parameter (default value: 10°), rather than to the calculated Azimuth value of the following sunrise, since this value has not yet been acquired by the program.

In the days following the first power-up, at sunrise, the stepper motor will move to the calculated azimuth position, ready to track the Sun as soon as its elevation reaches 1°.

The Shield generates the STEP and DIR signals required by the motor driver to automatically position the stepper motor at the correct angle without any manual intervention.

Display information

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



Time: 07:36:04 UTC
Azimuth: 94.729
Elevation: 37.523
Tracker: 94.725

At power-up:

"AsTra Trackers Solar Shield"

"V1.0"

"System boot"

After startup, while searching for GPS signal:

"Waiting for GPS data..."

Once GPS coordinates are acquired:

"GPS Data Acquired:

Latitude: xx.xxx

Longitude: xx.xxx"

During zero-position search procedure:

"Zero set positioning, please wait..."

During normal 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 tracking starts:

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

Parameter Configuration

The configurator, a simple and intuitive graphical interface sent by email upon purchase of the kit, allows the user to set several important operating parameters of the Shield.

How to use the configurator

Disconnect the Shield from the USB power supply.

Press and hold the CONFIG button on the board, then reconnect the USB cable to the PC.

The Shield enters configuration mode (CONFIG MODE) and the display shows the default operating parameters:

- **Motor micro stepping (default 1600):** This parameter defines the tracking resolution. When setting the microstep value, the configurator also displays the tracking resolution, i.e. how much the tracker moves at each positioning step.
- **Gear reduction ratio (default 1):** If a gearbox is used with the stepper motor, the reduction ratio must be set. The program automatically calculates the number of steps required to reach the correct angular position. If no gearbox is used, leave the default value of 1.
- **Software limit switch East/West (default 10° / 10°):** The configurator allows setting software movement limits, preventing the tracker from moving beyond the desired East and West boundaries. As shown, the configurator accepts software limits for both hemispheres. The program automatically interprets the configured values, ensuring safe and consistent tracker operation (see page 4).
- **Motor rotation direction:** This function allows the user to invert the rotation direction of the stepper motor. When using gear reductions mounted on the motor, the output shaft direction may be opposite to the motor direction due to internal gears that reverse motion. It is recommended to carefully verify the mechanical behavior of the system before enabling this function.

Once the operating parameters have been configured, the **COM** communication port must be selected via the **“Available serial ports”** command.

The drop-down menu will display the available ports. At this point, simply press the **“Send parameters”** button. A confirmation window will indicate that the updated parameters have been successfully transmitted.

After configuration, simply disconnect and reconnect the Shield to a standard USB power supply. A PC connection is no longer required.

Software limit switch operation:

The configurator allows setting software movement limits for the azimuth axis, preventing rotation beyond the desired range.

The configurable software end stop parameters are two:

1. **Start° (deg):** (East limit)
2. **Stop° (deg):** (West limit)

NORTHERN EMISPHERE

(Remember that the zero position corresponds to a real 180° azimuth, and the Tracker is facing South)

CONFIGURATOR PARAMETER	EQUIVALENT REAL DEGREES
Start°: from 10° to 170°	from 10° to 170° real deg. (East, clockwise direction)
Stop°: from 10° to 170°	from 350° to 190° real deg. (West, clockwise direction)

SOUTHERN EMISPHERE

(Remember that the zero position corresponds to a real 0° azimuth, and the Tracker is facing North)

CONFIGURATOR PARAMETER	EQUIVALENT REAL DEGREES
Start°: from 10° to 170°	from 170° to 10° real deg. (East, CCW direction)
Stop°: from 10° to 170°	from 190° to 350° real deg. (West. CCW direction)

Note: In both hemispheres, the values entered in the configurator are always between 10° and 170°. The controller automatically performs the conversion based on the selected hemisphere