

# T-BOX User Manual

Segway

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## 1. Version

| version | date       | author      | Revise the reason                                                   |
|---------|------------|-------------|---------------------------------------------------------------------|
| 1.0.0   | 2019-12-19 | mengran.guo | first edition                                                       |
| 1.0.1   | 2020-3-9   | xiuhua.wu   | Add structure dimension description                                 |
| 1.0.2   | 2020-4-27  | jie.zhao    | Revise some module parameters                                       |
| 1.0.3   | 2020-6-2   | xiuhua.wu   | Add certification requirements and reliability testing requirements |
| 1.0.4   | 2020-6-5   | jie.zhao    | Revision of 4G module parameters                                    |
|         |            |             |                                                                     |

## 2. Product introduction

T-BOX contains 4G networking, Bluetooth, GPS, 6 axis attitude solution, magnetic compass, mass storage, encryption functions. As an ORV power supply switch, the T-BOX can be used to power up and down the vehicle through remote unlocking of the network, or it can be used to power up and down the vehicle through bluetooth. T-BOX obtains vehicle information through CAN interface, and reports vehicle and its own running status and location information tracking to realize real-time monitoring of the vehicle.

## 3. Notes

There is no battery inside the T-BOX, so it should be continuously powered.

## 4. Basic parameter characteristics

| The parameter name                   |                 | indicators     |
|--------------------------------------|-----------------|----------------|
| size                                 |                 | 85mm*85mm*43mm |
| The input power                      |                 | DC:12V         |
| The power consumption of the product | Working state   | 12V@250mA      |
|                                      | Low power state | 12V@5mA        |
| Waterproof level                     |                 | IP67           |
| Working temperature                  |                 | -30℃~+85℃      |

## 5. Detailed description of hardware

### 5.1. RF parameters

| Item                      | parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hardware version          | EC25-EUX(Europe / Middle East / Africa / Korea / Thailand)<br>EC25-AFX(North America)<br>EC25-AUX(South America/ Australia,/New Zealand)<br>EC25-J(Japan)<br>EC21-KL(South Korea)<br>EC25-MX (Mexico)<br>EC20-CE(China / India)                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| technical characteristics | LTE CAT4/UMTS/EGPRS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Working frequency band    | <b>EC25-EUX:</b><br>LTE FDD: B1/B3/B7/B8/B20/B28A<br>LTE TDD:B38/B40/B41<br>WCDMA: B1/B8<br>GSM: B3/B8<br><b>EC25-AFX:</b><br>LTE FDD: B2/B4/B5/B12/B13/B14/B66/B71<br>WCDMA: B2/B4/B5<br><b>EC25-AUX:</b><br>LTE FDD: B1/B2/B3/B4/B5/B7/B8/B28<br>LTE TDD: B40<br>WCDMA: B1/B2/B4/B5/B8<br>GSM: B2/B3/B5/B8<br><b>EC25-J:</b><br>LTE FDD: B1/B3/B8/B18/B19/B26<br>LTE TDD: B41<br>WCDMA: B1/B6/B8/B19<br><b>EC21-KL:</b><br>LTE FDD:B1/B3/B5/B7/B8<br><b>EC25-MX:</b><br>LTE FDD: B2/B4/B5/B7/B8/B66<br>WCDMA: B2/B4/B5<br><b>EC20-CE:</b><br>LTE FDD: B1/B3/B5/B8<br>LTE TDD: B34/B38/B39/B40/B41<br>WCDMA: B1/B8<br>TD-SCDMA: B34/B39<br>CDMA: BC0<br>GSM: 900/1800MHz |

|                       |                                                                                                                               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------|
| GSM features          | EDGE: 296Kbps (DL)/ 236.8Kbps (UL)<br>GPRS: 107Kbps (DL)/ 85.6Kbps (UL)                                                       |
| UMTS features         | DC-HSDPA: 42Mbps (DL)<br>HSUPA: 5.76Mbps (UL)<br>WCDMA: 384Kbps (DL)/ 384Kbps (UL)                                            |
| LTE features          | LTE FDD: 150Mbps (DL)/ 50Mbps (UL)<br>LTE TDD: 130Mbps (DL)/ 30Mbps (UL)                                                      |
| Transmitting power    | GSM850/GSM900: 33dBm $\pm$ 2dB<br>DCS1800/PCS1900 :30dBm $\pm$ 2dB<br>WCDMA:24dBm+1/-3dB<br>LTE-FDD /LTE-TDD :23dBm $\pm$ 2dB |
| Receiving sensitivity | LTE:-102.5dB--99dB<br>WCDMA:-110dB<br>GSM850/EGSM900/DCS1800/PCS1900: -109dBm                                                 |
| Network protocol      | TCP/UDP/PPP/FTP/FTPS/HTTP/HTTPS/NTP/PING/QMI/NITZ/<br>MMS/SMTP/SSL/MQTT/FILE                                                  |

## 5.2. GPS parameters

| Item                            | parameters                                                                                                                                                                                                            |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model                           | MT3333                                                                                                                                                                                                                |
| Receiving sensitivity           | Tracking navigation mode: -167dBm<br>Capture mode: -148dBm<br>Recaptured mode: -161dBm                                                                                                                                |
| Horizontal positioning accuracy | Independent positioning: <2.5m CEP                                                                                                                                                                                    |
| Speed precision                 | <0.1m/s                                                                                                                                                                                                               |
| Time precision                  | 1ns                                                                                                                                                                                                                   |
| Startup time                    | Recapture time: <1s<br>First setting time @-130dBm Use the EASY™ technology:<br>cold boot: <15s<br>warm start: <5s<br>First setting time @-130dBm Do not use EASY™ technology:<br>cold boot: <35s<br>warm start: <30s |
| dynamic property                | maximum altitude: 18000m<br>maximum speed: 515m/s<br>maximum acceleration: 4G                                                                                                                                         |
| Type of antenna                 | internally installed                                                                                                                                                                                                  |

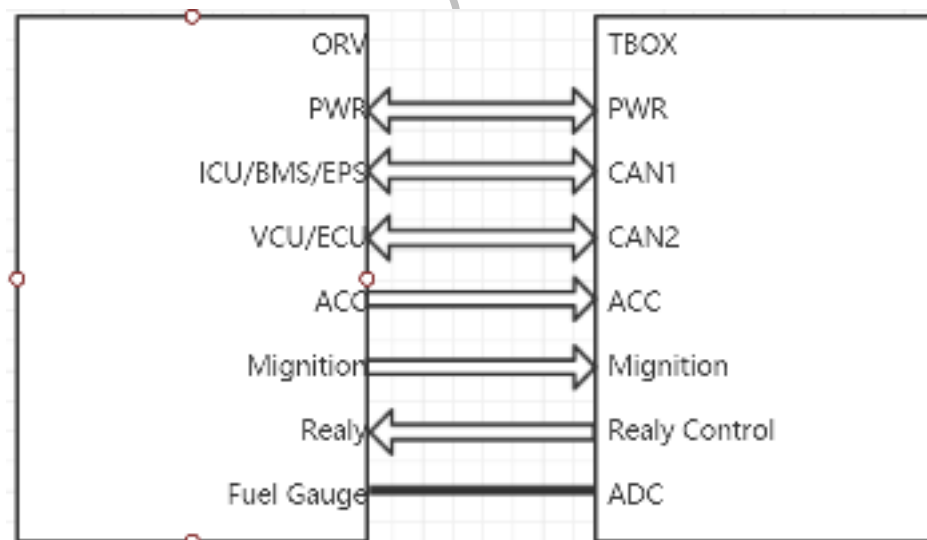
### 5.3. BLE parameters

| Item                  | parameters |
|-----------------------|------------|
| BLE Chip              | NRF51802   |
| Frequency             | 2.4GHz     |
| Receiving sensitivity | -91dBm     |

### 5.4. Other technical parameters

| Item            | parameters                                                                                                                            |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| main processor  | STM32F412VET3:<br>Core: Cortex-M4<br>Flash memory: 512K bytes<br>Ram: 256k bytes<br>Frequency: UP to 100Mhz                           |
| Six-axis sensor | acceleration: $\pm 2/\pm 4/\pm 8/\pm 16$ g full scale<br>angular velocity: $\pm 125/\pm 245/\pm 500/\pm 1000/\pm 2000$ dps full scale |
| magnetometer    | 1°to 2°Degree Compass Heading Accuracy                                                                                                |
| CAN             | 2Mbps                                                                                                                                 |

### 5.5. Detailed description of hardware interface



### 5.5.1.Power interface

- Input voltage DC 12V, peak current 1A
- short-circuit protection
- reverse connect protection
- Power consumption intelligent management

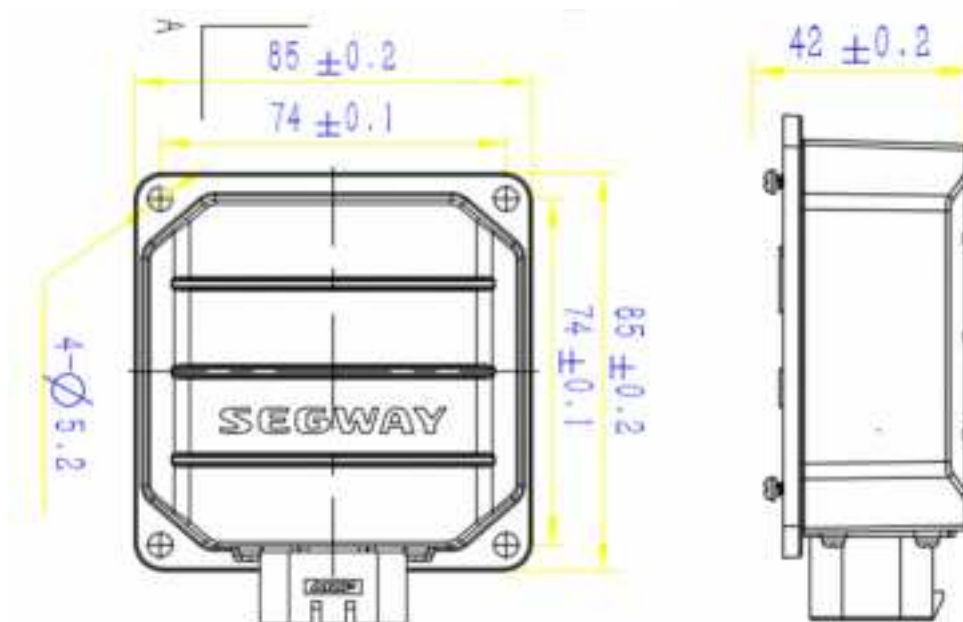
### 5.5.2.CAN

- communication baud rate: 500 KBPS, highest support 2 MBps

### 5.5.3.Debug interface

- MCU debug serial port: can be used to configure the equipment parameters and equipment upgrade, local log printing devices
- EC25 debug serial port: print EC25 log
- bluetooth debugging interface: log printing equipment, printing EC25 log
- cloud debugging interface

## 6. Structural dimension description



## Federal Communications Commission (FCC) Compliance Statement for USA

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.

Note: 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 equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

## Industry Canada (IC) Compliance Statement for Canada

This device contains licence-exempt transmitter(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur exempt de licence contenu dans 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 ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux radiations IC CNR-102 établies pour un environnement non contrôlé. Cet émetteur ne doit pas être situé ou fonctionner conjointement avec une autre antenne ou un autre émetteur. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.

Neither Segway Technology Co., Ltd. nor Ninebot is responsible for any changes or modifications not expressly approved by Segway Inc. or Ninebot. Such modifications could void the user's authority to operate the equipment.

T-BOX (model NB-ORBOXC12)

FCC ID:2ALS8-OR0001 IC:22636-OR0001

Contains FCC ID: XMR201909EC25AFX IC: 10224A-2019EC25AFX

## Important WEEE information



WEEE Disposal and Recycling Information Correct Disposal of this product. This marking indicates that this product should not be disposal with other household wastes through out the EU.

To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsible to promote the sustainable reuse of materials resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

## Battery recycling information for the European Union



Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC and amendment 2013/56/EU concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European Directive 2006/66/EC and amendment 2013/56/EU, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances.

Before placing electrical and electronic equipment (EEE) in the waste collection stream or in waste collection facilities, the end user of equipment containing batteries and/or accumulators must remove those batteries and accumulators for separate collection.

## Restriction of Hazardous Substances (RoHS) Directive

This Ninebot (Changzhou) Tech Co., Ltd. product, with included parts (cables, cords, and so on) meets the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment “( RoHS recast” or “ RoHS 2”).

## Radio Equipment Directive



Segway Europe BV, Hogehilweg 8, 1101 CC Amsterdam, The Netherlands.

Hereby, Ninebot (Changzhou) Tech Co., Ltd, declares that the wireless equipment listed in this section are in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

|           |                   |               |
|-----------|-------------------|---------------|
| Bluetooth | Frequency Band(s) | 2400-24835GHz |
|           | Max. RF Power     | 20mW          |

Segway Inside