TOPFLYtech SolarX 120 Asset GPS Tracker

User Manual

20240229

Thanks for your purchasing of the high-quality GPS tracker from TOPFLYtech. Please read this user manual carefully before installation and operation. Information in this manual is the property of TOPFLYtech. Changes to the specifications and features in this manual may be made by TOPFLYtech without prior notice. No part of this manual could be reproduced, copied, translated, transmitted, or published in any form or by any means without TOPFLYtech's prior written permission.

SolarX 120

The tracker is using GNSS & LTE technologies and could collect device coordinates then transfer them via LTE network to the server. It provides customer with cost-effective, efficient and safety management. It has been widely used in commercial transportation, company vehicle fleet management, intelligent transportation, logistics, car rental, engineering machinery, marine transportation, animal/pet tracking and other segments.

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1. Quick Reference

SolarX 120

Attention

i. SolarX 120 obtains power through sunlight to extend the battery life.

ii. Please make sure that the device is exposed to direct sunlight every day. This will be very useful to extend the battery life. If the device is not charged for more than three months, it may cause permanent damage to the internal battery.

iii. Please give the device a full charge before installation.

iv. Only when the solar panel output voltage value is 0.3V higher than device battery voltage value, the solar panel will start to charge the battery. Otherwise, the solar charging will stop.

v. To ensure the battery life for longer period, please be careful to set the reporting intervals. Lower reporting rates will maintain the balance between the power consumption and gaining (from solar panel). We usually recommend set the tracker reporting ⩾every 5 mins when ignition/motion on, and ⩾every 1 hour when ignition/motion off. Customer may contact TOPFLYtech for further advice.

Equipment power consumption and solar panel charging current

i. The normal device power consumption is around 50mAh when the device is in working mode without sleep.

ii. The typical charging rate of the solar panel under direct sunlight at noon (in summer) is

about 250mAh (different sunlight illumination, different charging current).

Disclaimer

Before using this device, customers should fully understand their usage scenarios and installation environment. TOPFLYtech will not be responsible for any lost caused by using the device in a wrong scenario or reporting rate. It is highly recommended that customers should contact TOPFLYtech before deployment. We are glad to give suggestions.

Intelligent Power Management

To extend the battery life, we designed an intelligent power management algorithm. This algorithm allows the tracker working under a lower reporting rate when battery is low. Once the battery is charged back, the tracker will report as normal. This function is enabled in default. Customer can disable it by command. The detail working logic is:

- When the battery voltage value is down to 3.2V, tracker will send position message at every 24 hours no matter ignition (motion) on or off. Alarm (event) message will not be affected and sent out immediately regardless of whether the tracker is in this mode.

- When the battery is charged back to 3.4V, the device will report at its TIMER setting.

Battery Protection

The tracker has a charging threshold to avoid the battery overcharge. Only when the battery voltage is ⩽3.95V, the battery charging will start once sunlight condition is met or the tracker is connected to external power through the cable. The charging will stop when the battery voltage reaches 4.05V or the sunlight condition isn't met or it's disconnected from external power, depending on which comes first.

FOTA (firmware over the air) Notification

TOPFLYtech is committed to providing clients with the best user experience. We are offering automatic firmware update feature for every device. This feature allows devices always having the latest version firmware. It can save clients the time and effort of updating firmware manually. Please note that this feature is enabled in default. If you want to turn it off, please contact with TOPFLYtech. If this feature is disabled, the fw update only can be done by sending upgrade command manually.

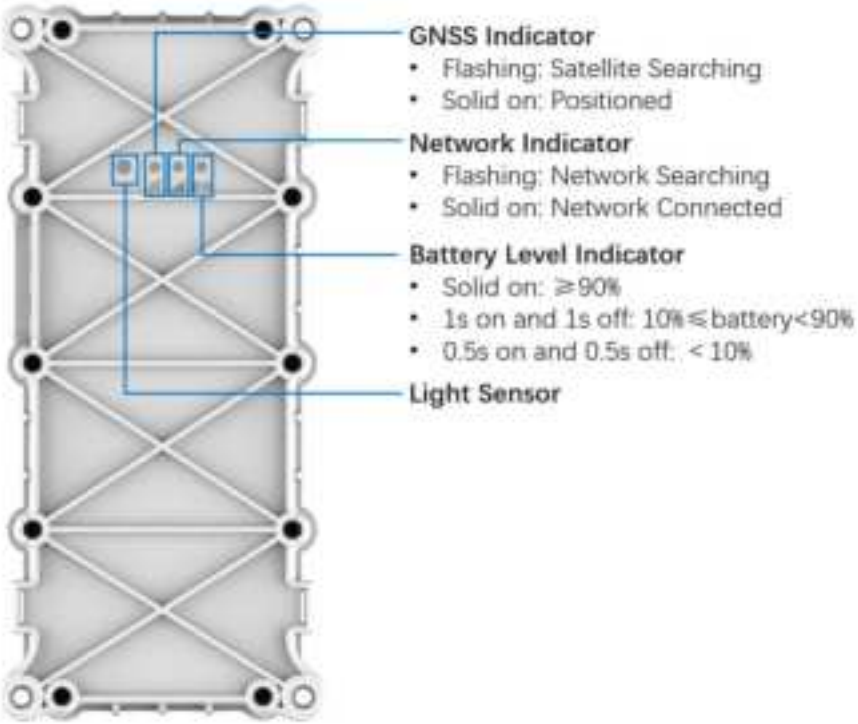
2. Product Specifications

Network Specifications	
Operating Band	LTE FDD Cat 1: B1/B2/B3/B4/B5/B7/B8/B12/B13/B17/B18/B19/ B20/B25/B26/B28/B66 LTE TDD Cat 1:

	B34/B38/B39/B40/B41 GSM: 850/900/1800/1900 MHz
Data Transmission	LTE-FDD:Max.10Mbps (DL), Max.5Mbps (UL) LTE-TDD:Max.8.96Mbps(DL), Max.3.1Mbps (UL) GPRS: Max. 85.6Kbps (DL), Max. 85.6Kbps (UL)
GNSS Specifications	
GNSS Chipset	All-In-One GNSS Receiver
GNSS System	GPS + Glonass + Beidou + Galileo +QZSS
Receiver type:	47 tracking / 47 acquisitions- channel GNSS receive
Sensitivity	Acquisition: -147dBm Tracking: -166dBm Reacquisition: -159dBm
Horizontal Position Accuracy	Autonomous: < 2 m CEP
TTFF @ -130 dBm with (without) Easy	Cold start: <28s Warm start: <25s Hot start: <1s
Interfaces	
Charging and Data Transmission	Type-C connector
Network, GNSS Antenna	Internal only
LED Indicator	Network, GNSS and Battery
Touch button	For Power On and Off
FOTA	Yes
Light sensor	For Remove Alert
Temperature Sensor	Built-in Temperature sensor
BLE 5.3	Yes
WiFi	2.4 GHz 802.11b (Rx)
Sim Card	Nano Sim Card
Tracker Configuring	TypeC Connector
General Specifications	
Waterproof	IP67
Dimensions	185.4mm*84.7mm*31.3mm (5.56" *2.54" *0.94")
Weight	410g (14.5oz)
Battery	Rechargeable Li-Polymer 7500 mAh/ 3.6V
Standby Time (Without solar charging, 2 hours active tracking per day and stop 2 hours upload one data)	30 minutes reporting: 300 Days 5 minutes reporting: 135 Days
Charging & Data Communication	Type-C cable (Recommend using 5V 1A adaptor, 10 hours

	charging)
Operating Temperature	-30℃ ~ +80℃ (-22°F ~ 176°F)
Mounting	Magnet/Screw/Double-sided tape
Air Interface Protocol	
Transmit Protocol	TCP, UDP, MQTT, SMS
Data Security & Encryption Option	MD5/ AES128
BLE Accessory Support	Yes
Scheduled Timing/angle/distance Report	Report position and status at preset intervals
Geo-fence	Support up to 64 internal geo-fence regions
Alarms	Support up to 31 types of alarm (Refer **7. Alarm Configuration**)
Industry Certifications	
FCC/CE/RCM/NBTC/TDRA/CITC/Anatel/IP67	

3. LED Indicator



Note: Indicator lights will go out automatically after the tracker turns on for 70 seconds without connecting to the external power via Type-C cable.

4. Installation Guide

4.1 SIM card pre-installation note

4.1.1 SIM card data service should be enabled.

4.1.2 If SIM card is locked via PIN, please unlock it first.

4.1.3 Ensure there is sufficient balance in the SIM card.

4.2 SIM card installation and tracker power switch

4.2.1 Open the tracker SIM card slot cover with the screwdriver.

4.2.2 Insert the SIM card with a little push until it clicks into place.

4.2.3 Put the cover back and use screwdriver to fix the cover tightly.

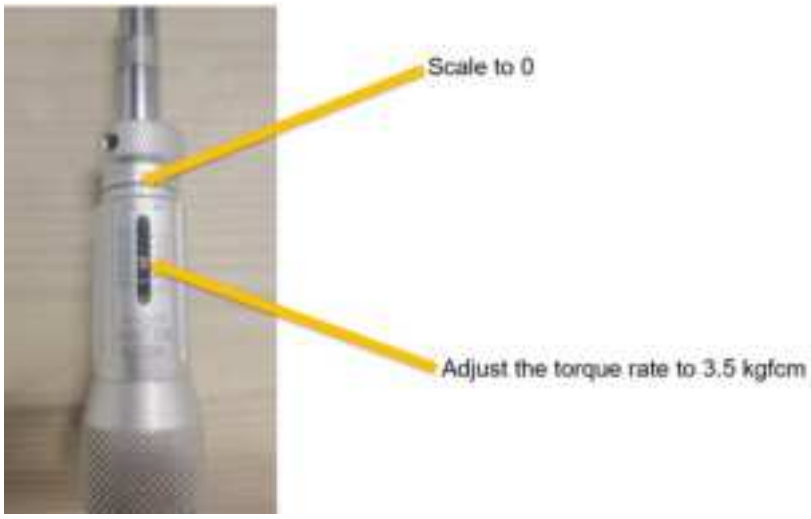
4.2.4 Power on: hold the power button on the back of the device for **5 seconds**. The LED lights on the device will sequentially light up from right to left until all three LED lights are lit, indicating that the device has powered on successfully. Refer to the image below for the location of the power button. If there is a laser-engraved circle in the upper right corner of the device, the power button is the laser-engraved circle. Conversely, if there is no laser-engraved circle on the device, the power button is the raised button.

4.3 Fix Screws

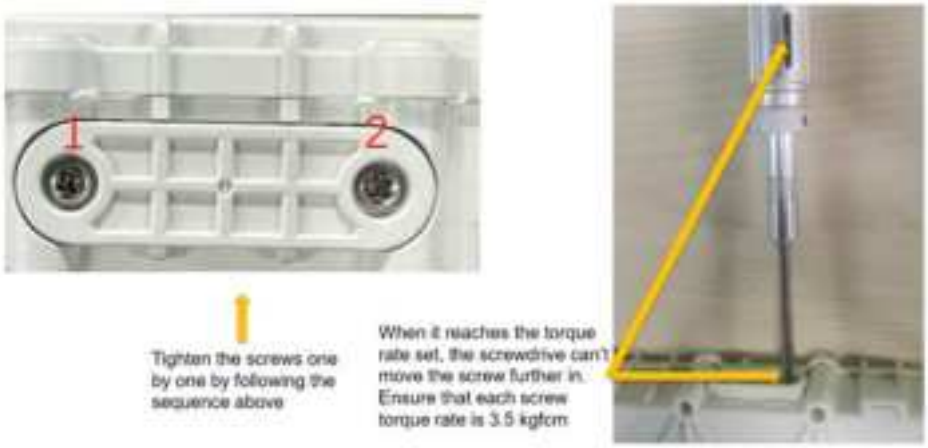
4.3.1 It is **VERY IMPORTANT** to fix the 2 SIM card cover screws to prevent water from leaking inside and cause damage to device.

Please note that, the structures on different sides of the cover are different. Therefore, please follow the below photos, to make sure the area highlighted in red toward the bottom of the device, and then tighten the screws after ensuring that it is fully covered.

4.3.2 Screwing: TOPFLYtech recommend TA51 screwdriver (as an optional accessory to help customer standardize the screw fixing strength). Screw fixing guide below.



4.3.3 Please fix the 2 screws one by one following the sequence below **1-2**, using the recommended screwdriver (TA51).



4.3.4 Final check, please ensure the cover/lid is fully covered and screws tightened.

4.4 Installation

4.4.1 Away from emission source such as all kinds of sensors, burglar alarm and other communication devices.

5. Tracker Operation

5.1 Power On/Off

5.1.1 Hold the power button on the back of the device for **5 seconds**

5.1.2 Physical power off is not enabled. To power off the device, please send the command"GUANJI,0000#". Power off is recommended when the tracker is stored in the warehouse.

5.2 Motion Operations

5.2.1 Hold the tracker and keep the LED indicator side towards the sky. Use normal speed to turn it over 180° (the solar panel side towards the sky) then recover. This is called one-time standard turning. By repeating the standard turning 3 times, the tracker will show GNSS, network and battery status through LED indicator. It only works when device powered on.

5.3 The Battery

5.3.1 Place the tracker solar panel side on the desk

5.3.2 Recommend connecting the device to a 5V 1A (cellphone) adaptor through Type-C cable for 20 hours charging to make sure the battery is fully charged.

5.3.3 Customer also can connect the tracker to other Type-C connectors. But lower current output will cause longer charging time.

5.3.4 When the battery voltage value drops to 3.5V, usually a battery charging is needed to avoid unexpected shutdown due to low power. If the battery runs out completely, please keep the tracker charging for 24 hours first. Only when the battery is charged to 3.5V, the device will power on again.

5.4 Get Current Position

5.4.1 SMS Query (only when the device in working mode and registered on the network)

Device default PIN is 0000. Send a location inquiry SMS command (google,0000#) to the tracker. The location information will be sent back through SMS (the tracker SIM card must support receiving and sending SMS first).

5.4.2 Platform Query

Connect your tracker to the tracking platform then check the real-time position online. (Additional tracking service charge may happen. Contact with your service provider to get more details)

6. Alarm Configuration

6.1 Alarm sent through network

6.1.1 alarm_set,0000,a,b,0,0,#

6.1.2 0000 is device default PIN

6.1.3 a=alarm code, value from 1 to 31

Alarm Code	Description	Alarm Code	Description
1	Device removal (VS alarm 21)	16	Start moving (VS alarm 17)
5	Start falling (VS alarm 24)	17	Stop moving
6	Low battery (Vs alarm 7)	18	Idle start (VS alarm 19)
7	Battery recover	19	Idle stop
8	Device high temperature (VS alarm 25)	21	Device mounted
9	Vibration start (VS alarm 26)	24	Stop falling
10	Collision (VS alarm 27)	25	Device high temperature disappear
11	Tilt start (VS alarm 28)	26	Vibration stop
12	Type-C cable connected (VS alarm 13)	27	Collision stop
13	Type-C cable disconnected	28	Tilt stop
14	Enter geofence (VS alarm 15)	30	Device low temperature (VS alarm 31)

15	Leave geofence	31	Device low temperature disappear

6.1.4 b=enable or disable, value is 0 (disable) or 1 (enable)

6.2 Alarm sent through SMS

Alarm also can be sent through SMS. But the tracker SIM card must support SMS function first. Then it needs customer set manager cellphone number. Please refer the frequently used commands part to get further information. Related commands: managera, managerd, manager.

7. Quick Trouble Shooting

7.1 Unable to Connect to the Tracking Platform

7.1.1 Check the APN and IP settings.

7.1.2 Check the SIM card data service whether enabled.

7.1.3 Make sure there is no limitation or already added server IP to the SIM card IP whitelist when using a M2M SIM card.

7.1.4 Check the balance/data of the SIM card.

7.2 Tracker Shows Offline

7.2.1 Check the battery remaining power

7.2.2 Check if the device entered into network blind area.

7.2.3 Check the SIM card balance.

7.2.4 If the connection lost happens on the last several days of the month, check whether the network service is terminated by carrier because of exceeding the max data usage volume.

7.3 Unable to Locate

7.3.1 The device may shield by metallic things.

7.3.2 The device may enter into an area with no satellite signal coverage. (Underground, building, etc)

7.4 Position Drift

In an area with poor GNSS signal (like the areas with lots of high buildings), position drift may happen. When the device moves to open area, the drift will no longer exist.

7.5 No Command Reply

7.5.1 Check the command format. Make sure it's correct.

7.5.2 The device may be in network blind area.

7.5.3 Ensure the SIM card is properly inserted.

8. Warranty and Stock

The device standard warranty period is 12 months starting from the date of purchasing. If the device will be stored for a long time, please connect it to the external power and recharge the internal battery (20 hours) every 3 months. It will be helpful to extend the internal battery life.

9. Frequently Used Commands

Commands are not case-sensitive and can be sent via mobile phone. The content is separated by comma and ends with #. When set successfully, the tracker will return OK and execute it. Otherwise, there will be no message returned.

Function	Command Format
APN Setting	**APN,***Current PIN*,*APN Name*,*Username*,*Password*#
Server Setting	**IP,***Current PIN*,*Server Domain Name or IP*,*Port Number*#
Upload Interval Setting	**TIMER,***Current PIN*,*Upload Time(ACC on)*:*Upload Time(ACC off)*:*Angle Compensation*:*Distance Compensation*#
Heartbeat Setting	**HBT,***Current PIN*,*Heartbeat Interva*#
PIN Setting	**PASSWORD,***Current PIN*,*New PIN*#
Google Map Search	**GOOGLE,***Current PIN*#
Forgot the PIN	**MYSELF#**

9.1 APN Setting

APN,*Current PIN,APN Name,Username,Password#*

APN Name:
Range: APN of service provider
Length Limit: 1~32

Username:
Range: Letters and Numerals
Length Limit: 0~32

Password:
Range: Letters and Numerals
Length Limit: 0~32

Note:

1) Tracker will return “SET APN OK” when received this command.
2) If there is no Username and Password, the SMS setting is:
   APN,Current PIN,APN Name,,#
3) If there is no APN PIN, the SMS setting is:
   APN,Current PIN,APN Name,Username,#

9.2 Server Setting

IP,*Current PIN,Server Domain Name or IP,Port Number#*

Server Domain Name or IP:
Range: Letters, Numerals and Symbols
Length Limit: 1~128

Port Number:
Range: Positive Integer
Length Limit: 0~65535

Note: Tracker will return "SET IP OK" when received this command.

9.3 Upload Interval Setting

TIMER,*Current PIN,Upload Time(ACC on):Upload Time(ACC off):Angle Compensation:Distance Compensation#*

Upload Time (ACC on):
Range: Positive Integer
Range Limit: 0, 5~65535 second

Upload Time (ACC off):
Range: Positive Integer
Range Limit: 0, 1200~ 4294967295 second

Angle Compensation:
Range: Positive Integer
Range Limit: 0, 15~90 degrees

Distance Compensation:
Range: Positive Integer
Range Limit: 0, 100 ~ 65535 meters

Note: Tracker will return "SET TIMER OK" when received this command.

9.4 Heartbeat Setting

HBT,*Current PIN,Heartbeat Interval#*

Heartbeat Interval:
Range: Positive Integer
Range Limit: 1 ~ 255 minutes
Default: 30 minutes

Note: Tracker will return "SET HBT OK" when received this command.

9.5 PIN Setting

PASSWORD,*Current PIN,New PIN#*

PIN:

Range: Letters and Numerals

Length Limit: 1 ~ 10

Default: 0000

Note: Tracker will return "SET PASSWORD OK" when received this command.

9.6 Google Map Search

GOOGLE,*Current PIN#*

Note: Tracker will return below message when received this command.

http://maps.google.com/maps?q=<Latitude>, <Longitude>

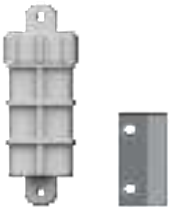
9.7 Forgot the PIN

MYSELF#

Note:

1) If the manager phone number has been set, only the manager can use "MYSELF#". If no manager setting, the tracker will return the IMEI and current PIN when it received "MYSELF#" from any mobile phone.
2) This command can be used to retrieve password.

10. Optional Accessories List

Product Sku	Description	Photo for Reference
TSTH1-B	BLE 5.0 Wireless Temperature and Humidity Sensor	
TSDT1-B	BLE 5.0 Wireless Door and Temperature Sensor	
TSR1-B	BLE 5.0 Wireless Relay	

TA39	Magnet Set (4 units)	
TA46	Sponge for light sensor	
T-button	BLE 5.1 Key Fob & Panic button	
T-sense	BLE 5.1 IP67 temp&movement&door sensor	
T-hub	BLE 5.1 IO extension hub	
T-one	BLE 5.1 Probe temp or temp&humi sensor extender	
TA51	Torque Adjustable Hand Screwdriver	
TA45	USB-A (male) to Type-C (male) cable 100cm	

11. FCC Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation

Caution!

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

IMPORTANT NOTICE:

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

12. ISEDC Warning

This device complies with Innovation, Science, and Economic Development Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d' Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil nedoit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device is compliance with RF exposure guidelines, users can obtain Canadian information on RF exposure and compliance.The minimum distance from body to use the device is 20cm.

Le présent appareil est conforme Après examen de ce matériel aux conformité ou aux limites d'intensité de champ RF, les utilisateurs peuvent sur l'exposition aux radiofréquences et la conformité and compliance d'acquérir les informations correspondantes. La distance minimale du corps à utiliser le dispositif est de 20cm.

