

# *GPS&GPRS CONTAINER TRACKING SYSTEM*

MODEL: CTS-100 SERIES

OPERATION / INSTALLATION MANUAL

## **I. BRIEF INTRODUCTION**

Container Tracking System utilizes the GPS and GPRS functions in one unit. You can monitor the container or the vehicle location and set the system remotely. In addition, the unit will send event report if any trigger occurs.

The standard report sent by the unit includes the information: (1) unit's ID, (2) status, (3) time, (4) GPS's latitude and longitude, (5) speed, (6) direction, (7) device's status, (8) event number, and (9) report configuration parameters.

The reporting mode can be categorized as 'normal' mode, and 'power saving' mode. In normal mode, the GPS will always be activated while moving, and it can be shut off the GPS when stop (for power saving purpose). To enable the maximum power saving, user can choose "power saving mode". In this mode, the GPS will be activated only when there is a report to send while moving. The report parameters can be set from the PC setup program. CTS-100 can be set to go in sleep mode (while not moving); the system will cut the power of GPS module in order to save power. With build-in 3-D acceleration sensor, CTS-100 can select related reporting modes with respect to it is moving or not.

The device has built-in 4 Geo-fences; it will send the report to the server if the Geo-fence event is triggered.

The UNIT must be initialized by PC setup program in order to make communication with the remote server /call center. There are four main sections that allow users to program the device, (1) User detail (Device ID, server IP, and port, GPRS APN....) (2) Geo-fence (4 circular Geo-fence) (3) Report (Time, Distance, speed, Low battery, wakeup ...) (4)Trigger report(Tamper ,Door)

When there is no GPRS service or the server close. The unit will send short message to the preset number. The max number of SMS message (monthly usage) and the monthly renew date can be set from the pc setup program or the remote setup program. Only 1 SMS number can be set. The reports sent via the SMS will be out again via GPRS after a valid GPRS connection is made.

CTS-100 can be configured by the PC setup program or the Over-the-Air (OTA) commands / or remote program. The unit can communicate with the server via UDP or TCP protocol. The protocol can be selected from the PC-setup program or remote server commands.

Flash memory for recording reports up to 900 reports. It can be read out from the PC setup program via serial port.

Using built-in real time clock to identify the report time, when GPS signal is lost. Hence, if the report is received with "LAST KNOWN" message, the time in the report will be the real time clock, but the GPS position will be the last known valid GPS position.

Three LED indicate the status of the system:

Power indicator: When the unit power on, the led will flash 1time/3sec by green. If the power has low status, the LED will change to red. when the battery charge ok then power LED will change to green. If tamper switch is triggered, the power indicator will flash twice continuously; if door sensor is triggered, the power indicator will flash 5 times continuously

GPS indicator: LED is GREEN when the unit has acquired a valid GPS signal, and it will flash when the unit is searching GPS signal.

GSM/GPRS indicator: Orange LED will flash when the device is connected to the server with valid GPRS connection. It will stay continuously on when it is in GSM mode. It will stay off if there is no GSM reception. Note that the GSM/GPRS and GPS LED's indication will not be valid until the system goes to the working mode, normally 30 seconds after power on.

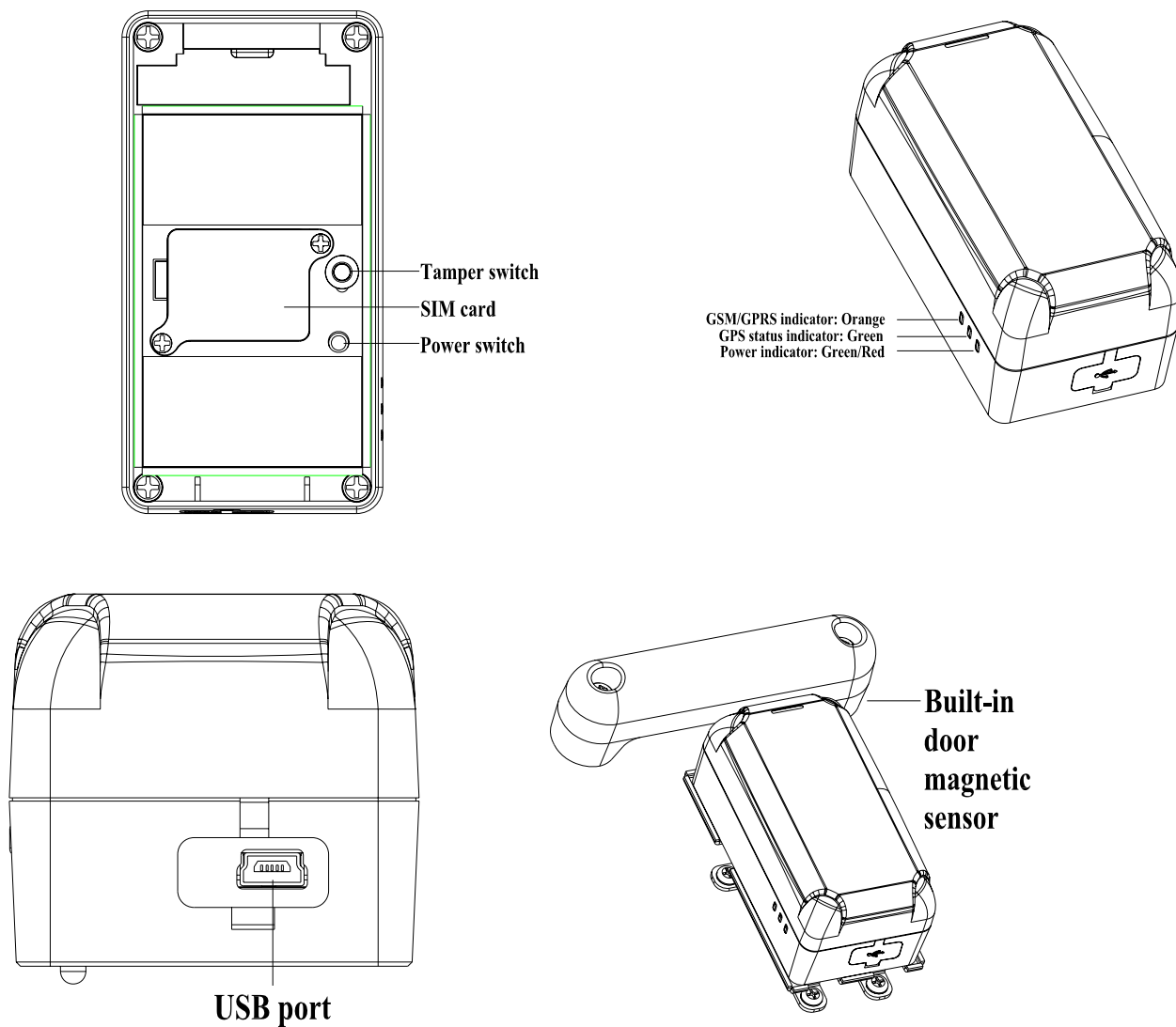
## II. The main unit's housing with Strong Magnetic Gives You Easy Instant Install Placement!

Just like we put you in control on how and when your CTS-100 reports to you with your own online controls, we also put YOU in control of how you want your CTS-100 installed on any container or vehicle. In addition, the unit has built-in door magnetic sensor, it used to detect the container door status.

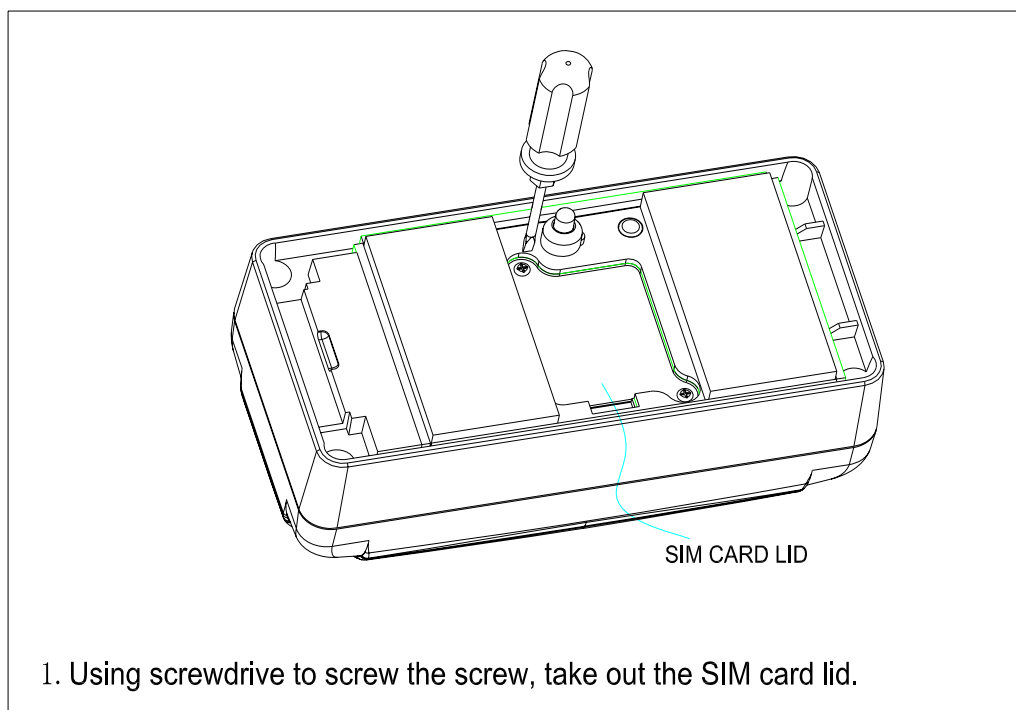
## III. BASIC FUNCTIONS

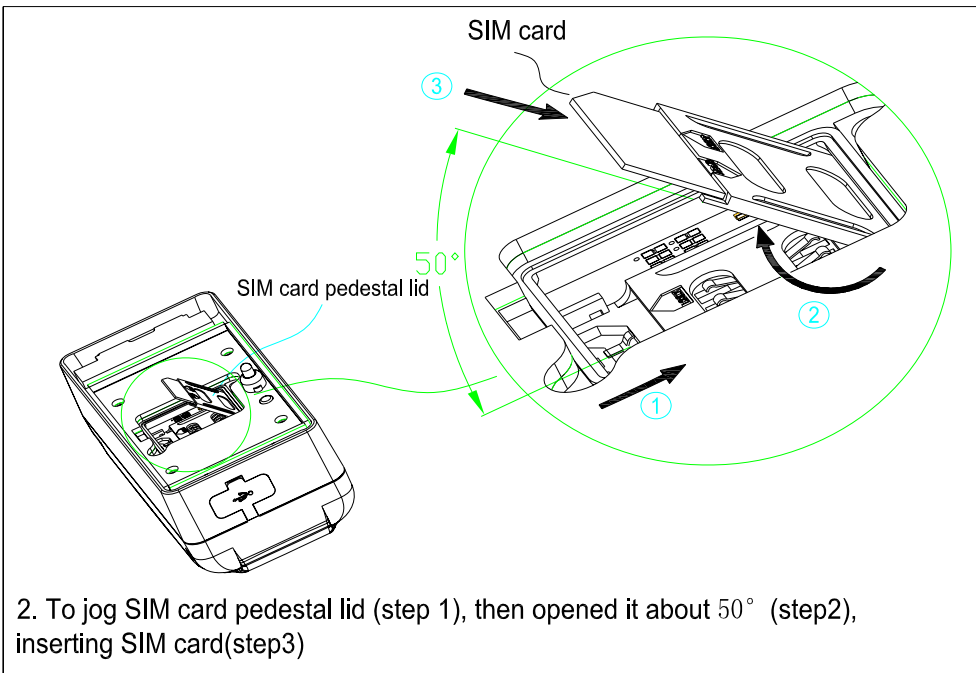
FUNCTIONS	APPLICATIONS
GPS	GPS receiver will output a complete position, velocity, and time (PVT) solution in the NMEA Version 3.0 protocol.
GPRS, SMS	GPRS use standard TCP or UDP communicate protocol. If the GPRS service is failed, the SMS mode will be turned on for emergency use.
Button	Power switch
PC-setup	Initialize the unit and program the device, including Network APN, server IP address, user message, report control, and Geo-fence setting, etc ... Note that Network APN and server IP details must be set before the installation.
Standard Report	Automatic report for tracking purpose: Fixed time report Fixed distance report Trigger report
History data store	900 report can be saved in unit and read from server and pc-setup

## IV. PANEL INSTALLATION

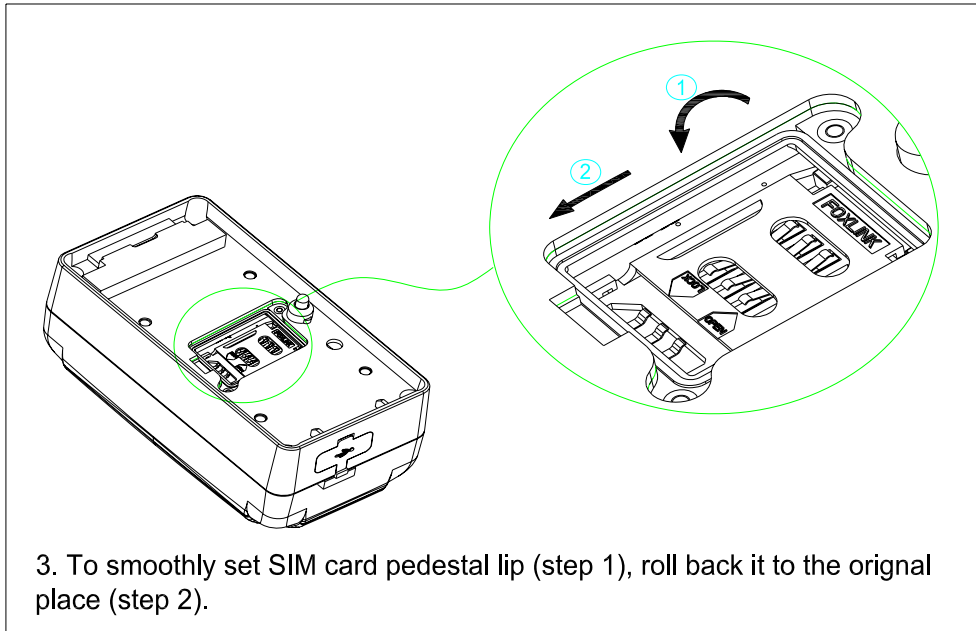


SIM card inserting guide:

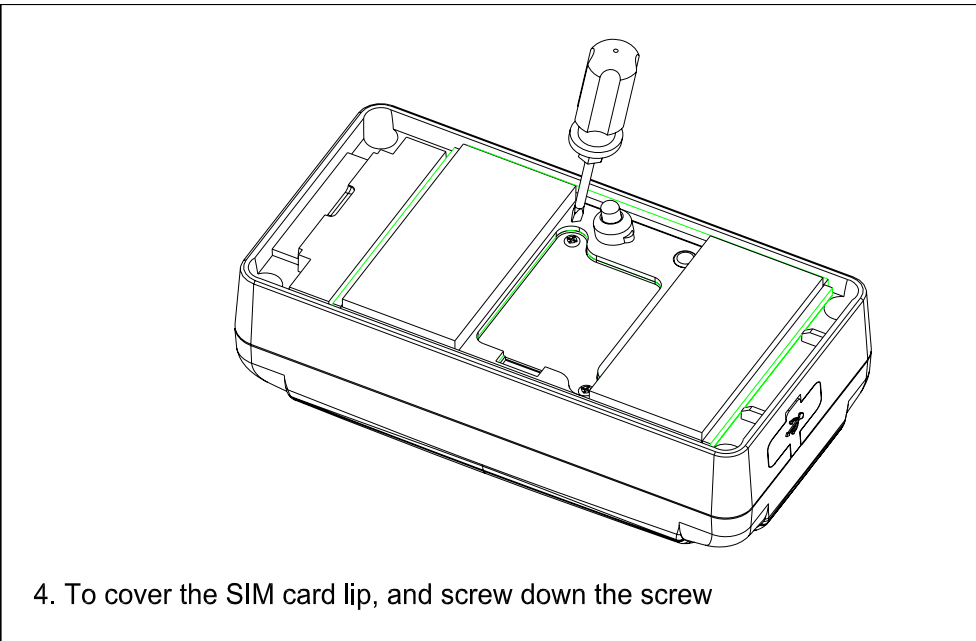




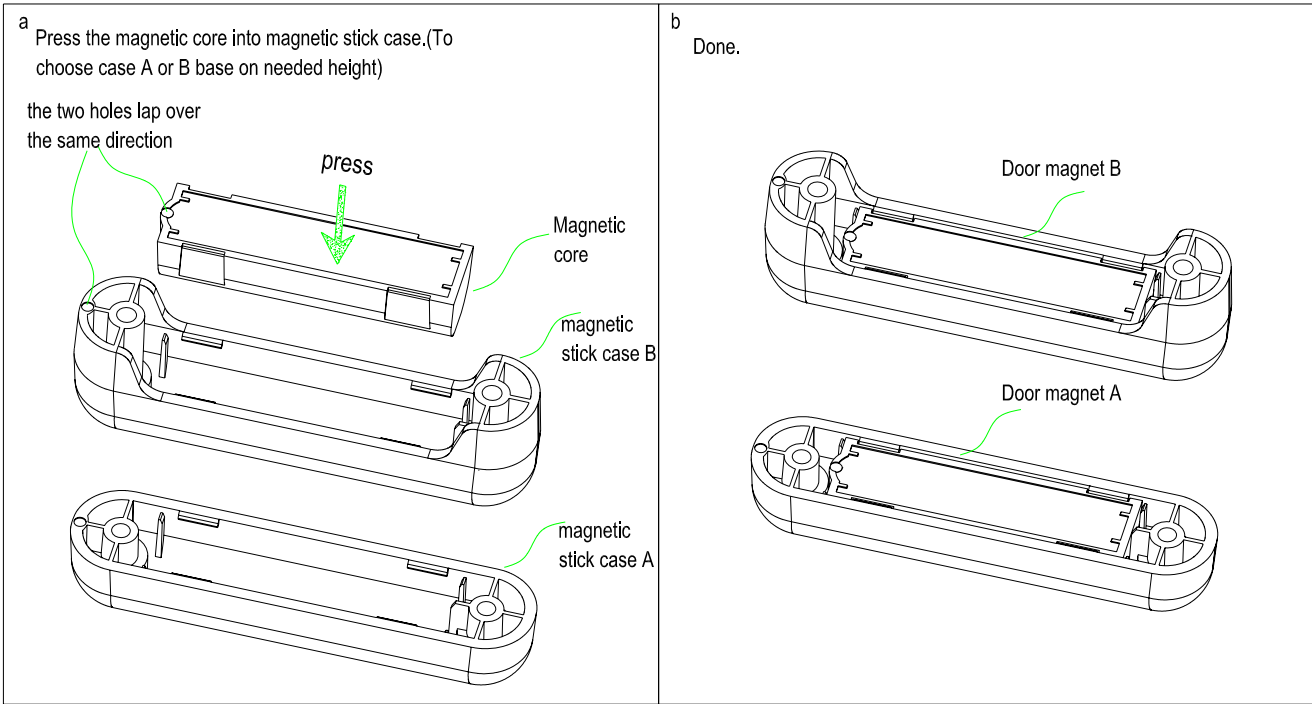
2. To jog SIM card pedestal lid (step 1), then opened it about 50° (step2), inserting SIM card(step3)



3. To smoothly set SIM card pedestal lip (step 1), roll back it to the original place (step 2).

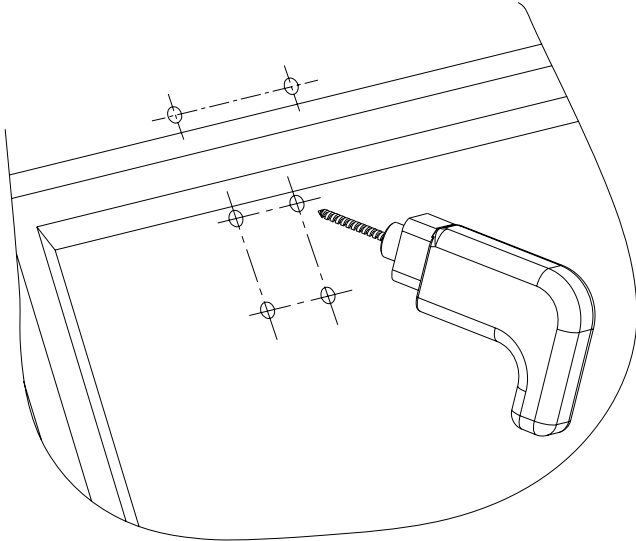


4. To cover the SIM card lip, and screw down the screw

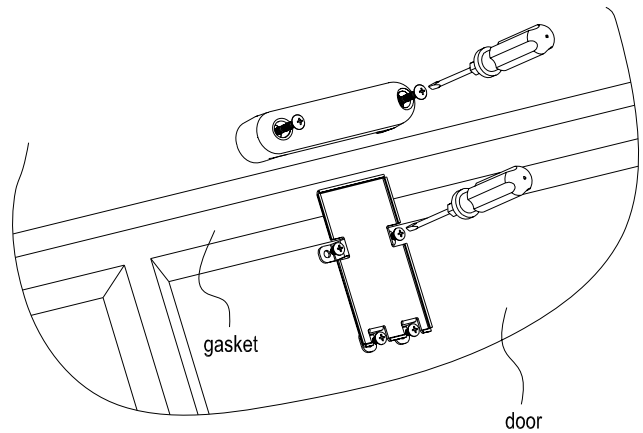


## CTS-100 Installation guide (Project one: vehicle doors with gasket)

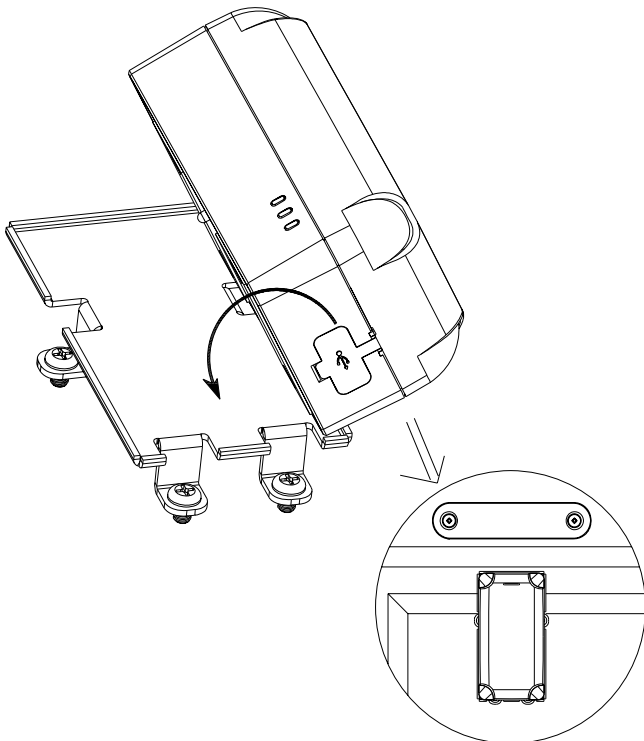
a. Drill adequate screw hole for holder and magnetic pillar.



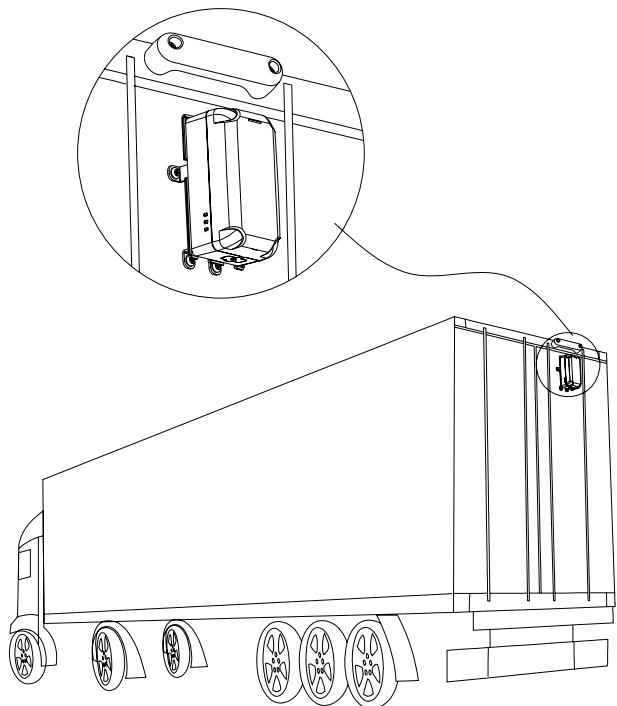
b. Fix holder and magnetic pillar in appropriate position.



c. Please see the following picture, when install the CTS-100, please put one side of it on the holder, then turn it to make the whole underside flat with the holder, when disassembly, please take it down on the opposite way.

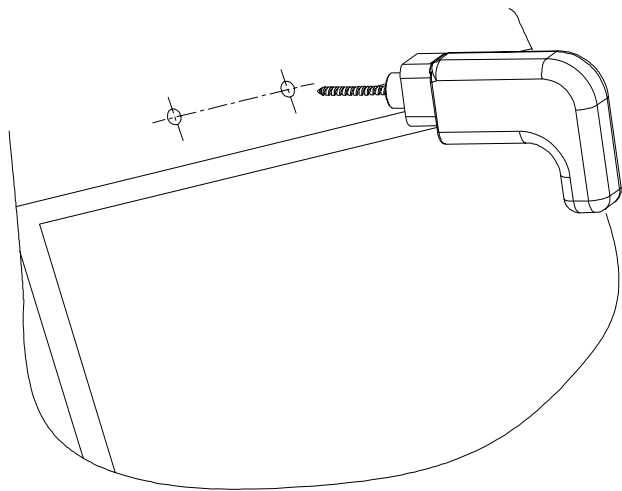


d. Done.

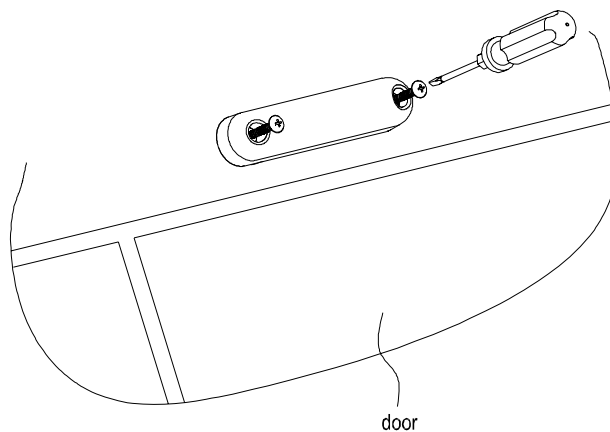


## CTS-100 Installation guide (Project two: vehicle doors without gasket)

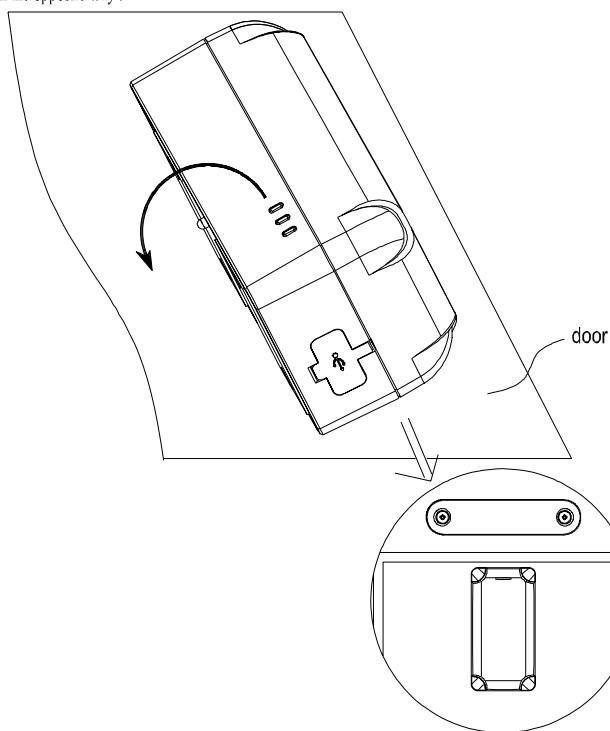
a. Drill adequate screw hole for magnetic pillar.



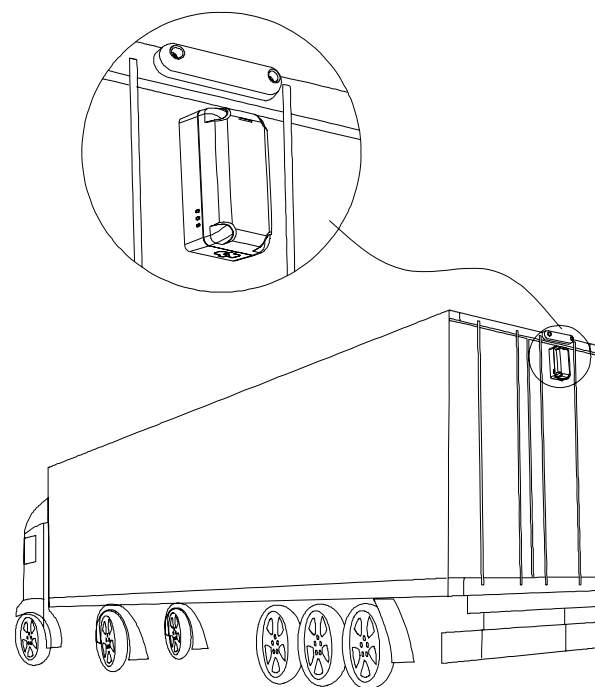
b. Fix magnetic pillar in appropriate position.



c. Please as follow picture, when install the CTS-100, please put one side of it on the door of the car, then turn it to make the whole underside flat with the door, when disassembly, please take it down on the opposite way .



d. Done.





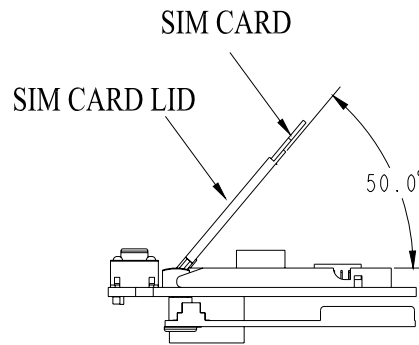
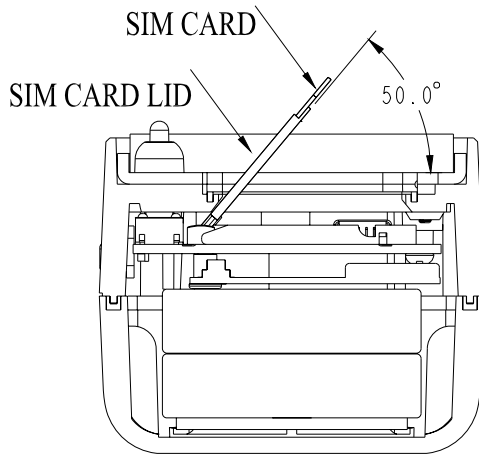
## V. PC SETUP AND SYSTEM INITIATION

PC setup Procedure:

- 1.) Connect the standard RS232 cable to the DB9 port.
- 2.) Open the PC setup program.
- 3.) Select the correct COM port for communication.
- 4.) Click “OK” to start the program
- 5.) Power on the device.

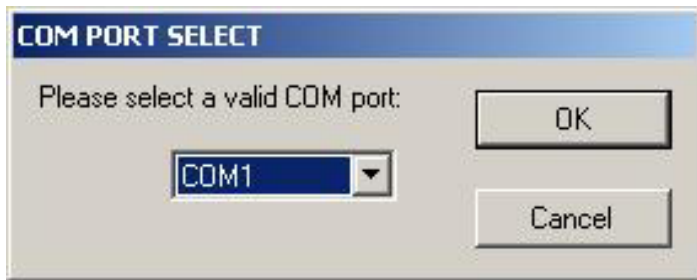
Note that, if the connection fails, please check the cable connection is secured correctly.

Note: Turnover SIM card lid angle as following drawing.



### A. LOGIN dialog window

Connect UNIT DB9 port to the PC serial port with a standard serial cable. Select the COM port, and click “OK”.



Note that: it is necessary to power on the device soon after starting the PC setup program.

PC setup program will detect the hardware for 60 seconds. If no hardware is detected, it will exit.

During the opening up screen shown as below, user can press “Esc” key to terminate the program.

## B. Version No. Checking

The below interface will last until correct UNIT Version No. is checked. (You should run this program before turn on power of UNIT)

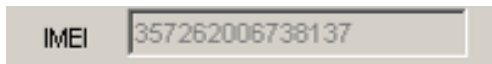


## C. MAIN INTERFACE

### 1. [User detail]:

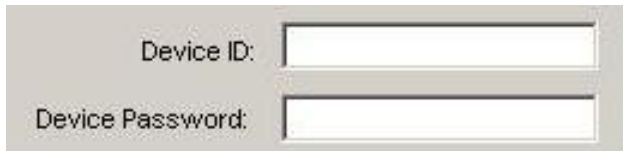
SIM PIN:

If the SIM card is password protected, user can input the “SIM PIN” window to set password of SIM Card.



IMEI: 357262006738137

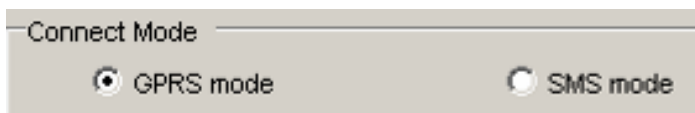
IMEI: Any operate with ‘request or request all’ after GPRS power on, the module series number will display automatically, otherwise it displayed with space.



Device ID:   
Device Password:

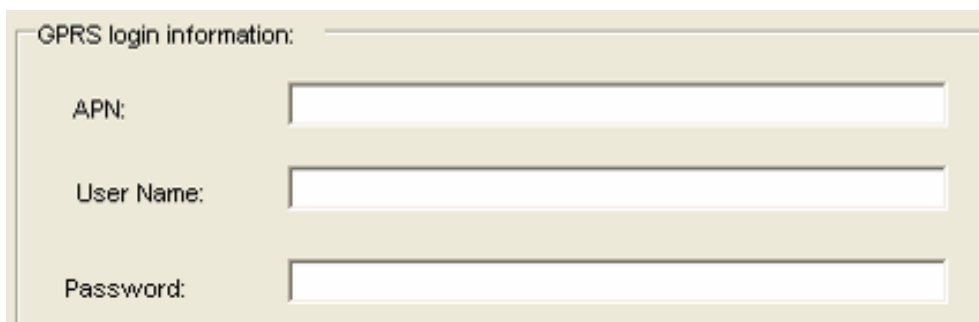
Set UNIT ID and UNIT password of for the device.

Set Access Point Name (APN), User Name, Password. The maximum length of the APN, User name and Password is 49 characters.



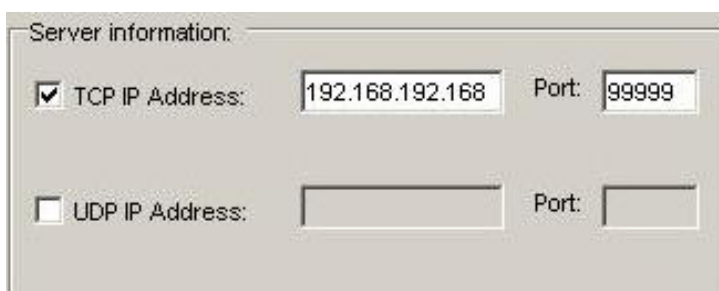
Connect Mode  
 GPRS mode  SMS mode

To select communication with GPRS or SMS, when select SMS communication; the GPRS login information and server information are reverse video.



GPRS login information:  
APN:   
User Name:   
Password:

Set Access Point Name (APN), User Name, Password. The maximum length of the APN, User name and Password is 49 characters.



Server information:  
 TCP IP Address:  Port:   
 UDP IP Address:  Port:

TCP/UDP address and Port number of alarm center being set, UNIT will send message to these address.

Note that either TCP or UDP should be selected.

Note: the IP address and port must input correctly, otherwise it will cause fail to make a call.

Set the primary SMS Number of the server. The unit will send reports to the server if GPRS connection is failed.

Setup the max number of the SMS can be sent out from the unit every month. By default, it will be renewed by the first date of every month.

UNIT can save 900 reports (900-1). Click 'Export' button can export them with Excel or Text format.

“Initialize” button: clear all data in UNIT.

Request All: read out the whole existing setting from CTS-100.

Request: read out the setting in the current page.

Apply: transfer the setting to CTS-100 in the current pages.

Apply All: transfer the whole setting to CTS-100.

Load: load the saved configuration files.

Save: save the current configuration setting to a file.

Add to database: Add the current configuration to database

“Exit” button: exit PC-Setup to main program.

## 2. [Geo-fence]:

The screenshot shows the 'Geofence' configuration window in the CTS100 application. The window has a title bar with 'CTS100' and standard window controls. Below the title bar is a menu bar with 'User Detail', 'Geofence', 'Report', and 'Alarm'. The main area contains a 'Circular Type' section with the following fields:

- Origin Format: Example : N2446.5321E12120.4231
- Radius: Km (dropdown menu)
- Table with 4 rows for defining circular geofences:

No.	Origin	Radius
<input type="checkbox"/> 1.	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> 2.	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> 3.	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> 4.	<input type="text"/>	<input type="text"/>

At the bottom of the window is a toolbar with the following buttons: Initialize, Request All, Request, Apply, Apply All, Load..., Save..., Add to Database, and Exit.

Setup the circular Geo-fence parameters in this window. The format will be center of the Geo-fence and the related radius.

### 3. [Report]:

Report setup can be configured in this section. To activate the function(s), please select “√” in checkbox and fill in data in the textbox. There are 2 modes for the CTS-100, first is the Normal mode, and second is the Power saving mode. In normal mode, the GPS will be always activated if CTS-100 is in moving state. However, if in Power saving mode, CTS-100 will turn off the GPS power if there is no report to send.

Note: that user can configure the wakeup report if the device is in “stop” (not moving) state.

#### **Normal mode, report will be summarized as:**

(1) Fixed time report

Parameters: On/Off, and time.

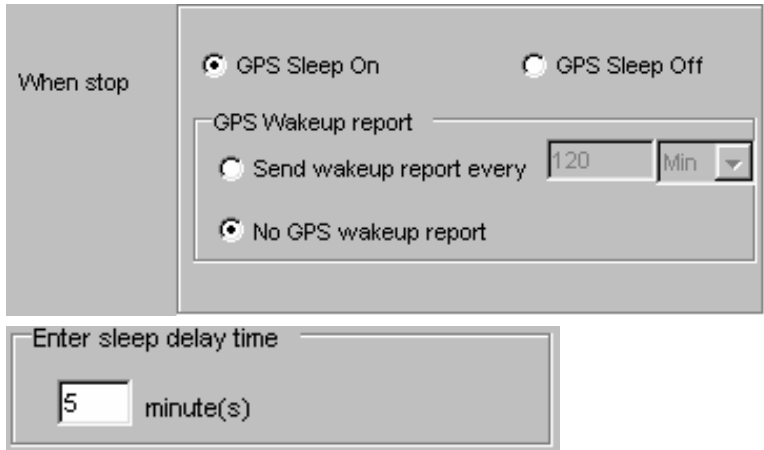
(2) Fixed distance report

Parameters: On/Off, and distance. (min. distance is 0.1 km, max. distance is 100 km).

(3) Speding report: (min. speed is 0.1 km/Hr, max. speed is 1000 km/Hr).

Parameters: on/off, and speed

#### (4) GPS wakeup report:



When stop

GPS Sleep On       GPS Sleep Off

GPS Wakeup report

Send wakeup report every 120 Min

No GPS wakeup report

Enter sleep delay time

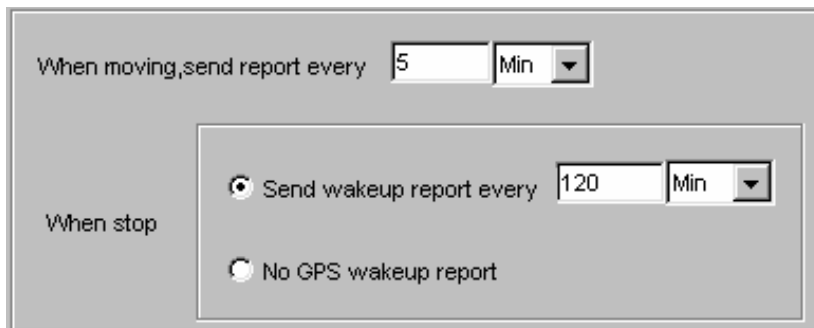
5 minute(s)

While the device is in stop status, user can let the GPS go to sleep mode for power saving. If select GPS sleep ON, user can setup the wakeup report configuration/ or NO GPS wakeup report.

IF select GPS SLEEP OFF, CTS-100 will follow the report sending rule in “When Moving” section.

#### Power saving mode

While in Power saving mode, CTS-100 will cut off the GPS power if there is no report to send.



When moving, send report every 5 Min

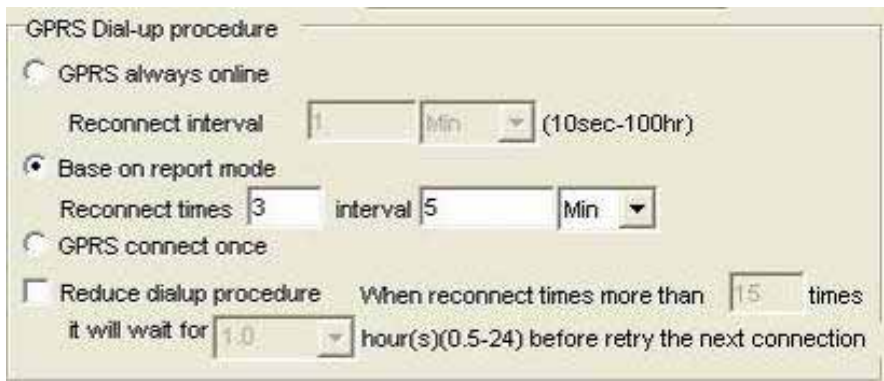
When stop

Send wakeup report every 120 Min

No GPS wakeup report

Report configuration will be listed as: the fixed time report while moving, and wakeup report / or no GPS wakeup report while stop. In this mode, in order to save power unit will cut power of GPS, only wake up GPS at the time of send report.

#### GPRS dial-up procedure



GPRS Dial-up procedure

GPRS always online

Reconnect interval 1 Min (10sec-100hr)

Base on report mode

Reconnect times 3 interval 5 Min

GPRS connect once

Reduce dialup procedure When reconnect times more than 15 times it will wait for 1.0 hour(s)(0.5-24) before retry the next connection

##### 1) GPRS always one-line

Parameters: Reconnect interval

While using this mode, when the unit can not searched GPRS signal, system will reconnect GPRS interval a preset value. (e.g.: 1minute)

## 2) Base on report mode

Parameters: Max. reconnect times, reconnect interval

While using this mode, the unit will connect to the server when there is a report to send. If the first connection is failed, it will retry to connect to the server up to the max. reconnect times. Each retry will be separated by the reconnect “interval”.

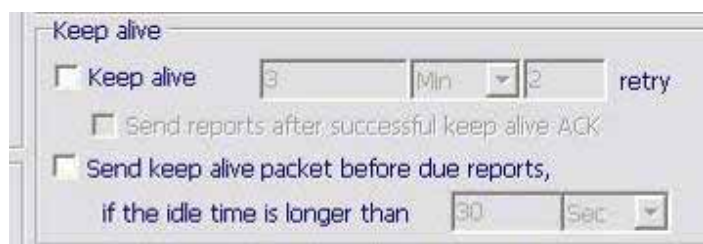
## 3) GPRS connect once

While using this mode, the unit will connect to the server when there is a report to send (but only try once). If it is not successful, the report will be stored and sent out in the next successful connection. Disconnect GPRS connection when report sending is completed.

## 4) Reduce GPRS dialup method

Parameters: On/Off, Max. reconnect times, connect delay

If this method is used, the unit will reduce the GPRS dial-up connection when the dial-up is failed after number of times. User can define the delay time for the unit before try to reconnect to the server. If there is trigger report, the unit will connect to server immediately.



### Keep alive procedure

Parameters: On/Off, and interval / retry times. In order to keep connection in GPRS network, the unit can be set to send short keep alive report to the server in order to prevent the disconnection from the mobile service provider.

Send reports after a successful keep alive ACK. Parameters: On/Off .

If you select this function, all the reports will only be sent out after a successful keep alive ACK. (So if your keep alive time is shorter then select this function will be OK.) This function is very useful while using UDP to prevent report lost.

Send a keep alive packet right before a due reports if no data stream within certain time: Parameters: On/Off, and idle time.

Some GSM provider might cut connection, if there is no data within certain time. It might result report lost in this “fake connection” duration. For example, you can set parameters in this region, ex 20 mins. (it means if the unit did not send any data in this 20 mins (including keep alive or normal reports) ), then it will send a keep alive packet to check if the GPRS connection is valid or not. If not, it will actively reconnect to GPRS network.

### Special command for SMS mode:

If the CTS-100 is not in the GPRS online status, user can send command &&Y02 or &&Y04 to ask unit to connect to server. This command can be sent from any device via SMS;

&&Y02:

When received this command, system will actively try to connect to server in next 600 seconds.



&&Y04,[connection time],[report interval]:

For example: &&Y04,3600,60

When received this command, system will connect to server in the next 3600 seconds, and send one report out every 60 seconds.

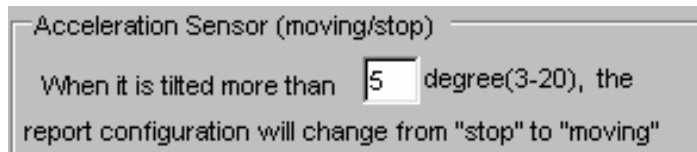
### Low battery report:

Low battery warning report (to alert user when the external battery level is low)

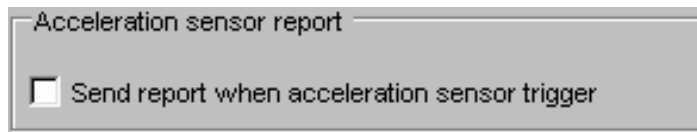
Parameters: On/Off, and warning battery level for report. For example, 30 to represent 30% lower level report.

The system will ignore the parameter with a value '0' to prevent continuous non-stop reporting. Low battery, unit will cut power of GPS, only call function will be activated.

### Acceleration sensor:

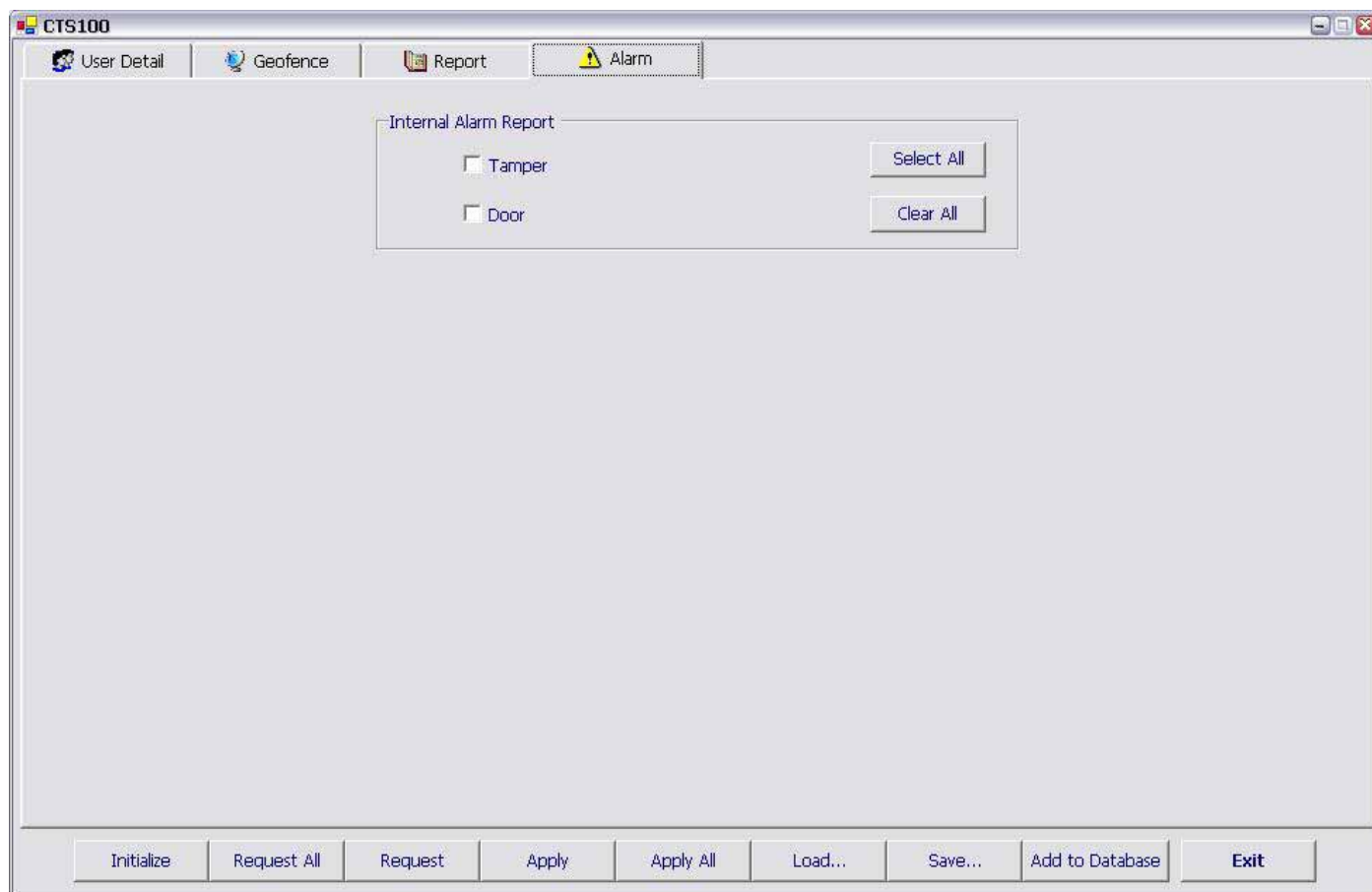


To determine whether CTS-100 is moving or not, user can select the sensitivity of the “acceleration sensor”. It is distinguished by the tilt angle of the device. If the unit tilted more than the degree set here, CTS-100 will be in moving mode. Otherwise, it will be in stop mode. The smaller the parameter of degree for the sensor set in pc-setup is, the higher the sensitivity is. Otherwise, the result is the opposite.



You can select the Acceleration sensor trigger report to be sent or not, while the unit is moved. “Select” (by click), the related reports will be sent. Otherwise the report will be ignored, when the device is moved.

#### 4. [Trigger report setup]



The unit has built-in door magnetic sensor and tamper switch, user can select if send report when the door sensor and tamper switch has triggered.

1. door sensor :It will send out event reports when door on or off.

2. Tamper switch: the tamper switch is used to check the box of host, when the box of host is moved over, it will send out a relevant report.

#### CTS-100 SPECIFICATIONS

##### **Physical Parameters**

Enclosure dimensions (mm)	96(L)*50(W)*42(H)
Unit Weight	About 400g

##### **Electrical**

Operating current	52mA
Voltage (Recharge)	5V - 16V
Current (Recharge)	770mA
Current (sleep)	0.5-11.6mA

##### **Battery**

	Battery type	Battery capacity	Charge type
Battery	Lithium 3.7V	3600mAh	Built-in charge circuit

**GPS\***

Channels	20 parallel tracking
Frequency	L1-1575 MHz
Sensitivity	
Tracking	-159 dBm
Acquisition (Cold start)	-142 dBm
Position accuracy (Horizontal)	< 2.5m CEP autonomous
	< 2.0m CEP SBAX
Time to first fix	
Hot start 1	< 1s
Warm start 2	< 32s
Cold 3	< 35s
Standard GPS software	
NMEA message switchable	GGA, GSA GSV, VTG, RMC, GLL

**GPRS\***

Frequency Range (MHz) (Be used in CTS-100MT/ CTS-100FT/CTS-100ST)	850/900/1800/1900
Frequency Range (MHz) GPRS* (Be used in CTS-100XT)	900&1800&1900 or 850&1800&1900
GPRS connectivity (Be used in CTS-100MT/ CTS-100FT/CTS-100XT/CTS-100ST)	GPRS multi-slot class 10 GPRS mobile station class B
SIM card interface (Be used in CTS-100ST)	1.8V/3.0V
SIM card interface (Be used in CTS-100MT/ CTS-100FT/CTS-100XT)	3V
Antenna Impedance (Be used in CTS-100MT/ CTS-100FT/CTS-100XT/CTS-100ST)	50ohms

**IO Connection**

POWER SWITCH

**Communication**

	GPRS \SMS\RS232\USB
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**Environmental**

Operating Temperature	-20°C to +55°C
Storage Temperature	-40°C to +85°C

**Accessories**

1. Internal battery
2. Magnetic sensor
3. PC setup cable

15.21

Federal Communications Commission (FCC) Statement

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

15.105(b)

Federal Communications Commission (FCC) Statement

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.

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.

FCC RF Radiation Exposure Statement:

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