TOPFLY tech

TOPFLYtech KnightX 300 Vehicle GPS

Tracker User Manual

20240329

Contents

Document Purpose

The purpose of this user manual is to provide information about the TOPFLYtech PioneerX100 vehicle tracking device. It covers the main features of the device and instructions for its use.

TOPFLYtech may make changes to the specifications and features of this manual without prior notice.

Legal Information

Document Version and History

20240329	First review for new CS model
20230820	Final version before new CS model

Safety Information

The following information is provided to ensure safe operation of the device. Please read them carefully before starting to use the device:

- Do not disassemble the device. If the device case is damaged or the insulation of the wires is compromised, disconnect the power cables from the power supply first.
- It is important to remember that all wireless data transmission devices generate interference that can affect other devices nearby.
- Installation or dismantling of the device should only be carried out by qualified personnel.
- The device must be securely fixed as described in the installation instructions.
- Configuration must be carried out using a second safety class computer with an independent power supply.
- Ensure that the device is installed in a location that is protected from adverse environmental conditions for long periods.
- Dispose of used batteries in accordance with environmental regulations.
- For configuration, use quality, certified cables. TOPFLYtech accepts no liability for damage or loss resulting from the use of unsuitable cables.
- Caution! Do not incorrectly connect the wires marked red (positive power supply) and black (negative/chassis) to the wrong poles of the battery. The device has reverse polarity protection, but if connected improperly, the device will not work.
- Disconnect the device from the power supply before disassembling it to insert or replace the SIM card.
- To disconnect the device from the power supply, you need to unplug the device's 6-pin connector or disconnect the wires from the vehicle's power supply.
- Make sure that the cross-sectional area of the wires is at least 18 AWG (0.75 mm^2).
- Use good splicing techniques as crimping or soldering.
- Install the device in a restricted-access location that is not visible or easily accessible to the driver.
- Waste from the equipment must not be disposed of with household waste. The product must be sent to specific collection points at the end of its useful life.

Acronyms and abbreviations

2G - Second generation cellular technology

3G - Third generation cellular technology

4G – Fourth generation cellular technology

AC/DC - Alternating current/Direct current

AIN - Analog input

APN - Access point name

CAN - Controller area network

DIN - Digital input

DOUT - Digital output

FMS - Fleet management system

FW - Firmware

HDOP - Precision horizontal dilution

GLONASS - Global Navigation Satellite System

GMT - Greenwich Mean Time

GNSS - Global Navigation Satellite System

GPRS - General Packet Radio Service

GPS - Global Positioning System

GSM - Global System for Mobile Communications

IP - Internet protocol (address)

OBD - On-board diagnostics

OTA – Over-the-air

LED - Light Emitting Diode

LTE - Long Term Evolution

PCB - Printed Circuit Board

SMS - Short Message Service

SW - Single-Wire or Software or Switch

TCP - Transmission Control Protocol

UDP - User Datagram Protocol

UMTS - Universal Mobile Telecommunications System

USB - Universal Serial Bus

VCOM - Virtual communication port

Reference Material

Command list: Can be found at the DMS (Device Management Platform)
Protocol description: Contact TOPFLYtech support for detailed protocol information

About this device

TOPFLYtech's KnightX300 compact telematics device is a versatile GNSS-based tracker designed for personal tracking and parcel/cargo tracking.

The KnightX100 incorporates GNSS and LTEtechnologies, enabling the precise collection of the device's coordinates and the efficient transfer of this data via the LTE network to the server. This provides customers with cost-effective and secure management. Its rugged and compact IP67-rated enclosure has made it a popular choice in a variety of sectors.

This battery powered tracker, the KnightX300, besides the built-in SOS button has compatibility with BLE sensors that makes it possible to monitor temperature, humidity, door status and other relevant information. It is a complete model that meets the diverse needs of customized solutions.

⚠ FOTA (firmware over the air) Notification

TOPFLYtech is dedicated to ensuring that its clients enjoy the most seamless and user-friendly experience with its products and services. To achieve this, we have introduced automatic firmware updates for all our devices. This feature is designed to keep your devices up to date by automatically installing the latest firmware versions. It has been integrated to not only enhance the performance of your devices but also to save you the time and effort required for manual firmware updates.

However, we understand that there may be cases where you prefer to have more control over when and how firmware updates are applied to your devices. If you wish to turn off this automatic feature for any reason, you have the option to do so. To disable automatic firmware updates, contact TOPFLYtech, and our support team will assist you in this process.

Once you've disabled the automatic firmware update feature, please note that the responsibility for keeping your device's firmware up to date will fall on you. In such cases, firmware updates can only be performed by sending manual upgrade commands to your device. This ensures that you have full control over the update process and can apply firmware updates at your discretion.

Disclaimer

Customers should make sure they know how and where to use this device before using it. If they use the device in an inappropriate scenario or reporting rate, they may face some problems. TOPFLYtech is not liable for any damages caused by such misuse. Customers are advised to contact TOPFLYtech for guidance before deployment. We are happy to help.

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 3.4V, 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 3.5V, the device will report at its TIMER setting.

Product Specifications

Network Specifications	
Operating Band	LTE FDD Cat M1: B2/B4/B5/B12/B13/B25/B26/B66/B85 LTE FDD Cat NB2: B2/B4/B5/B12/B13 /B25/B66/B71/B85 GSM/EDGE: 850/1900 BLE: 2402 ~ 2480MHz
Data Transmission	eMTC: Max. 300Kbps (DHL), Max. 375Kbps (UL) EDGE: Max. 396Kbps (DL), Max. 236.8Kbps (UL) GPRS: Max. 107Kbps (DL), Max. 85.6Kbps (UL)
GNSS Specifications	
GNSS Chipset	All-In-One GNSS Receiver
Parallel GNSS	GPS + Glonass + Beidou + Galileo +QZSS
Receiver type:	47 tracking / 47 acquisitions - channel GNSS receiver
Sensitivity	Acquisition: -147 dBm Reacquisition: -159 dBm Tracking: -166 dBm
Horizontal Position Accuracy	Autonomous: < 1.5 m CEP
TTFF @ -130 dBm with (without) EPO	Cold Start: < 5s (28s) Warm Start: < 2s (25s) Hot Start: < 1s (1s)
Interfaces	
Antenna	Internal only
Indicator LED	Network and GNSS and Power
FOTA	Yes
Temperature Sensor	1 temperature sensor (internal)
External sensor	Optional temperature sensor
BLE	Yes, 5.1
Panic button	Integrated
Tracker Configuring	Type-C Connector, OTA commands.

General Specifications	
Ingress Protection Rating	IP67
Dimensions	91.8mm*43.5mm*29.2mm ("3.61 *1.71" *1.14")
Weight	165g (5.82oz)
Battery	Lithium-ion 6400mAh/ 3.6V
Charging Voltage	5V DC
Operating Temperature	-20°C ~ +80°C (-22°F ~ 176°F)
Storage Temperature	-40°C ~ +85°C (-40°F ~ 185°F)
Air Interface Protocol	
Transmit Protocol	TCP, UDP, MQTT, SMS
Protocol Check & Encryption Support	MD5/ AES256
BLE Accessory Support	Yes
Scheduled Timing/angle/distance Report	Report position and status at preset intervals
Low Power Alarm	Report when backup battery is low
Data Roaming Control	Avoid additional data consumption

Product overview

GNSS Indicator(Blue):
Flashing: Satellite Searching
Solid on: Positioned

Network Indicator(Green):
Flashing: Network Searching
Solid on: Network Connected

Battery Level Indicator(Red):
Solid on:>90%
1s on and 1s off: 10%battery<90%
0.5s on and 0.5s off: < 10%

Note: The indicator lights will go out automatically after the tracker is powered for 8 mins, unless configured to be always on.

Individual device ID

Every KnightX 300 has a laser engraved table containing important information as charging voltage, battery capacity and IMEI number both human readable and in a QR code format.

Features

- Real-time GPS and accelerometer data
- Remote ignition block
- Geofence support
- Connection to numerous BLE sensors
- Firmware update over the air
- Motion detection
- BLE 5.1
- 3-axis accelerometer
- Panic button
- Ability to read up to 50 BLE sensor information
- 165g
- 91.8mm*43.5mm*29.2mm (”3.61 *1.71” *1.14”)
- USB battery charging
- Operating temperature -20°C to 80°C

SIM Card

The KnightX 300 is compatible with SIM cards in the Nano format. To ensure proper operation , make sure that the SIM card's data plan is enabled, that no PIN code is set and that there is sufficient balance. If you plan to use SMS commands to setup the device, make sure the SIM card plan has SMS enabled.
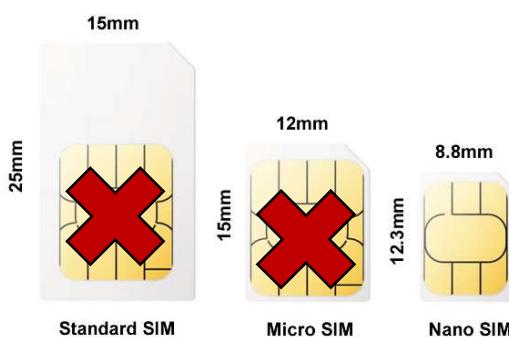
To insert the SIM card, follow the steps below:
- Remove the SIM card lid on the bottom of the device
- Insert the SIM card following the orientation imprinted on the device
- Push it until you hear a click and it is flush with the bottom of the cavity

Your device is now ready for configuration.

USB Charging Port:
Open the Cap to Charge
Close the Cap after Charge Done

Sim Card Slot((Nano):
Open the Cap to Insert Sim Card
Close the Cap after Insert SIM Card

Note: the caps are not interchangeable.

Integrated touch switch function

Power on (enabled by default)	Press and hold the button for more than 6 seconds, device will vibrate for 1 second and all LEDs turn on.

Device health status check (enabled by default)	When the device is powered on, click the button 5 times in a row in less than 5 seconds. Device's LEDs will be active for 100 seconds and indicate:
	 • GNSS status:
	     o GPS disabled, LED stays off.
	     o GPS enabled, LED solid on.
	     o Searching for GNSS signal, LED blinks once a second.
	 • Network status:
	     o Network connected, LED solid on.
	     o Looking for network, LED blinks once a second.
	
	 • Battery level:
	     o ≥90%, LED solid on.

	o Between 90% and 10%, LED blinks once a second. o Less than 10%, LED blinks twice a second.
Power off (enabled by default)	When the device is powered on, click on the button 9 times in less than 9 seconds, holding it on the last press for 3 seconds. Device will vibrate and power off. Note: The device can only be powered on after 120 seconds it has been powered off.
Panic (SOS) (disabled by default)	When the device is powered on, hold the button for over 6 seconds. Device will vibrate in morse code for SOS and the panic alert will be sent to the platform.

Battery charging information

- The minimum recommended charging current is 1A. Lower current chargers are supported but result in longer charging time.
- When the battery voltage drops to 3.3V or below, charging the battery is needed to avoid unexpected shutdown due to low power. If the battery runs out completely, please keep the tracker charging for at least 24 hours prior to use.
- The device will only accept the power on command if the battery is at 3.4V or more.

Configuring the device

Configuration software

Before starting, make sure you have installed all the necessary USB drivers.
Drivers can be downloaded from our FTP server. Contact TFT Support if you cannot find them.

1. With the device connected to the configuration tool, go to the network tab:
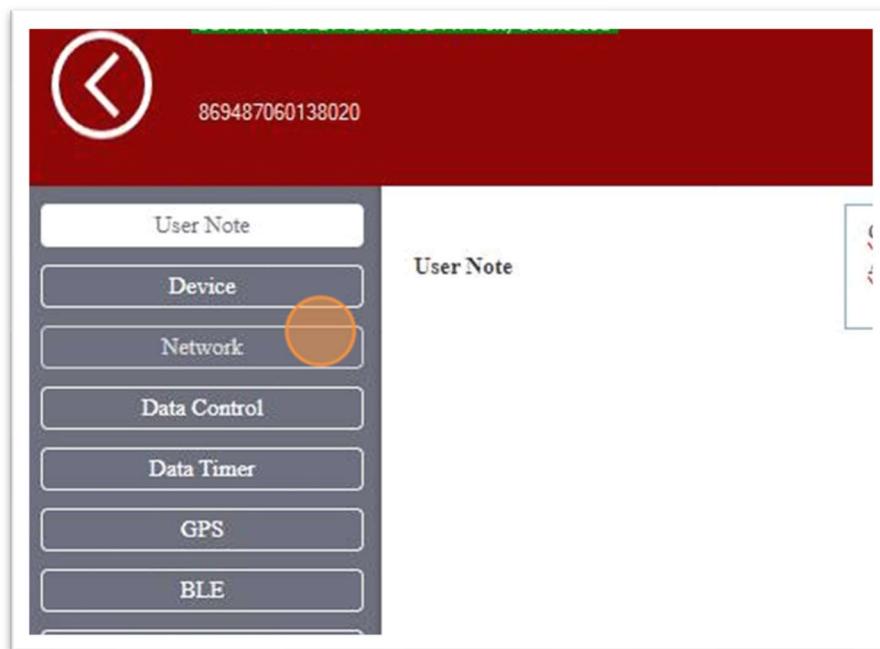
2. Type your APN information (Claro as an example)
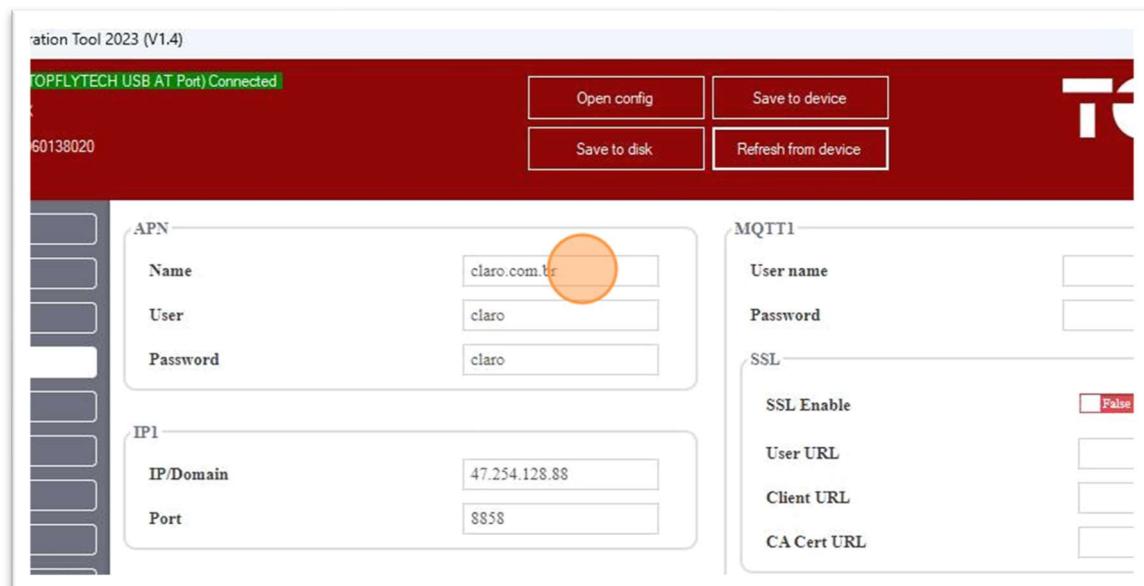
9. Type your Platform IP and port (TFT Monitor as an example)
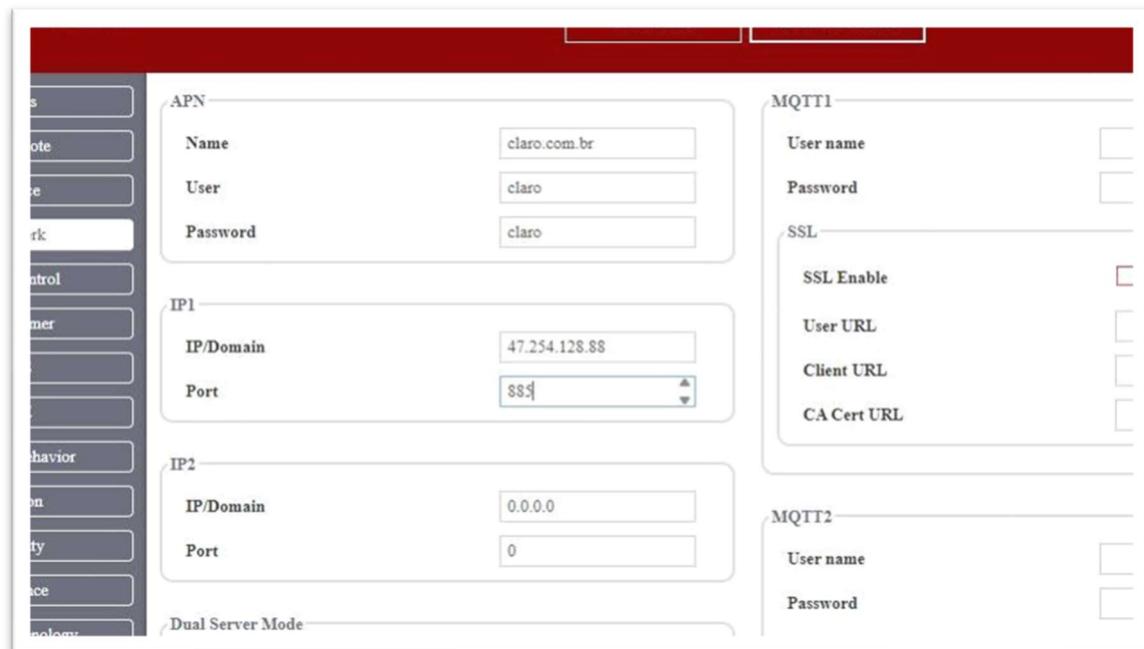
12. Click "Save to device"
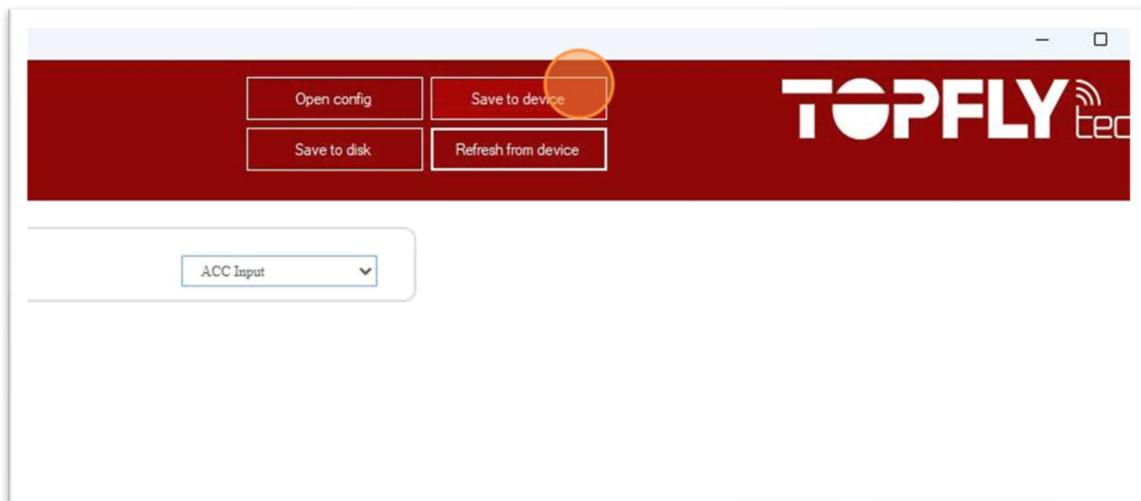
13. Click on "yes"
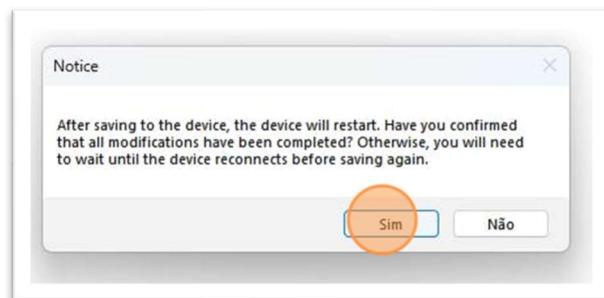
14. Close the configuration tool when the upload is complete. The device will reboot and will have the correct configuration installed.
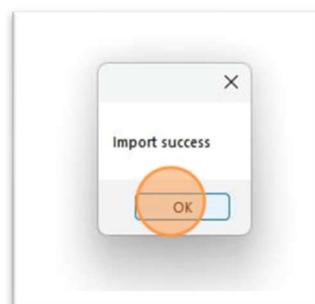
Using commands

Send the following command via serial console or SMS to set up the device APN:

```
APN,<password>,APN_name,username,password#
```

If there is no need of password:

```
APN,<password>,APN_name,username,#
```

If there is no need of user name and password:

```
APN,<password>,APN_name,,#
```

Use the following command to set IP address:

```
IP,<password>,ip_address,port#
```

In this case both IP and domain name are acceptable.
Default password is 0000.

Setting data timer

Data timer are the intervals of which the device will send location/sensor messages to the server.

Using the Configuration tool

In the Data timer tab, set the Data Acquisition values.
1. Ignition/motion on: tracker reports every A seconds when ignition is on (range is 0 or 3~65535. 0 means disable)
2. Ignition/motion off: tracker reports every B seconds when ignition is off (range is 0 or 3~65535. 0 means disable)
3. Heading: tracker reports when the vehicle turns every C degrees (range is 0~180, 0 means disable)
4. Distance: tracker reports when the vehicle runs every D meters (range is 0~65535, 0 means disable)
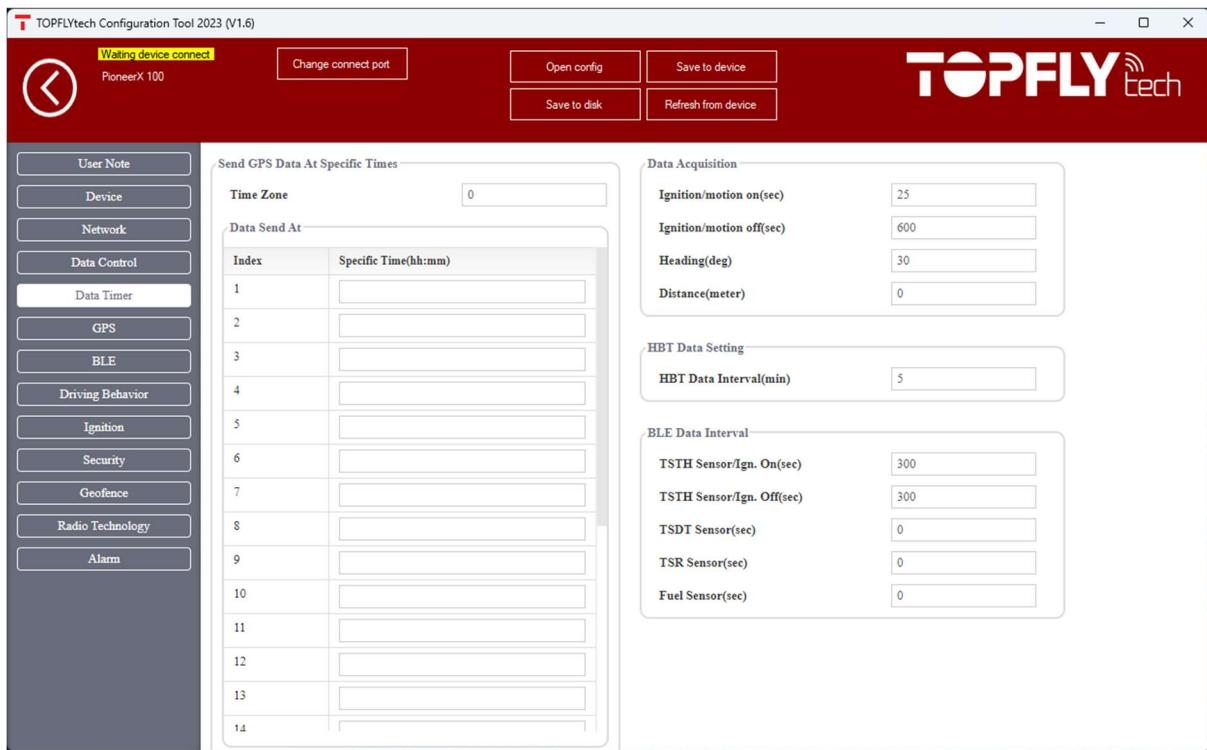
On the same screen the user can set the interval to send BLE sensor data to the server, and the Heartbeat interval.

Using commands

Send the following command via serial console or SMS:

$$TIMER,<0000>,A:B:C:D\#$$

Where:

5. A, tracker reports every A seconds when ignition on (range is 0 or 3~65535. 0 means disable)
6. B, tracker reports every B seconds when ignition off (range is 0 or 3~65535. 0 means disable)
7. C, tracker reports when the vehicle turns every C degrees (range is 0~180, 0 means disable)
8. D, tracker reports when the vehicle runs every D meters (range is 0~65535, 0 means disable)

Changing the default password

There are 2 ways to change the device's default password.

Using commands

Send the following command via serial console or SMS:

`PASSWORD,<0000>,<new_password>#`

The new password can have up to 10 alphanumeric characters.

Using the configuration tool

When configuring the device, on the security tab the user can set the desired password.
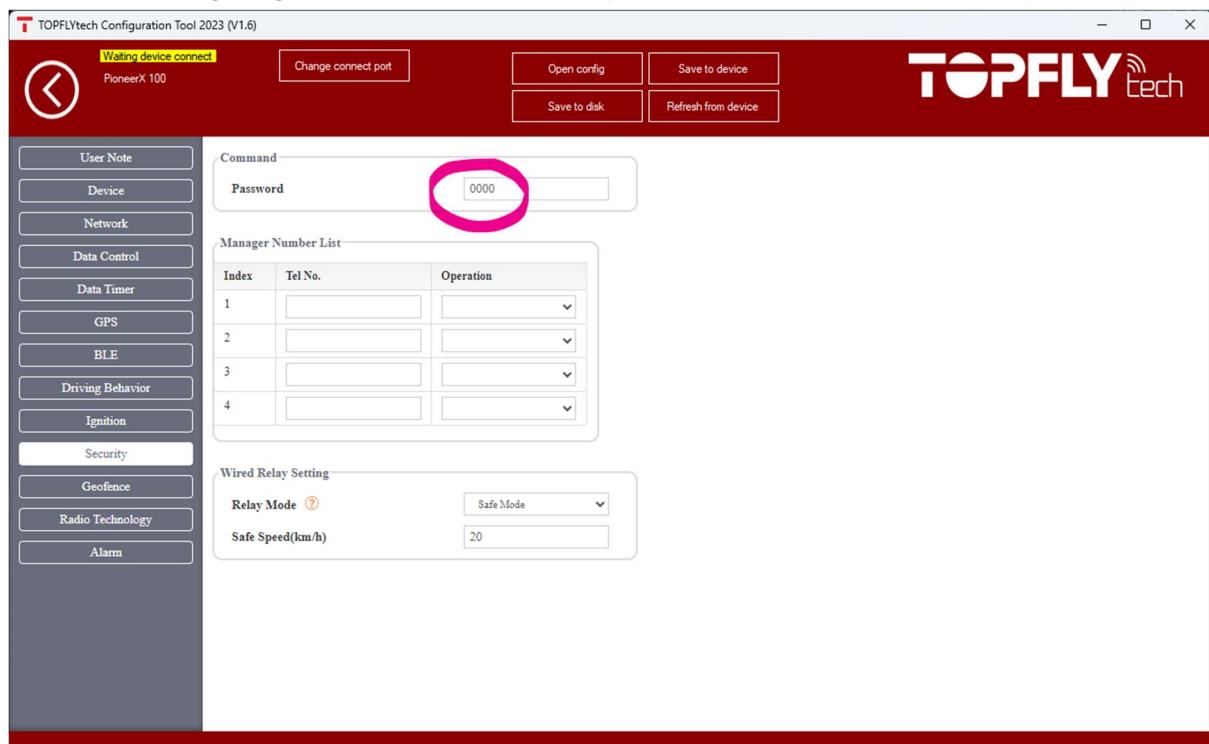
Forgotten password?

If the user has forgot the device's password, the "MYSELF#" command can be sent to the device in order to retrieve the current password.

NOTE: If a manager phone number has been set, only this number can use this command if sending via SMS. If the command is sent via serial console or SMS with no manager setting, the tracker will return the device IMEI and current PIN.

Sending commands via network (TCP/UDP/MQTT/DMS)

If the user is sending commands to the device via the platform instead of SMS or serial console the password is not needed. Remove the "<password>," from the command before sending. More information is available in the Command List in the DMS.

Bluetooth accessories

Using the configuration tool

TOPFLYtech devices

1. On the device configurator, go to the "BLE" tab
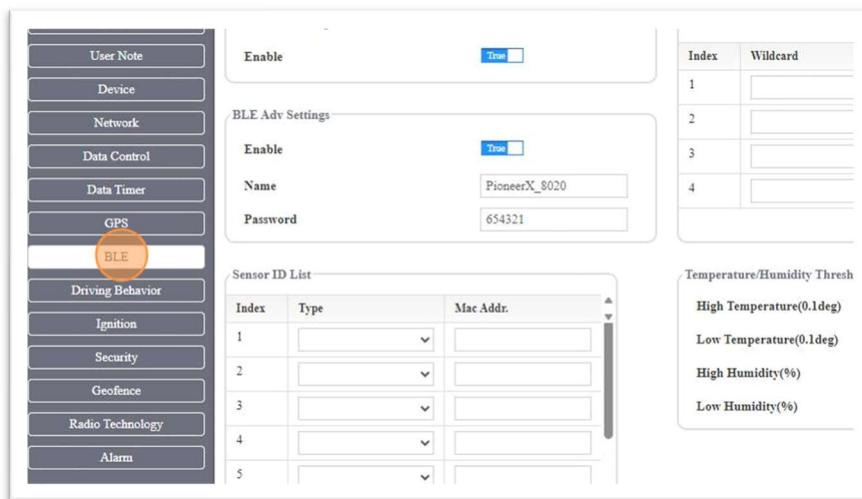
2. Select the type of the device you want to pair:
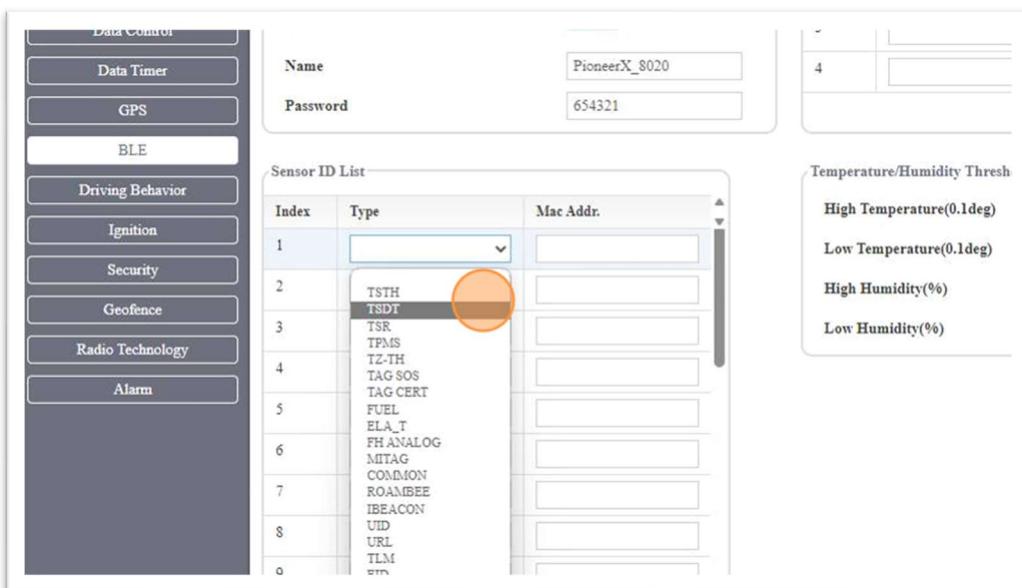
3. Type the device MAC address

4. Click "Save to device"

Bluetooth device types

- TSTH = TFT Temperature and Humidity BLE sensor
- TSDT = TFT Door and temperature BLE Sensor
- TSR = TFT BLE Relay
- TPMS = Tire pressure monitoring Sensors
- TZ-TH = T-Zone Temperature and Humidity sensor
- Tag Cert = Driver ID button (T-Button)
- Tag SOS = Panic button (T-Button)
- Fuel = ESCORT fuel sensor
- ELA_T = ELA Temperature Sensor
- Common = BLE Passthrough mode (transparent channel)
- iBeacon = Apple iOS iBeacon protocol
- UID, URL, TLM, EID = Eddystone Protocol
- TH Acc = T-Hub ACC detection

TOPFLYtech BLE relay

The KnightX 300 can be connected to up to 8 TFT BLE relays and control it following the Alarm settings or received commands.

1. Open the "Alarm" tab
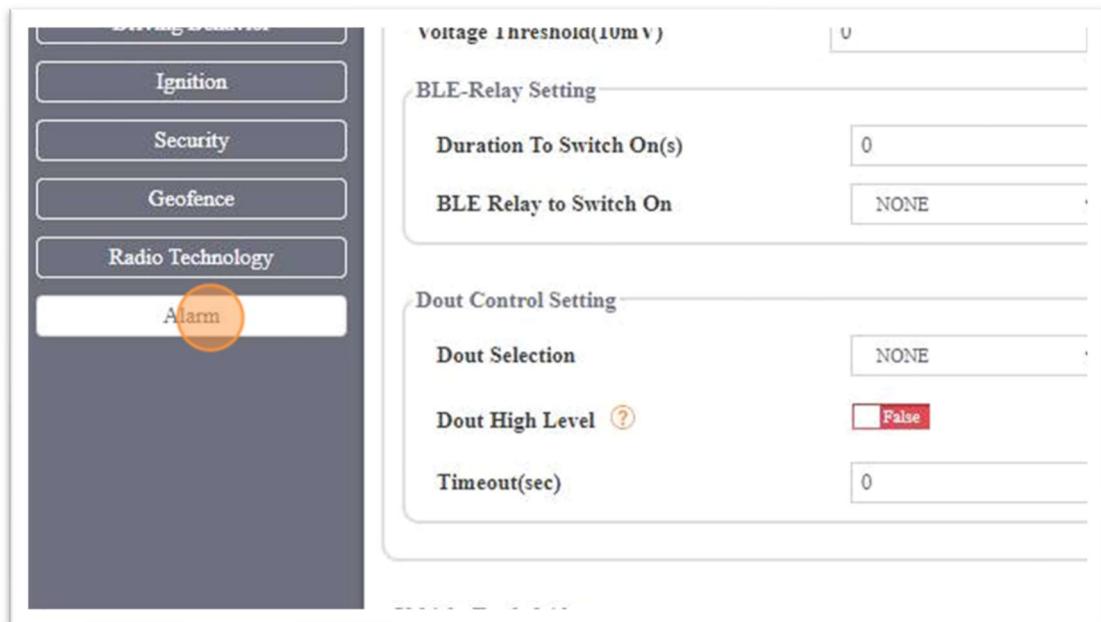
2. Type the BLE relay MAC address and password
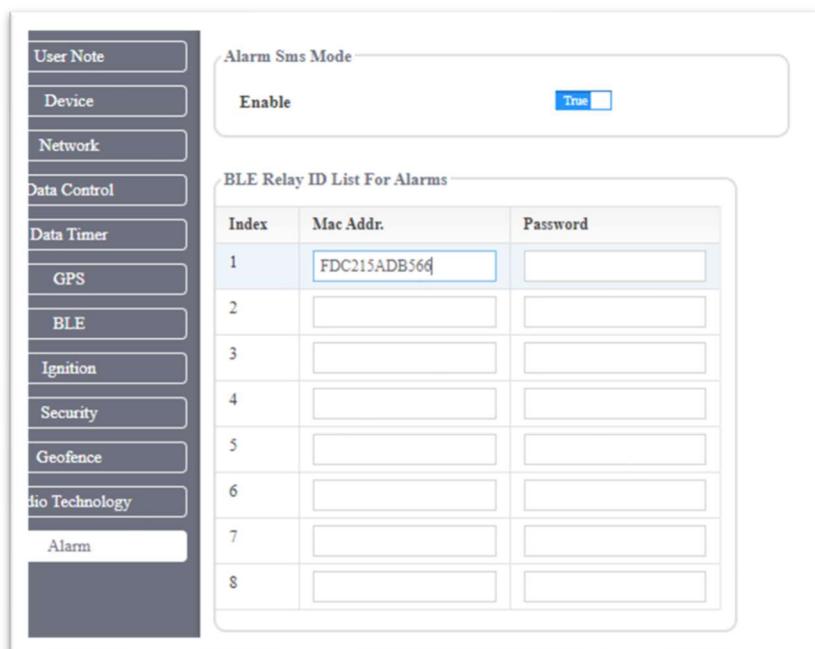
4. Choose which alarm will activate the BLE relay and its timeout. "0" means no timeout.

5. Click "Save to device"
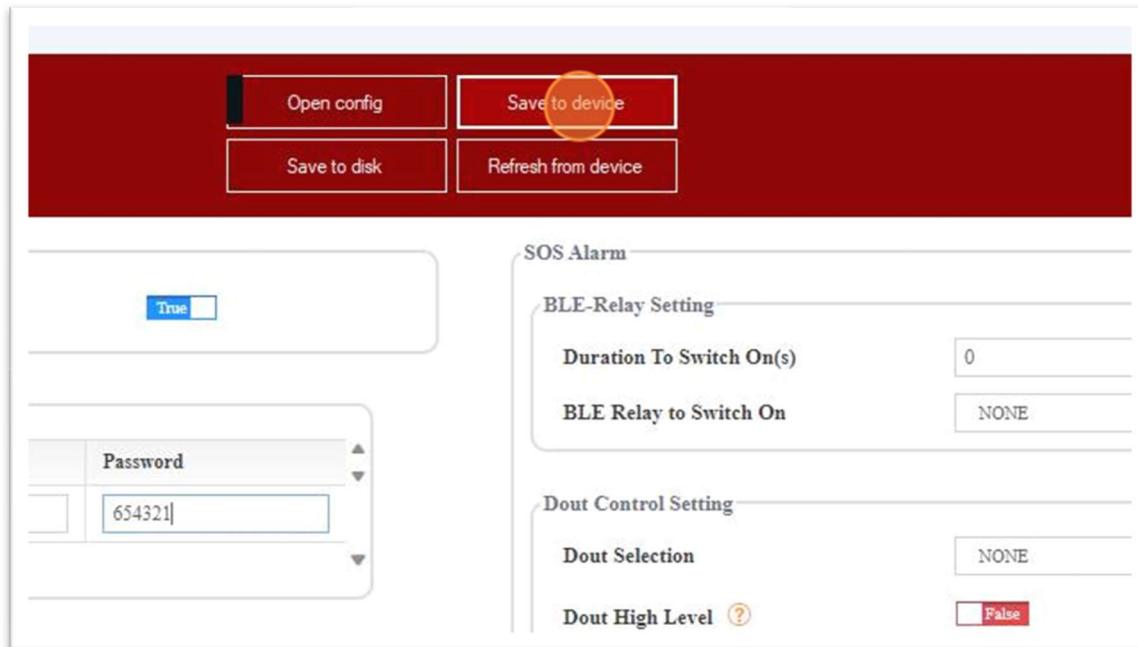
Simple troubleshooting

- Inability to Connect to the Tracking Platform
    - Check the APN and IP settings.
    - Check that the SIM card supports the specific network and that the data service is enabled.
    - Make sure there are no limitations or that the server's IP address has already been added to the IP whitelist when using an M2M SIM card.
    - Check the remaining balance or network signal of the SIM card.
    - Make sure the IMEI is correctly added to the platform.
    - Check ACK setting for the Login message.
- Tracker Indicates Offline
    - Check the voltage of the external power source to see if the tracker has been disconnected from the external power source.
    - Check if the vehicle has entered a network shadow area.
    - Check the tracker's SIM card balance.
    - If the disconnection occurred in the last few days of the month, check whether the network service has been interrupted by the operator due to exceeding the maximum data usage volume.

- o Make sure the IMEI is correctly added to the platform.
- o Check ACK setting for the Login message.
- Unable to locate
  - o Check that the top side (with the TOP SIDE logo) is facing upwards without being covered by metal objects during installation.
  - o Has the vehicle entered an area without satellite coverage?
- Location deviation
  - o In areas with a weak GNSS signal (such as areas with many tall buildings), location drift can occur. When you move to an open area, the drift will no longer occur.
- Lack of response to commands
  - o Check the format of the command. Make sure it is correct.
  - o The vehicle may be in a network shadow area.
  - o Make sure the device is online or wait for it to become online.

Warranty and stocking

The standard warranty for our product lasts for 12 months starting from the date of purchase. To ensure the longevity of your tracker, especially if you plan to store it for an extended period, we recommend a specific maintenance procedure.

If you anticipate leaving the tracker unused for a while, it's advisable to connect it to an external power source and recharge the internal battery for a continuous period of 10 hours every 3 months. This proactive measure will significantly contribute to preserving the lifespan of the internal battery.

Optional TFT Compatible Accessories List

TA01	Fuel Supply Cut Relay (12V)	
TA11	Fuel Supply Cut Relay (24V)	
TA20	External TPS Set (BLE)	
TA22	Internal TPS Set (BLE)	
TSTH1-B	BLE 5.0 Wireless Temperature & Humidity Sensor	
TSDT1-B	BLE 5.0 Wireless Door & Temperature Sensor	
TSR1-B	BLE 5.0 Wireless Relay	
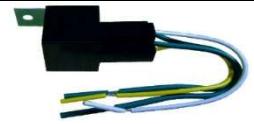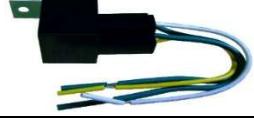
TA48	Wired Panic Button (2m)	
T-button	BLE 5.1 Key Fob & Panic button	
T-sense	BLE 5.1 IP67 temperature, movement and door sensor	
T-hub	BLE 5.1 IO extension hub	
T-one	BLE 5.1 Probe temperature sensor	

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.

ISEDC Warning

This device complies with Innovation, Science, and Economic Development Canada license-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.