



PORTMAN

OPERATION & INSTALLATION MANUAL

GPS GPRS TRACKING AND ALARM SYSTEM TLU100N

I. BRIEF INTRODUCTION

TLU100N System utilizes the GPRS, GPS and car alarm functions in one unit. The unit continuously gets its precise position and speed information from GPS system. It automatically manages and monitors all of its peripheral equipment and their status all the time. It will send timely message to user if any predefined trigger occurs through GPRS network system. With the unit user can track and control their target all the way easily and remotely.

- TCP/UDP optional Internet connections for monitor center server.
- SMS backup communication approach for more security design.
- Internet based scheduled report and periodic status reports programmable
- Concision PC setup or OVER the air to request and adjust parameter setting.
- All optional event report for money saving design.
- TLU100N ID and User ID double check design for safe manipulation.
- Up to 900 complete real time records capacity of flash memory for history review.
- 10 programmable geofence circles and 20 programmable geofence check points.
- Duty-On/Off report and accumulated distance, speed, duration statistic for one complete trip.
- Built-in tamper switch as trigger input for box open inform
- Built-in TL sensor for wake up in power-saving mode
- Humanism designed mini wireless Keypad with brief and easy operation command
- Up to 4 wireless magnetic door sensor input trigger.
- Optional wireless wide range temperature sensor
- Built-in solar panel with charging circuitry.
- Large built-in 14AH 12V Lead Acid capability battery to perform 4 weeks standalone operation
- Automatic power in from truck power, internal battery pack, or solar cells.
- Aggressive Power saving mode with sleep mode and automatic wakeup function.
- Designed to be aerodynamic to reduce drag on a trailer while in motion.
- Designed for location on top of the trailer; in the front, center or rear of the trailer unit.
- All devices are waterproof and extra strong structure design

II. Report INTRODUCTION

1. Report message format:

A report example form TLU100N to monitor center should be like this:

%%8888,A, 050929003153,N2240.6927E11359.3980,60,185,C+28,C3800000,253,CFG:1234,0Km/h,0Km/h,0Km,0Min,0Min|

The standard report sent by the unit includes the following information:

- 1) Device ID: 4 to 8 decimal digitals that has been set in User detail of PC-Setup
- 2) GPS valid flag: 'A' mean it is a update valid GPS data; 'L' indicate a last known GPS data
- 3) Date & Time: The current date and UTC time with the format yy/mm/dd/hh/mm/ss, e.g.: 050926003153
- 4) GPS's latitude and longitude: e.g.: N2240.6927E11359.3980
- 5) Speed: The current speed of the unit
- 6) Direction:0-360 degree of moving direction,0 is north and 180 is south etc.
- 7) Temperature: The environment temperature of TLU100N
- 8) Device's status word: 32 bits (8 ASCII hex characters) status flag, every express a system status which being monitored. E.g.: C3800000
- 9) Event code: Event number indicates a predefined trigger happened. e.g.: 120

2. Supplement message of report

Some special reports have supplement message segment that begin with “CFG:”, for example:

- 1) Duty-On report: it has an additional User-ID segment.

e.g.: %%8888,A,050929003153,N2240.6927E11359.3980,0,185,C+28,C3800000,151,CFG:1234

- 2) Duty-Off report: it has the following additional message segment.

CFG: User-ID, Maximum speed, Average speed, Total trip distance, Total duration, Total over speed duration

e.g.:

%%8888,A,050929003153,N2240.6927E11359.3980,60,185,C+28,C3800000,152,CFG:1234,110Km/h,80Km/h,40Km,30min,10min

3. The reporting mode

User can choose the reporting mode and related parameters via the PC setup program or the remote sever. Almost all the reports are optional as report or not report, if user chose report then the unit will send out the related report to the destination, it would not, however, send the report out even though the trigger occurred. The reporting mode can be categorized as:

- 1) ‘Time’ report.
- 2) ‘Distance’ report.
- 3) ‘Intelligent’ report.
- 4) ‘Input trigger’ report

4. Report storage

The report data may be saved in device’s flash memory and would not be lost even if the power supply was failure. Up to 900 reports flash memory capacity for history reports recording. They can be read out from the PC setup program via serial port line. These reports may be intelligent history user select in report of PC setup those save only and would never send out to save money.

5. Report sending approach

The unit can communicate with the server via TCP, UDP or SMS protocol. Generally the unit will select TCP as its default access to Internet; basically this manner is fairly reliable and secure. User can also select UDP, which is more rapid and economic compared with TCP. When there is no GPRS service or the server is offline, the unit will send SMS report to the SMS acceptor if SMS number defined. And user can set the maximum allow sending number of short message. After reconnect to the server, all the reports will be sent out again.

III. WORKING MODE:

The unit has almost 3 working modes; they are Normal Working mode, Standby mode and Sleeping mode.

1. Data transmitting mode

During this mode, the unit is fairly busy, it will monitor all of its status to see if any of them was changed or any trigger condition met, and it will receive all input data and send out its allowed report. The power consumption is nearly 80mA.

2. Standby mode

During this mode, the unit is fairly leisurely, it connects to the sever but no data in or out, and nearly no too much matters to process, then the unit will enter standby mode. The average current is nearly 50 mA.

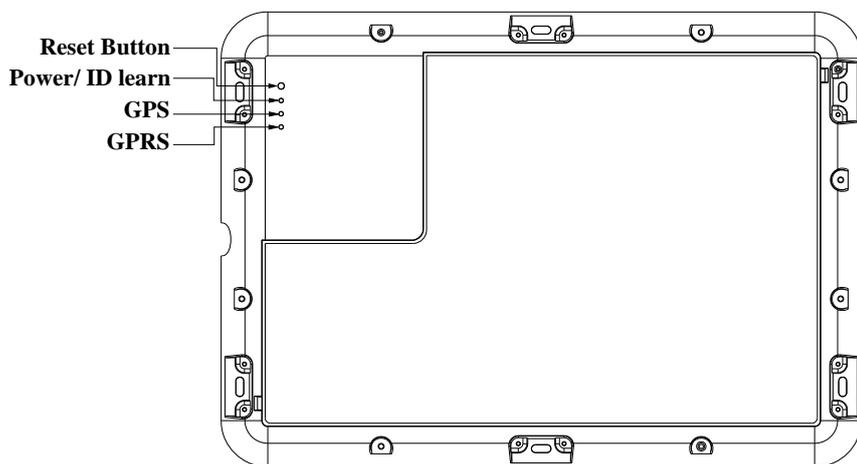
3. Sleeping mode

In order to save power, TLU100N can go to sleep mode when duty off and TL-sensor is not triggered for 5 minutes. This feature is configurable. Both “GPS” and “GPRS” or either one of them may be selected to power off. User can setup the automatically wakeup time for the sleep mode to ensure the device will wakeup to work. The system can send out a wake up report to the server after waking up. During the sleep mode, if any of the inputs are triggered, the system will wake up and send relevant reports to the server. The input triggers for waking the device up are selectable. When Duty-On, the system will back to normal working mode and stay connected to the TCP/UDP server in GPRS network.

IV. 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.
5 input	<ol style="list-style-type: none"> 1. Door TG- 2. general AD1 port 3. TG+ 4. Tamper switch 5. TL sensor
PC-setup	Initialize the unit and program the device, including Network APN, server IP address, user message, report control, and Geofence setting, etc ...
Standard Report	Automatic report for AVL tracking purpose: Fixed time report Fixed distance report Intelligent report (combine time and distance) Self-diagnostic report
Event Report	Speeding report Low battery report Power cut report Geofence report TG+ on/off AD1 trigger, e.g., ...
History data store	900 reports can be saved in unit, and read from server and pc-setup

V. PANEL INSTALLATION AND WIRING DIAGRAM



Warning! Power off the system until the Red LED completely turns off before unplug or insert the SIM card. Otherwise, it may damage your SIM card.

VI. WIRED PERIPHERAL TRIGGER

TLU100N system has 5 important peripheral trigger sources and an A/D input interface for potential usage.

1. TG+: It will send out a event report when TG+ on or off
2. Door TG-: It will send out an event report door open or close.
3. TL sensor: In sleep mode TLU100N will wake up the unit and send out an alert report.

4. Tamper switch: The tamper switch is used to check whether the box of host be opened or not, if so it will send out a relevant report.
5. Backup A/D: There is still 1 A/D input interface for potential use.

VII. WIRELESS ACCESSORIES DESCRIPTION

The TLU100N has now 3 kinds wireless equipments: wireless door sensor, wireless temperature sensor and wireless key pad.

1. Wireless Door magnetic sensor

A: The unit can support up to 4 wireless magnetic door sensors. The door sensor can monitor the door status and will send out the changed message timely. It has 5 kinds of report: Door open or Door close, Tamper switch pop and Tamper switch push, Low battery report, It will send a message to host as soon as its tamper switch or magnetic door status changed. It will also send a low battery message to host when its voltage below 2.3v.

B: The sensor ID will be sent to host every 30 seconds after power on in the first 3 minutes, user should power on the sensor device no sooner than the wireless door sensor ID learning function of TLU100N has been launched.

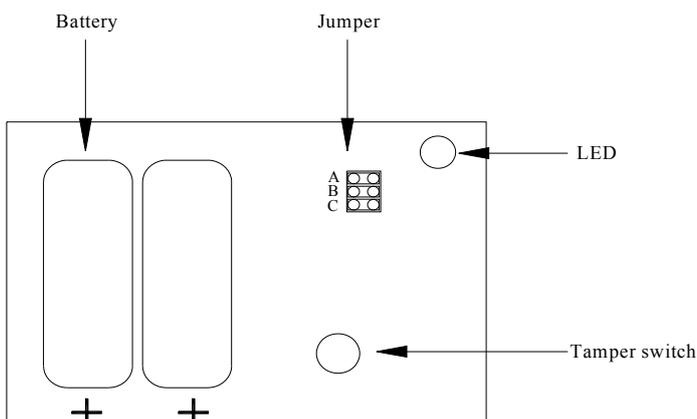
2. Wireless Temperature sensor

A: The temperature will report its environmental temperature and then send it to host. In order to save energy and fit for the actual application environment too, the temperature will be hand to host every a fixed centigrade changed. This sensor has 5 kinds of reports: Tamper switch pop and Tamper switch push, Out of temperature scope and Enter the temperature scope, Low battery report, It will send a message to host as soon as its tamper switch status changed. It will also send a low battery message to host when its voltage below 5v.

B: The sensor ID will be sent to host every 30 seconds after power on in the first 3 minutes, user should power on the sensor device no sooner than the wireless temperature sensor ID learning function of TLU100N has been launched.

C: The sensor will report its current temperature to host every fixed centigrade temperature changed, this fixed reference value can be defined by the on board 3 jumpers. The following jumper code table and the jumper graph describe how to set the fixed interval for temperature value handing in.

Jumper Code			Description
C	B	A	When will the sensor hand in its update temperature value to host ?
on	on	on	Current temperature will send to host every 8 changed
on	on	off	Current temperature will send to host every 7 changed
on	off	on	Current temperature will send to host every 6 changed
on	off	off	Current temperature will send to host every 5 changed
off	on	on	Current temperature will send to host every 4 changed
off	on	off	Current temperature will send to host every 3 changed
off	off	on	Current temperature will send to host every 2 changed
off	off	off	Current temperature will send to host every 1 changed



3. The Wireless Keypad

The Wireless Keypad was used for communication interface between user and TLU100N. It communicate with host by two-way RF, normally the keypad sends its command that user entered to host, if the command is accepted as a valid command then the host will send back a response as an ACK. The Key Pad has total 9 commands. And it has 4 main functions; they are Duty On/Off, Help Request, Self-Geofence setting and Wireless sensor ID learning. It will directly trigger 3 reports: Help, Duty-On and Duty-Off.

VIII. STATUS INDICATOR

The system has three statuses LED; the following is their corresponding description:

- 1):Red: Power indicator and Device ID learning indicator. Generally, the led will flash every 5 seconds all the time to indicate the unit’s power on. The LED will be continuously on to indicate enter into device ID learn mode when select the JP1 to ON. The Led will flash three times after one successful device ID learning.
- 2):Yellow: GPRS indicator. This LED will flash periodically and slowly when the TLU100N system has connected a server by GPRS network. The LED will blink twice when it has received the signal of the GSM base station but has not connected a target server. Or else the LED keep extinct to indicate GPRS function be sleep mode or failure.
- 3):Green: GPS indicator. This LED will flash periodically when the unit received a valid GPS data. Or else the LED keep extinct to indicate GPS is in sleep mode or invalid data.

The following table is the brief function list that tells how to use the mini keypad:

TLU100N Key-Pad & Main-Board Communication Command Table			
NO.	Function Name	Key code	Description
1	Help	*1*#	User press *1*# to ask for help.
2	Self-Geofence-on	*2*#	User press *2*# enable self-geofence, The * LED flash 3 times in one second when self-geofence status was set to “ON” successfully.
3	Self-Geofence-off	*3*#	User press *3*# disable self-geofence function. The * LED will stop flashing when self-geofence status was set to “Off” successfully.
4	Duty-on	*TLU100N-ID* USER-ID*#	User input TLU100N&USER ID for identify confirming. Both TLU100N-ID and USER-ID should be 4 to 8 decimal digitals characters. The * LED will be continuously “ON”.
5	Duty-off	*#	User press *# to declare duty-off, * LED will be continuously OFF.
6	Door-sensor-study	*88*#	User input *88*# to inform main-board enter Door Code studying state.
7	Temperature-sensor-study	*99*#	User input *99*# to inform main-board enter Temperature Code studying state.
8	Door-sensor-study end	*80*#	User input *80*# to inform main-board end Door Code studying state.
9	Temperature-sensor-study end	*90*#	User input *90*# to inform main-board end current Temperature Code studying state.

Attention:

1. The TLU100N-ID should be set by user in PC-SETUP;
2. Any other commands can only be accepted after the successful duty-on.
3. Re-input duty-on is needed for another request after a duty-off command successfully launched.
4. The # LED will flash quickly after it send out a command to indicate ack receiving state. The LED flashing will not stop until it received an ack from keypad or 1 second overtime.
5. Host will send back an ack for all valid command from keypad and the keypad will beep if it received the ack.

IX. PC SETUP AND SYSTEM INITIATION

1. Brief PC SETUP Description

The UNIT must be initialized by PORTMAN 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 , 4 SMS number....)
- 2) Geofence (9 circular Geofence and 1 Self Geofence, 20 point Geofence....)
- 3) Report (Time, Distance, Intelligent mode, Low battery, Course change...)
- 4) Alarm/Sleep Setup (to enable or disable the event generated by the inputs, e.g....and set the conditions for sleep mode.)

2. PC setup Procedure:

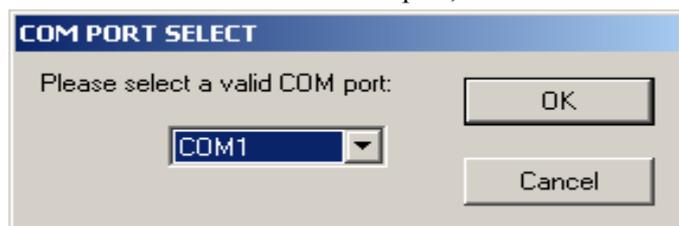
- Step 1: Connect the standard RS232 cable to the DB9 port.
- Step 2: Open the PC setup program.
- Step 3: Select the correct COM port for communication.
- Step 4: Click “ok” to Start the program
- Step 5: Power on the device and press the reset button for at least 3 second.

Note that, if the connection fails, please check the cable connection is secured correctly. Press the reset button for a longer time, e.g. another 5 seconds.

3. Detail operation decryptions:

A. LOGIN dialog window

Connect TLU100N and PC with a standard DB9 serial cable, the other terminal plug into the 3-pin connector on the main board. Select the available COM port, and then click “OK”.



Note that: it is necessary to power on and reset the PORTMAN device soon after “OK” button clicked. 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 TLU100N Version No. is checked. (You should run this program before turn on power of TLU100N)



C. MAIN INTERFACE

The following is the brief Button Description for main interface:

- (1) Initialize: clear all saved parameters in TLU100N.
- (2) Request All: request all parameters that is saved previously in TLU100N
- (3) Request: request parameters in the current page
- (4) Apply: set the parameters in the current page
- (5) Apply All: save all the parameters into TLU100N
- (6) Load: load the saved configuration file (*.ptm)
- (7) Save: save the parameters into a files (*.ptm).
- (8) Exit: exit the PC-Setup program; the system will exit the PC setup mode and enter the working mode.

1. [User detail]:

The screenshot shows the 'PORTMAN TLU' software window with the 'User Detail' tab selected. The interface is organized into several sections:

- Firmware Version:** TLU100N_TLU200C_PTM_5.0.9_V1.27
- Device ID:** 12345678 (with a note: "(must between 4 and 8 decimal digitals)")
- GPRS login information:** Fields for APN, User Name, and Password.
- Server information:** Checkboxes for TCP IP Address and UDP IP Address, each with an associated Port field.
- SMS:** Fields for Primary SMS number, Max SMS number (set to 100), and Renew date(1-28) (set to 1).
- Export History Record:** Radio buttons for 'To Text' and 'To Excel' (selected), and an 'Export' button.

At the bottom, a toolbar contains buttons for: Initialize, Request All, Request, Apply, Apply All, Load..., Save..., and Exit.

(1) Set Device ID for TLU100N. The TLU100N ID should be 4 to 8 decimal digitals characters. And the device ID must be unique in order to be identified by the server.

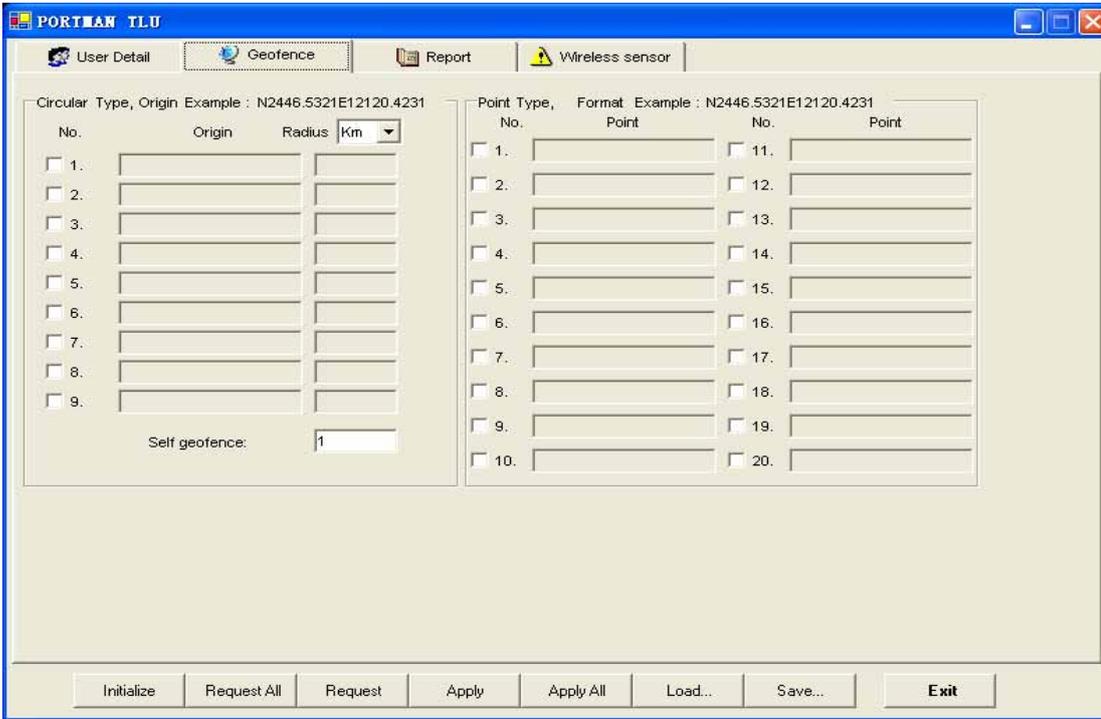
(2) Set Access Point Name (APN), User Name (GPRS), Password (GPRS). Note that: The maximum length of the APN, User name and Password is 49 characters. Some service provider does not require USER name or PASSWORD, hence, user can leave blank in this section.

(3) "TCP/UDP" address and Port number of alarm center being set, TLU100N will send message to the IP address. Note that: Only one TCP or UDP server will be used at a time.

(4) SMS communication number setting: The primary SMS number is the default number, e.g.: when a important event can not send to user by internet then the report will send to user by this default number. The max SMS number is a limit for allowed out SMS. And the renew date is be used as a judge when shall the unit clear all SMS stored in it.

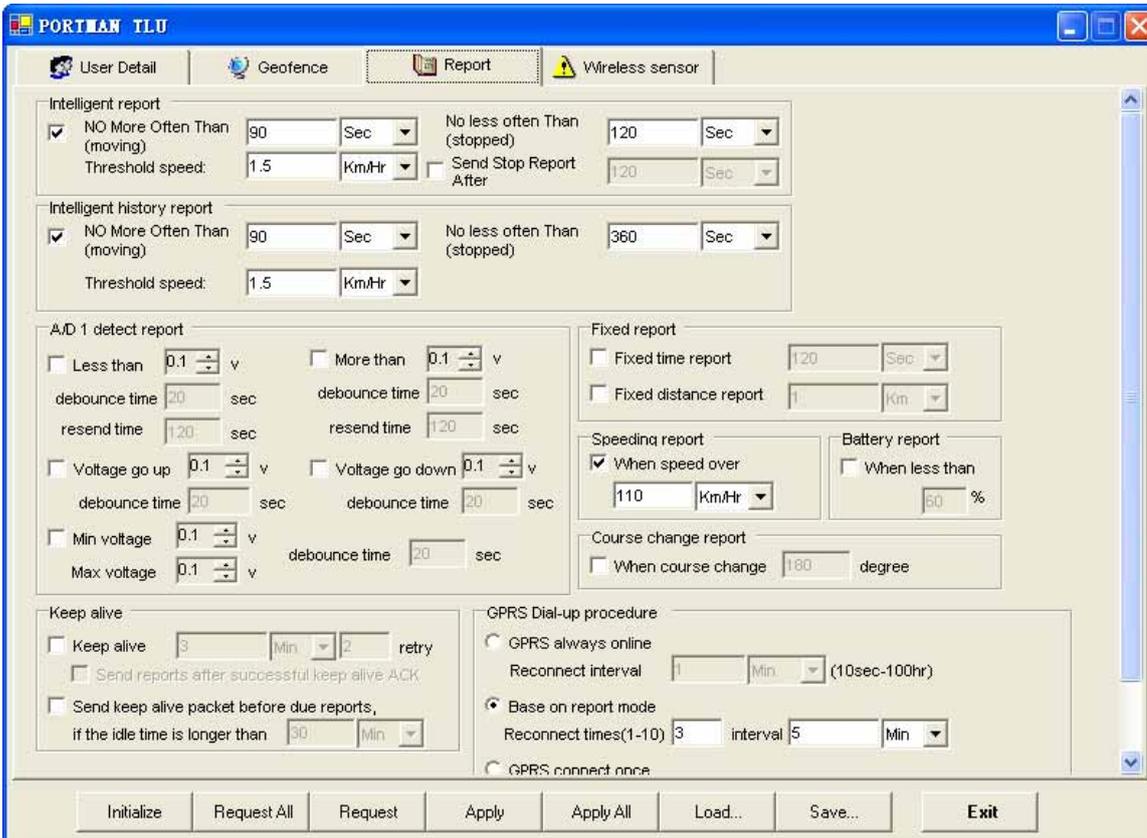
(5) TLU100N can save 900 reports (899-0) recently; Click 'Export' button can export them into Excel or Notepad.

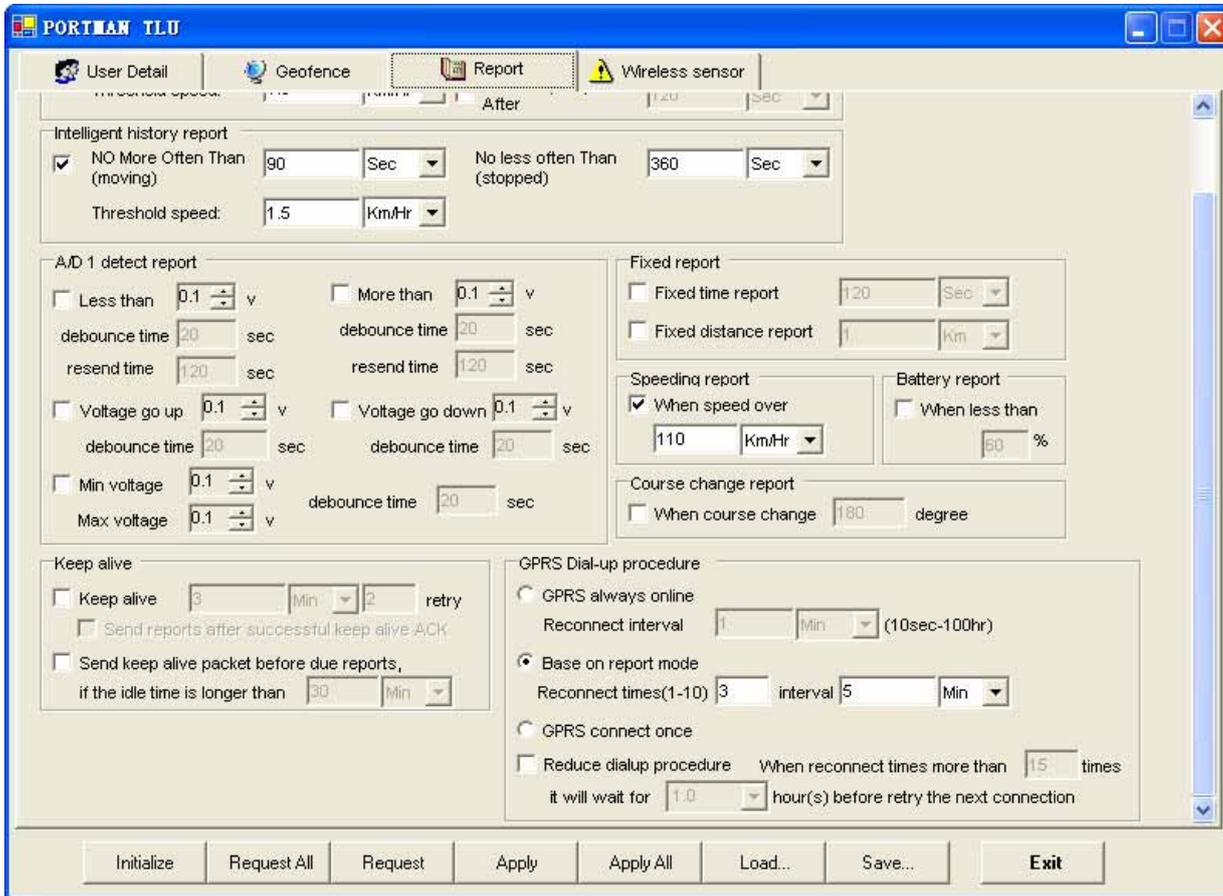
2.[Geofence]:



- 1) Circle Geofence setting: Set circular Geofence parameters in left window. The data should be coordinate center of the Geofence and the related radius.
- 2) Point Geofence setting: Set point Geofence in right part of the window, only GPS coordinate point data is needed.
- 3) Self-Geofence setting: Self-Geofence is a fresh idea for vehicle guard. User need only input a circle radius in this field. After this the unit will record that GPS position at the time the self-Geofence function be activated, from then on the unit will continuously check it new position and judge whether it is beyond the defined circle, if yes then send out an alert to user. This function is useful for an uncertain Geofence. The self-Geofence can be activated/deactivated by keypad *2*# or *3*# command after Duty-On command is entered.

3. [Report]:





In normal working mode (DUTY ON), the system will use the configurations as defined in this section. To activate the automatic report, please select “√” in checkbox and fill in data in the textbox.

The reports will be summarized as

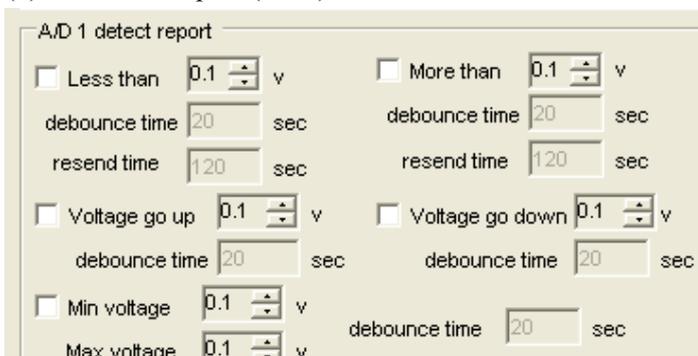
(1) Intelligent report

Parameters: On/Off, Report time when moving, Report time when stop, and threshold speed. Report when speed less than a preset value (refer the following 1.5 Km/Hr), and it will send stop report after a preset time (refer the following 120Sec). (min. speed is 0.1 km/Hr, max. speed is 1000 km/Hr).

(2) Intelligent history report (record the report in the system’s flash ram)

Parameters: On/Off, Report time when moving, Report time when stop, and Moving distance. (min. distance is 0.1 km, max. distance is 1000 km).Note that: these report will not be sent out but only be saved in flash memory.

(3) AD detect report (AD1)



[on/off] SEND REPORT IF ADC1 LESS THAN [min voltage] V for [debounce time] SEC, RESEND PER [resend time] SEC

[on/off] SEND REPORT IF ADC1 MORE THAN [max voltage] V for [debounce time] SEC, RESEND PER [resend time] SEC

[on/off] SEND REPORT IF ADC1 GO UP [up voltage] V for [debounce time] SEC

[on/off] SEND REPORT IF ADC1 GO DOWN [down voltage] V for [debounce time] SEC

[on/off] SEND REPORT IF ADC1 ENTER/EXIT [min voltage] V TO [max voltage] V for [debounce time] SEC

Note: AD1 input voltage range is 0~3.3v, it must connect a resistance to share the voltage if the detected voltage higher than 3.3v,.

(4) Speeding report

The UNIT will automatically check the current speed information; it will send a report to the server when it is over the defined maximum speed.

(5) Low battery warning report (to alert user when the backup 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.

(7) Course change report

Parameters: On/Off, and course change in degree.

(8) 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.

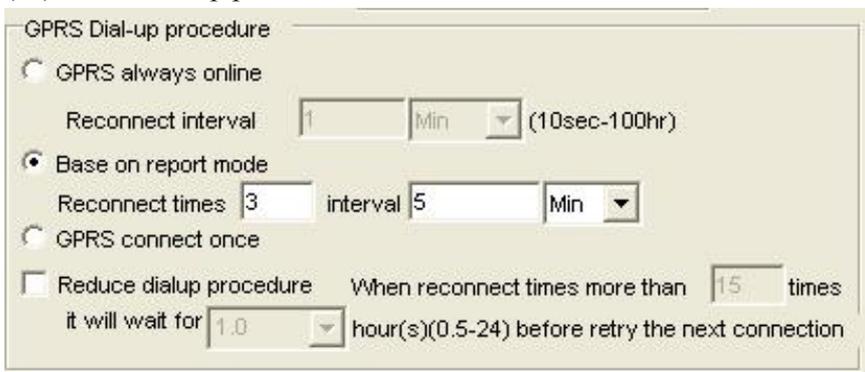
(9) Fixed time report

Parameters: On/Off, and time. The unit will send out a report every fixed duration.

(10) Fixed distance report

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

(11) GPRS dial-up procedure



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.

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.

Special command for SMS mode:

If the TLU100N 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]:

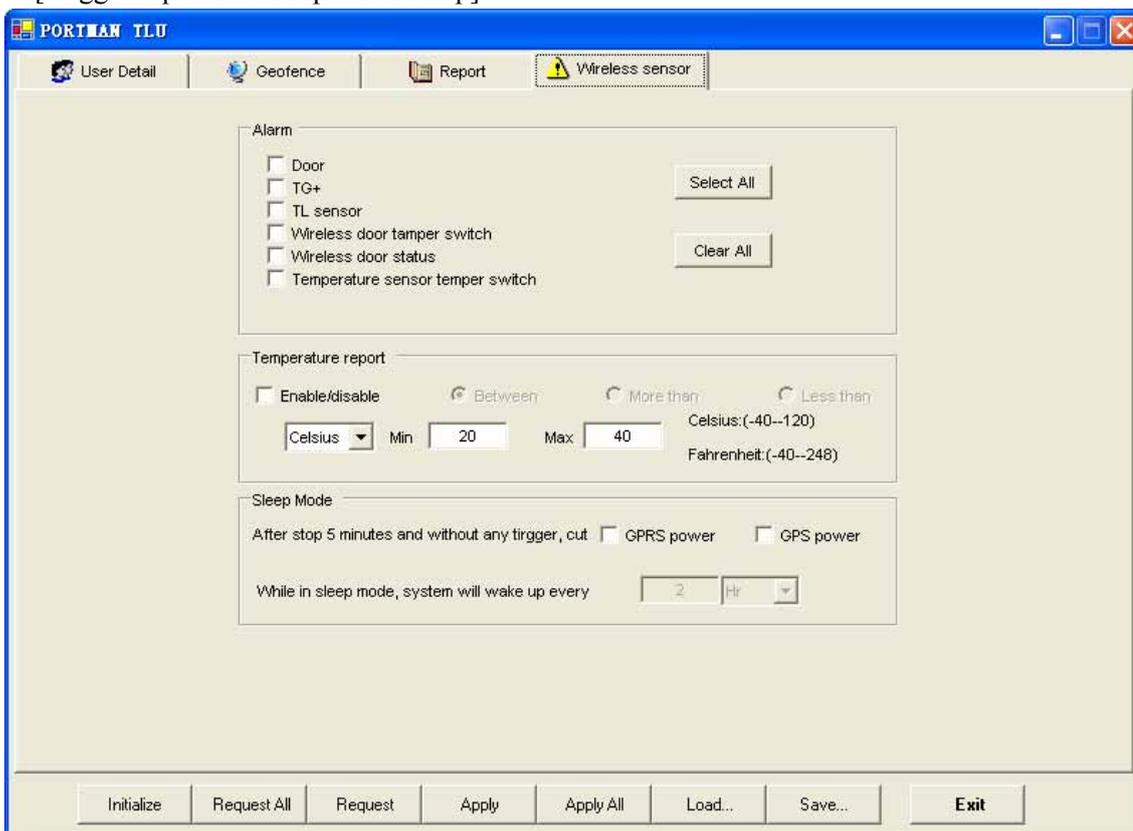
For example: &&Y04,3600,60

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

(6) Self-diagnostic report (for a contain period of time, the UNIT can send a report to the server in order to check the functionality)

Parameters: On/Off, and time.

4. [Trigger report and sleep mode setup]



1) Input trigger report

All input trigger reports are also configurable. User can customize the events generated by the in-vehicle input to be sent to the server. To enable the particular trigger reports by click the box.

2) Sleep mode (when Duty-Off)

(1) TLU100N can go to sleep mode when duty off and TL-sensor is not triggered for 5 minutes. In sleep mode, GPS & GPRS will be disabled.

(2) During the sleep mode, the system can wake up automatically to check if anything need to be processed and will send a wake up diagnostic report.

(3) During the sleep mode, if any of the inputs are triggered, the system will wake up automatic report and then send reports to the server.

X. WIRELESS SENSOR ID LEARNING:

In order to match a wireless sensor to host, the TLU100N host must memorize its related wireless sensor's ID by this both of the device created a valid communication measure, which is called ID learning. In TLU100N system there are two sensor need code learning before putting to use, they are wireless door sensor and wireless temperature sensor. Both of the two devices will send their ID to host every 30 seconds at the beginning 3 minutes after powered on. If the host's sensor ID learning function was enabled then host will get a new sensor ID and save it to its nonvolatile memory. There are two ways by which user can enable TLU100N host's wireless sensor ID code learning function.

1. On board jumper code learning

- Put the on board 'JP1' jumper to "ON" to let host enter wireless sensor ID accepting state. The ID learning indication LED of host will light on.
- Power on the wireless accessory soon, the sensor will send out its ID into air and at the same time the LED of the sensor will flash.
- The ID learning indication LED of host will flash 3 times for every successful sensor ID learning.
- Power on next device that need to be learned until all of them are finished.
- Put back the on board 'JP1' jumper to "OFF" as soon as all sensor be learned successfully, the host will exit the code learning state.

Note that:

- 1) Both temperature and door sensor can achieve ID learning by this same way.
- 2) Nothing will be changed if no any sensor ever sent ID learning request to the host during ID learn valid period.
- 3) All previous ID will be cleared as soon as a same kind sensor ID learning request arrived first time, the new ID will then be saved.
- 4) Do not forget to put back 'JP1' to "OFF" state after code learning over, or else new ID learning request may destroy the original ID.

2. Keypad command code learning

Wireless temperature and door sensor have different keypad commands for ID learning, e.g.: *88*# for door sensor and *99*# for temperature sensor.

A: wireless temperature sensor ID learning

- Input "*99*#" to enable temperature sensor ID learning.
- Power on the wireless accessory soon, the sensor will send out its ID into air and at the same time the LED of the sensor will flash.
- The buzzer on keypad will beep for successful sensor ID learning.
- Input "*90*#" to disable temperature sensor ID learning, the buzzer will beep to indicate a successful operation.

Note that:

- 1) Nothing will be changed if no any sensor ever sent ID learning request to the host during ID learn valid period.
- 2) Every successful “*99*#” command will be valid for only 3 minutes, so user should power on the ID learn need sensor before the state turn into invalid. It will delay 3 minutes for another device ID learning after one time of successful code learning.
- 3) Up to 1 wireless temperature sensors can be matched with one host in one time ID learning process

B: wireless door sensor ID learning

- Input “*88*#” to enable door sensor ID learning.
- Power on the wireless accessory soon, the sensor will send out its ID into air and at the same time its LED will flash.
- The buzzer of keypad will beep for every successful sensor ID learning.
- Power next device on that need to be learned till all of them are finished.
- Input “*80*#” to end door sensor ID learning, the buzzer will beep to indicate a successful operation.

Note that:

- 1) Nothing will be changed if no any sensor ever sent ID learning request to the host during ID learn valid period.
- 2) Every successful “*88*#” command will be valid for only 3 minutes, so user should power on the ID learn need sensor before the state turn into invalid. It will delay 3 minutes for another device ID learning after one time of successful code learning.
- 3) All previous ID will be cleared as soon as a same kind sensor ID learning request arrived first time, the new ID will then be saved.
- 4) Up to 4 wireless door sensors can be matched with one host in one time ID learning process

XI. INTERNAL BATTERY PROTECT MECHANISM:

1. To protect internal battery, we added a mechanism to TLU100N, when the internal battery voltage drop to 10.8v, TLU100N will keep to detect battery voltage for 2 minutes, if the battery voltage keep 10.8v continuously during this 2minutes period. TLU100N will send a “battery shut down event” to server to notice user. After this event is send out, TLU100N only can work another 30 minutes.
2. After TLU100N goes into “battery shut down” mode, TLU100N will check the battery continuously, if the battery charges to 12v for 2 hours, it can work again.

XII. Two ways can be selected to use TLU100N

1. Normal: Connect unit’s hard wire to vehicles. All the above function can be used.
2. Simplification: No connect unit’s hard wire to vehicles. The hard wire door TG-; TG+; 1 A/D; ext. power will not be used. Notes: if you first time use TLU100N, please press the reset button once to active built-in battery work.

XIII.FREQUENTLY ASKED QUESTIONS:

1. Question: How can I set the unit’s system working circumstance?
Reply: User can configure the unit’s parameters by PC setup program or by remote server web page. Generally the former is quick and the latter is convenient. Reference PC SETUP AND SYSTEM INITIATION section for more detail guidance.
2. Question: What is tamper switch and how does it work?
Reply: The tamper switch is a special input trigger, which is designed for box open detect. A tamper switch has a physical spring; normally the spring is squeezed by box shell of equipment, however, the spring will pop on because its elastic force as soon as the box is open, the unit will detect this change and send out a trigger report.

3. Question: What are circle geofence and point geofence?

Reply: Geofence is just a position check idea. Circle Geofence uses a pre-defined radius and a GPS position center to check a target's current position and judge whether it is beyond the setting circular scope or not. It may report when a status change detected. The Point Geofence only compare its current GPS coordinate with the predefined one. It may send out a report when it is closing to the checkpoint or away from it.

4. Question: What is the difference among the three connectors on main board?

Reply: The 3 pin connector is for PC-SETUP; user may connect the unit and PC together by this interface. The 5 pins and the 6-pin connector is for firmware downloading or debug, user do not need to care them.

5. Question: TLU100N can go to sleep mode when duty off and TL-sensor is not triggered for 5 minutes, but are they independent?

Reply: The TLU100N system will enter sleep mode when all the following conditions met at the same time.

1): user has configured sleep function.

2): several minutes have elapsed since the latest trigger.

3): no connecting to external power.

4): User through wireless keypad registered TLU100N as duty-off state.

XIV. APPENDIX

Appendix 1: Event code summary

GROUP A: (BASIC event)

- 101 Over the defined maximum speed limit
- 102 Self-diagnostic report
- 103 Course changes (direction changes) bigger than defined angles.
- 104 Exit defined Circular Geofence area0
- 105 Enter defined Circular Geofence area0
- 108 Fix time report
- 109 Fix distance report
- 110 Intelligent time and distance report
- 111 low battery report
- 112 External battery is removed.
- 114 Exit defined Circular Geofence area1
- 115 Enter defined Circular Geofence area1
- 118 Wakeup report
- 119 Block is open
- 120 Block is closed
- 124 Exit defined Circular Geofence area2
- 125 Enter defined Circular Geofence area2
- 128 external power connected
- 129 after 30 minutes system will shut down to protect internal battery
- 130 Power of wireless door sensor1 is low
- 131 Power of wireless door sensor2 is low
- 132 Power of wireless door sensor3 is low
- 133 Power of wireless door sensor4 is low
- 134 Exit defined Circular Geofence area3
- 135 Enter defined Circular Geofence area3
- 139 Tamper switch of temperature sensor is close
- 140 Tamper switch of temperature sensor is open

- 141 Power of temperature sensor is low
- 144 Exit defined Circular Geofence area4 (Self Geofence)
- 145 Enter defined Circular Geofence area4 (Self Geofence)
- 150 'Help' request
- 151 User Duty on
- 152 User Duty off
- 154 Exit defined Circular Geofence area5
- 155 Enter defined Circular Geofence area5
- 156 Door Close (Wireless Door Sensor 1)
- 157 Door Open (Wireless Door Sensor 1)
- 158 Door Close (Wireless Door Sensor 2)
- 159 Door Open (Wireless Door Sensor 2)
- 160 Door Close (Wireless Door Sensor 3)
- 161 Door Open (Wireless Door Sensor 3)
- 162 Door Close (Wireless Door Sensor 4)
- 163 Door Open (Wireless Door Sensor 4)
- 164 Exit defined Circular Geofence area6
- 165 Enter defined Circular Geofence area6
- 166 Tamper Switch Close (Wireless Door Sensor 1)
- 167 Tamper Switch Open (Wireless Door Sensor 1)
- 168 Tamper Switch Close (Wireless Door Sensor 2)
- 169 Tamper Switch Open (Wireless Door Sensor 2)
- 170 Tamper Switch Close (Wireless Door Sensor 3)
- 171 Tamper Switch Open (Wireless Door Sensor 3)
- 172 Tamper Switch Close (Wireless Door Sensor 4)
- 173 Tamper Switch Open (Wireless Door Sensor 4)
- 174 Exit defined Circular Geofence area7
- 175 Enter defined Circular Geofence area7
- 184 Exit defined Circular Geofence area8
- 185 Enter defined Circular Geofence area8
- 194 Exit defined Circular Geofence area9
- 195 Enter defined Circular Geofence area9
- 230 [on/off] SEND REPORT IF ADC1 LESS THAN [min voltage] V for [debounce time] SEC, RESEND PER [resend time] SEC
- 231 [on/off] SEND REPORT IF ADC1 MORE THAN [max voltage] V for [debounce time] SEC, RESEND PER [resend time] SEC
- 232 [on/off] SEND REPORT IF ADC1 GO UP [up voltage] V for [debounce time] SEC
- 233 [on/off] SEND REPORT IF ADC1 GO DOWN [down voltage] V for [debounce time] SEC
- 234 [on/off] SEND REPORT IF ADC1 ENTER [min voltage] V TO [max voltage] V for [debounce time] SEC
- 235 [on/off] SEND REPORT IF ADC1 EXIT [min voltage] V TO [max voltage] V for [debounce time] SEC

Point Geofence report event

- 280 Enter point Geofence 0
- 281 Enter point Geofence 1
- 282 Enter point Geofence 2
- 283 Enter point Geofence 3

- 284 Enter point Geofence 4
- 285 Enter point Geofence 5
- 286 Enter point Geofence 6
- 287 Enter point Geofence 7
- 288 Enter point Geofence 8
- 289 Enter point Geofence 9
- 290 Enter point Geofence 10
- 291 Enter point Geofence 11
- 292 Enter point Geofence 12
- 293 Enter point Geofence 13
- 294 Enter point Geofence 14
- 295 Enter point Geofence 15
- 296 Enter point Geofence 16
- 297 Enter point Geofence 17
- 298 Enter point Geofence 18
- 299 Enter point Geofence 19

GROUP C In-vehicle INPUTS event

259 (in-vehicle control INPUT2/TG+)

Example: if the STATUS BIT '17' has been changed from '0' to '1', the 'EVENT 259' will be generated and sent to the server.

260 (in-vehicle control INPUT2/TG+)

Example: if the STATUS BIT '17' has been changed from '1' to '0', the 'EVENT 260' will be generated and sent to the server.

255 Out of the defined temperature scope

Example: if the temperature is 80°C and over the defined maximum temperature 40°C, the 'EVENT 255' will be generated and sent to the server.

256 The temperature within the defined temperature scope

257 TL sensor triggered

Command ACK event

402 GPRS connection request (SMS command)

403 GPRS disconnection request (GPRS command, let the UNIT go into GSM mode.

405 Store forward was cleared

406 Read the Unit's firmware version.

407 Check the UNIT Geofence status.

408 Read external battery level

Report Setup ACK event

501 Setup the time interval for the 'keep alive' procedure

502 Setup the Circular Geofence or Immediate Geofence parameters

508 Setup sleep mode parameters

531 Setup fixed time report

532 Setup Intelligent report

533 Setup Intelligent history report

534 Setup the Maximum speed limit

- 535 Setup the Self-diagnostic report
- 536 Setup the fixed distance report
- 537 Setup Course change report
- 539 Remote setup server IP and port
- 540 Setup Low Battery report

APPENDIX 2: TLU100N SPECIFICATIONS

Physical Parameters

Enclosure dimensions	L*W*H=480*344*46(mm)
Weight	7.8kg

Battery parameters

Capacity	7.5AH*2*2
Charging mode	Max 0.1C(1.4A) limited 14V voltage
Ext power supply charge full time (solar panel not work)	20 hours
Solar panel charge full time (no Ext power supply and TLU100N is sleeping all the time)	50 hours
Normal work time (no charging)	30 days

Solar panel parameters

Valid solar panel area	100000 square millimeter
Operation voltage	15V
Operation current	0.60A
Output power	11W

Electrical characteristic

Vehicle voltage range	10V-40V
Min chargeable vehicle voltage	15V
Current (Sleep)	13mA (Both GPS and GPRS are off)
Current (GPRS & GPS online)	60mA
Current (GPRS transmitting)	80mA
Current (Peak)	120mA

GPRS*

Frequency Range (MHz)	900&1800&1900 and 850&1800&1900 models
Channel spacing (Hz)	200
GPRS connectivity	GPRS multi-slot class 10 GPRS mobile station class B
SIM card interface	3V
SMS storage Capacity	40 in ME
Antenna	Built-in

GPS*

* Data provided by Trimble

Protocol	NMEA0183
Baud Rate	9600
Signal	1575MHz
Accuracy Horizontal	<6 meters (50%), <9 meters (90%)
Altitude	<11 meters (50%), <18 meters (90%)
Velocity	0.06 m/sec.
Hot Start:	<14 sec. (50%), <18 sec. (90%)

Warm Start:	<38 sec. (50%), <45 sec. (90%)
Cold Start:	<90 sec. (50%), <170 sec. (90%)
Antenna Type	Built-in

IO Connection

1* three pin connector	PC_SETUP cable
1* 5 wires	Vehicle battery, TG+ input & Door Trigger input
1*button	RESET

Communication

	GPRS \SMS\RS232
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Environmental

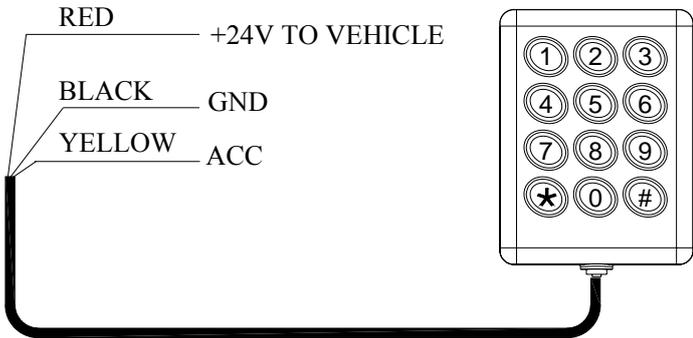
Operating Temperature	-20°C to +55°C
Storage Temperature	-40°C to +85°C

Optional Accessories

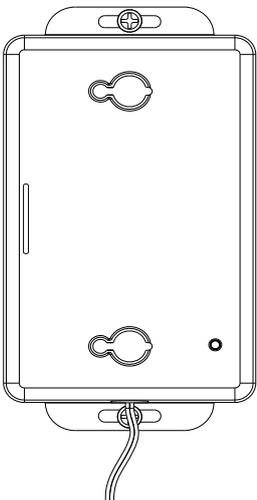
1. Built-in GPRS Antenna 900&1800&1900 and 850&1800&1900 models
2. Built-in GPS Active Antenna
3. Wireless door magnetic monitor
4. Wireless temperature sensor
5. Wireless mini keypad

Appendix 3 Wireless Accessories (Optional)

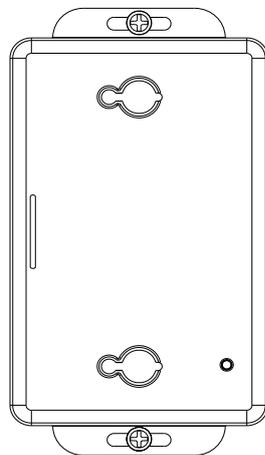
Wireless Keypad

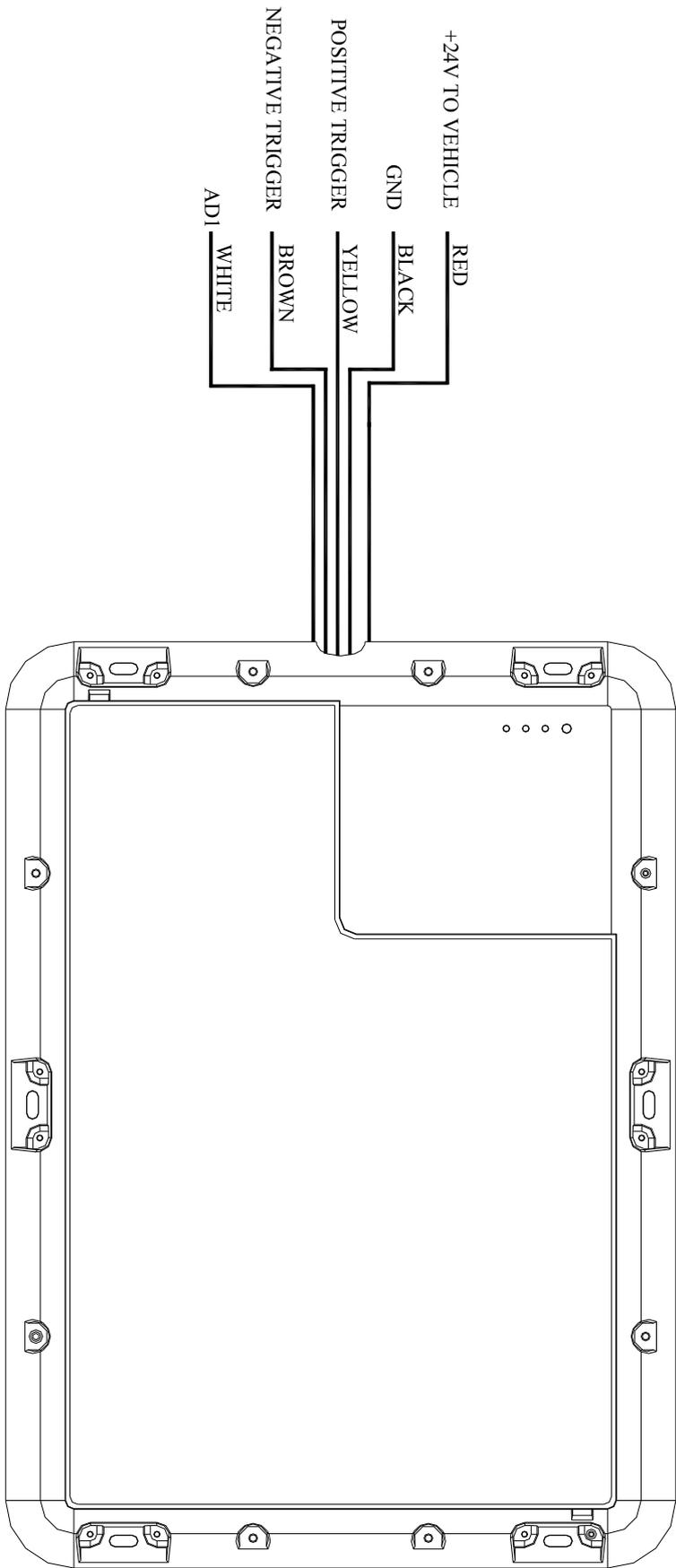


Wireless Temperature sensor



Wireless Door sensor





VI. Federal Communications Commission (FCC) Statement

1)

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.

2)

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.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

VII 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.

VIII 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.