

TR-151A / TR-151E Vehicle/Asset Tracker User Manual

Version **0.9.4**



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1. Introduction and Features

1.1 Introduction

TR-151 is a durable and water resistant GPS/GSM/GPRS tracker. Users can install TR-151 on vehicles or assets for tracking. It can send out SMS with its location (longitude and latitude) to user's cell phone by GSM network or to personal computer by internet connection of GPRS network. Then users can track the location of their vehicles or assets. TR-151 is designed to equip with high capacity of Li-ion battery for long operation time. There is one SOS button on the TR-151 for emergency help. It is very easy to install or hide TR-151 in the car to perform tracking. TR-151 is ideal application for vehicle tracking and equipment/assets monitoring.

1.2 Features

- SiRF Star III **LP** GPS chipset
- Combination of GPS ,GSM/GPRS wireless network
- Durable and water resistant GPS tracker
- Easy to install or hide in the car to perform tracking. No external wires needed.
- Ideal application for vehicle tracking and equipment/assets monitoring
- Optional external antenna for GPS reception
- Rechargeable 2100mA high capacity Li-ion battery for long operation time
- External DC power supply
- Configuration can be done via SMS commands or by application software via USB interface.SOS (emergency) button.
- Voice monitor function to monitor the sound/conversation live.
- Geofence function

NOTE: Voice Monitoring function allows user to send a SMS with voice monitoring command by a cellular phone to TR-151. TR-150 will call back to the returned number in the SMS. And then user can listen to the sound or voice around TR-151. While users listen to the sounds or voice around TR-150, people who around TR-151 won't know they are under voice monitoring. Please refer to page29 to get the detailed method of making voice monitoring.

NOTE: Geofence feature allows user to set up to 10 permissible or restricted areas whose shape is either circular or rectangular for tracking the vehicles or monitoring the equipment/assets. Users can choose to receive alarm message if TR-150 enters the restricted areas or to receive alarm message if TR-151 gets out the permissible areas. Please refer to page 26-28 to get the detailed setting method of Geofence.

2. Specifications

2.1 Hardware

GSM module:	TR-151A: Siemens GSM 850/1800/1900 TR-151E: Siemens GSM 900/1800/1900
GPS Chipset:	SiRF Star III LP chipset
Frequency:	L1, 1575.42 MHz
C/A code:	1.023 MHz chip rate
Channels:	20 channel all-in-view tracking
Horizontal Position Accuracy:	10 meters, 2D RMS
Velocity Accuracy:	0.1 m/s
Default datum:	WGS-84
Hot start:	1 sec., average
Warm start:	38 sec., average
Cold start:	42 sec., average
Altitude Limit:	18,000 meters (60,000 feet) max.
Velocity Limit:	515 meters/second (1000 knots) max.
Acceleration Limit:	Less than 4g
Jerk Limit:	20 m/sec ³
Operating temperature:	-20° to 55° C
Antenna Type:	GPS patch antenna
Dimension:	86.7*48.9*32.5 mm
Battery:	2100mA rechargeable Li-ion battery
LED indicator:	For Charging, GPS, GSM and Status.
Interface:	Mini USB port for connecting to PC
Casing:	Water resistant (IPX4)
GPS external antenna port:	MMCX port

3. Start-up

3.1 Accessories



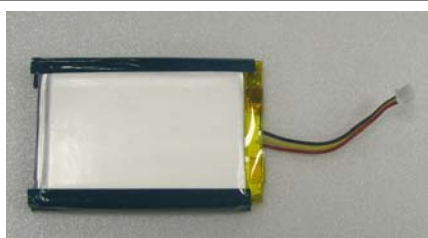
TR-151



AC charger



USB Cable



Battery



Car charger



Mounting bracket with magnet
(optional)

3.2 Install SIM card and Battery



- Use a coin or screwdriver to loosen the screw on back cover.

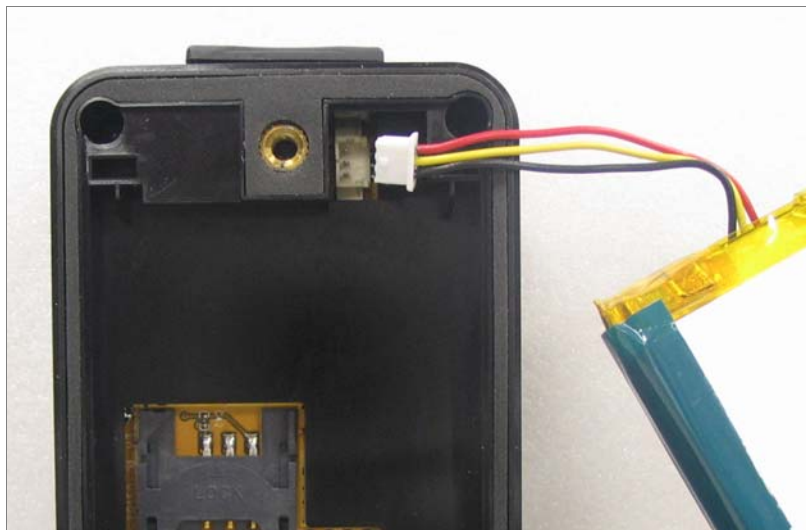


- Lift up the back cover and remove it as the direction shown.



- Push forward the cover of SIM card slot to the position marked with "OPEN". Then lift up the cover.
- Insert the SIM card with its metal contacts facing down and the cut corner at the top left.

Note: It is suggested to disable the SIM PIN protection function (asks SIM PIN entry while turn on the device) by your cellular phone before installing the SIM card in TR-150.



- Plug the battery connector into socket. Be aware that the **red wire** must be plugged on the top side.

3.3 Charging the battery

Before you can use the TR-151, you must complete the following procedures:



1. Fully charge the battery. Before using TR-151 for the first time, please charge it by connecting it with AC power adapter under the power-off condition. (The included battery is specially designed for TR-151. Please do not use other type of battery; otherwise it will damage the device. If you need to change the battery for TR-151, please contact you local dealer.) You can also charge the TR-151 by connect the USB cable to PC or Notebook. (The power of PC or of notebook should be turned on.)

3.4 TR-151 with magnetic holder



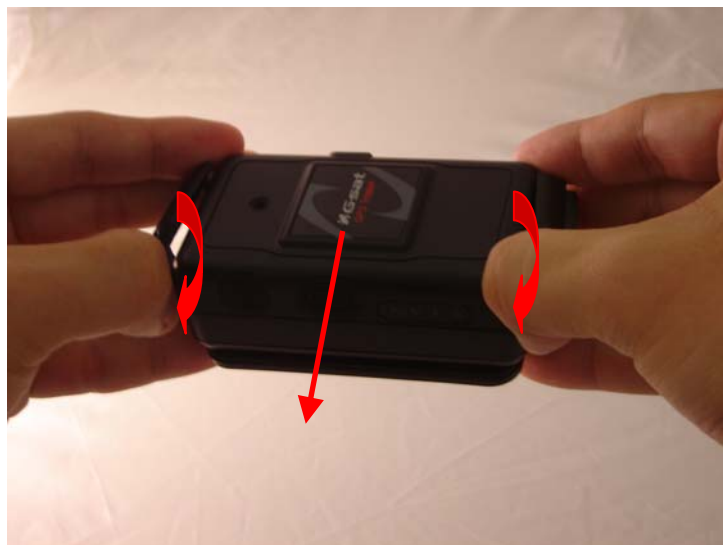
- Insert the TR-151 with the Power button side facing out.



- Push TR-151 into the holder until it clicks in position.



- There are 4 circular magnets on back of the magnetic holder for attaching TR-151 onto the metal material of vehicle or machine.



- To remove TR-151, slightly push outward the two sides of holder, and slide out the TR-151.


4. Hardware Overview

4.1 Appearance



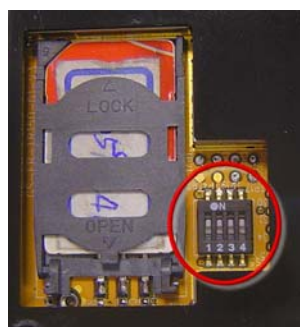
(1)	Power button
(2)	SOS button
(3)	Indicators
(4)	USB connector
(5)	Microphone
(6)	External antenna connector

4.2 Button description

Power button	<ol style="list-style-type: none"> 1. Power On: Press and hold the power button for 3-4 seconds. The status LED will flash 2 times 2. Power Off: Press and hold the power button for 3-4 seconds. The status LED will flash 1 time. 3. Enter parking mode: Press the power button once to enter parking mode. When power button is pressed, LED will flash slowly (once per second) first, and then enter parking mode. The flash number is the second number you set in Park_Time.
SOS button	<p>Press the SOS Button, the status LED will flash 3 times to indicate the button is activated. TR-151 will immediately send out emergency messages along with its GPS report to 3 preset phone numbers.</p>
Indicator	 <ol style="list-style-type: none"> 1. GSM LED: <ul style="list-style-type: none"> • Voice monitoring: LED keeps on. • When no SIM card is inserted, network searches in progress, ongoing user authentication, or network login in progress: LED blinks quickly (about once per second). • In standby mode: LED blinks slowly (once per 3 seconds) 2. GPS LED: The LED keeps on when it is fixing the location. The LED blinks when TR-151's location has been fixed. When GPS function is disabled, GPS LED will be off. 3. Status LED: <ul style="list-style-type: none"> • When battery low: LED keeps on. • When enter setup mode: LED keeps on. • Press power button to turn on: LED flashes quickly 2 times. • Press power button to turn off: LED flashes quickly 1 time. • When SOS button is pressed: LED flashes slowly 3 times. • When error occurs: LED flashes quickly 5 times. • Parking mode: When power button is pressed, LED will flash slowly (once per second) first, and then enter parking mode. The flash number is the second number you set in Park_Time. If you want to stop parking mode, press the power button again. The LED flashes quickly 3 times and it will exit parking mode.

	<ul style="list-style-type: none"> • Sleeping mode: LED will flash slowly 60 times and then it enters sleeping mode. <p>4. Power LED:</p> <ul style="list-style-type: none"> • The LED emits orange light when charger is plugged for charging the battery. • The LED goes off after the battery has been fully charged.
USB connector	<p>There are two functions of the USB connector:</p> <ol style="list-style-type: none"> 1. Connect TR-151 to PC by a Mini USB cable and setup all its features and functions from application software through PC. 2. Charge the battery by connecting a USB cable.
Microphone	For voice monitoring use.
External antenna connector	For you to connect a MMCX external GPS antenna.

4.3 DIP switch



- Set Switch 1 to ON:** Enable the Auto-On feature. When external power is connected, the device will auto-on. When remove external power, the device is off.
- Set Switch 2 to OFF:** All LEDs (except Status LED) go off to perform secret tracking. Status LED flashes as usual except battery low. (In another word, Status LED is not on if battery is low.)
- Set Switch 3 to ON:** For entering setting mode.
- Set Switch 4 to ON:** Enable Sleeping Mode.
- Note:** You can set the switch by a little tweezers or pen point or toothpick.

5. TR-151 Setup and Call Center Operation

5.1 Install the USB driver

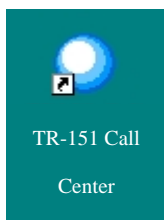


- 1.) Insert the Driver CD into your CD-ROM driver.
- 2.) AutoRun installation window will appear.
- 3.) Click "Install USB Driver" button to install the USB driver.
- 4.) You will see two folders. If your Windows is Vista version, please double click to open "PL2303_USB_Driver_for_Windows_Vista" folder and double click on "PL-2303 Vista Driver Installer.exe" to begin installation. Follow the instruction to complete the installation process.
- 5.) If your Windows is XP or 2000 version, please double click to open "PL2303_USB_Driver_for_Windows_2000_XP" folder and double click on "PL-2303 Driver Installer.exe" to begin installation. Follow the instruction to complete the installation process.

5.2 Install the Call Center program








- 1.) Click "Install PC Software" button to install the Call Center program.
- 2.) Follow the instruction to complete the installation process.
- 3.) After the installation is completed, you will see the icon "TR151-Call Center" appears on desktop. Double click on this icon to start TR151 Call Center program.



5.3 Call Center Menu

TR150-Call Center V1.01

FileManagementDeviceMapAbout



SMS TrackingSearch RecordsSMS Command

SMS Information

Latitude :

GPS Speed :

User Name :

Longitude :

GPS Direction :

Phone Number :

GPS Status :

GPS Date-Time :






Module IMEI :

GPS Altitude :

Receive Date-Time :

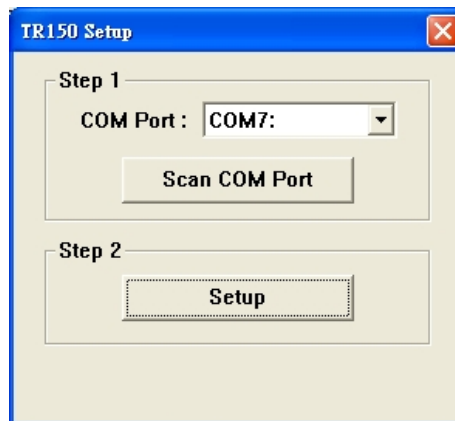
User Name	Receive_Date	Receive_Time	GPS_Latitude	GPS_Longitude	GPS_Date	GPS_Time	GP
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2007/08/2311:25:03NUM

Menu item	Description
File > Exit	Close the Call Center program.
Management > User Information 	Display the User (TR-151) Information. You can setup up to 5 users in the Call Center. (Each Call Center can manage up to 5 sets of TR-151.)
Management > User Edit	For deleting a user. The Call Center can only hold 5 users' information at most. If you want to add a new user after you have already set 5 users, please delete an existing one first.
Device > TR151 Setup 	When a TR-151 is connected to your PC, you can do the basic setup for TR-151.
Map > View Tracking Points 	Check this item to mark returned location in the Google Map. When you receive the latest data report from TR-151, it will automatically update the point on Google Map. (Only for SMS Tracking function.)
Map > Export KML File 	Export information to the KML Format. (Only for SMS Tracking function.)
About	Version information.
	Delete user.

5.4 TR-151 Setup

1. Connect the USB cable to TR-151 and the USB port on your PC.
2. Set DIP Switch 3 to "On" position.
3. Turn on the power of TR-151. The status LED will emit red light indicating it has already entered the setup mode.
4. Start Call Center program.
5. Click **Device > TR151 Setup** to select the COM port. If you are not sure about which COM port to use, please click "Scan COM Port" button to automatically scan it. Then click "Setup" button to enter setup window.



6. Write down the Module IMEI of your TR-150, you may need it later. Enter the information in the "User Name", "Phone Number", and "SOS Number" fields.
7. Press "OK" button and then unplug the USB cable from PC and TR-150.
8. Press power button to turn off TR-150.
9. Set DIP switch 3 to "OFF" position. (That is, set switch to "ON" and switch 1, 3, 4 to "OFF.")

Setup File

Information Firmware Version : TR-151 v.test_2.06 by Nat Lin 070927(F-0TR-0Q-0710111) Module IMEI : 352022004442958 Set Time Zone : On User Name : Phone Number :		Park Mode Setting Park Time : 30 Park Interval : 60 Park Number of Reports : 1 Park Return Phone Number : 0910190643
SMS Default Return Phone Number <input type="checkbox"/> SMS Default Return Phone Number :		Sleep Mode Setting Sleep Time : 12 Sleep Interval : 60 Sleep Number of Reports : 1 Sleep Return Phone Number : 0910190643
Maximum GPS Fixing Time Maximum GPS Fixing Time : 3		GPRS Setting GPRS Port : GPRS apn : GPRS user name : GPRS user password : GPRS_dns1 : GPRS_dns2 : GPRS Server Host Name :
Default Report Mode Setting Default Report Mode : Stop Report Report Interval : 30 Report Format : Format 1 Number of Reports : Return Phone Number for Default Report Mode : 0910190643		
SOS Number SOS Number 1 : 0910190643 SOS Number 2 : SOS Number 3 :		

OK Reset Default Cancel

Information: the basic information of TR-151

Item	Description
Firmware Version	Firmware version of TR-151
Module IMEI	International Mobile Equipment Identity
Set Time Zone	On: The SMS returned by TR-151 will contain a local time. Off: The SMS returned by TR-151 will contain a Coordinated Universal Time, abbreviated UTC.
User Name	Enter a user name here.
Phone Number	Enter the phone number of SIM card installed in this TR-151.

SMS Default Return Phone Number

Item	Description
SMS Default Return Phone Number	TR-151 will send data report or confirmed message back to this return phone number that is in the last field of all SMS tracking commands. If user leaves "Return Phone Number" empty in the tracking commands, TR-151 will send report back to "SMS Default Return Phone Number". If "Return Phone Number" and "SMS Default Return Phone Number" are both empty, TR will send report back to caller ID.

Maximum GPS Tracking Time

Item	Description
Maximum GPS Fixing Time	The time that allows for GPS fixing. If GPS fixing is not achieved in time, it will close GPS and send back the previous location info.

Default Report Mode Setting

Item	Description
Default Report Mode	User can configure TR-151 to perform the "Default Report Mode". There are 3 report modes: immediate report, period report, stop report (standby). When you select some report mode, the unavailable item will be disabled. After power on the device, TR-151 will perform the "Default Report Mode" automatically. For example, if the default report mode is set to "Period Report" mode, every time when user power on the TR-151, it will send out period reports by default.
Report Interval	Time interval of sending data report for period report mode. The unit is second.
Report Format	Set TR-151 to return message by Format0 or Format1 . (Please see description later in this user manual.)
Number of Reports	Set how many reports will be sent for period report mode?
Return Phone Number for Default Report Mode	After turn on the TR-151, it will perform default report mode and send the data report to this number.

SOS Number

Item	Description
SOS Number	When SOS button is pressed, TR-151 will dial to these 3 numbers and send the location information to them by SMS.
OK	OK to confirm and save.
Reset Default	Reset system to Factory Default.
Cancel	Cancel the Setup.

Park Mode Setting

Item	Description
Park Time	The time of entering Parking Mode after pressing the power button under power on condition. The value is between 1-300 second, and the default is 30 seconds
Park Interval	The interval of sending Parking mode reporting SMS
Park Number of Reports	Set how many Park mode reporting SMS will be sent
Park Return Phone Number	The phone number for receiving Park mode report SMS

Sleep Mode Setting

Item	Description
Sleep Time	The time length of Sleep mode. The default is 12 hours
Sleep Interval	The interval of sending Sleep mode reporting SMS
Sleep Number of Reports	Set how many Sleep mode reporting SMS will be sent

Sleep Return Phone Number	The phone number for receiving Sleep mode reporting SMS
----------------------------------	---

GPRS Setting

Item	Description
GPRS Port	The communication port for connecting GPRS network
GPRS apn	The apn of GPRS network station
GPRS user name	The account for connecting GPRS network
GPRS user password	The password for connecting GPRS network
GPRS DNS 1/ DNS 2	The DNS for connecting GPRS network
GPRS Server Host Name	GPRS server address

NOTE: About GPRS setting, please contact with your GPRS network service provider.

5.5 SMS Tracking commands and Configuration for SMS Call Center software developer

You can connect one TR-151 to PC and use GlobalSat PC software Call Center to send **SMS tracking commands** and **SMS configurations** to control the other TR-151 which is outside on the road. It can help Call Center service providers to evaluate TR-151 and build their own SMS Call Center efficiently.

Please refer to "[SMS_Call_Center_software_Development_manual_VX.X_EN.doc](#)" for details.

6. Operating the TR-151

6.1 Turn on / Turn off

- **Turn on:** When the device is off, press the Power button for 3~4 seconds to turn on the device. When the device is on, GPS will do cold start to locate its position for the first time with the green GPS LED on. If location is fixed, the LED will blink. It is suggested that you stay at outdoor place or near the window where TR-151 can receive the better GPS signal when you turn on the device.

NOTICE: If it does not successfully get the location fixed after turning power on, TR-151 may be located in the weak signal area or on the move.

- **Turn off:** When the device is on, press the Power button for 3~4 seconds to turn it off. When the LEDs go out, it indicates that the device is turned off for sure.

6.2 Tracking/Monitoring TR-151 by SMS

User can send the following tracking commands to TR-151 to control the device. After TR-151 receives the command, TR-151 will enter the specific report mode. There are five report types: **Immediate report**, **Period report**, **Stop** (Standby), **Geofence** and **Voice monitor**.

SMS Commands for controlling TR-151

	Report type	Format	Return message
0	Immediate report	?0,IMEI,Report_Format,Return_Phone_Number!	?0,IMEI,OK!
1	Period report	?1,IMEI,Report_Interval,Number_of_Reports,Report_Format,Return_Phone_Number!	?1,IMEI,OK!
2	Stop	?2,IMEI,Return_Phone_Number!	?2,IMEI,OK!
4	Geofence	?4,IMEI,{[R,longitude,latitude,longitude,latitude],[C,longitude,latitude,radius(meter)]},In_or_Out,Report_Interval,Number_of_Reports,Report_Format,Return_Phone_Number!	?4,IMEI,OK!
6	Voice monitor	?6,IMEI,Return_Phone_Number! Note: If return phone number is empty, TR will call back to Caller ID	?6,IMEI,OK!
8	GPRS Immediate report	?8,IMEI,Return_Phone_Number!	?8,IMEI,OK!
9	GPRS Period report	?9,IMEI,Report_Interval,Return_Phone_Number!	?9,IMEI,OK!
11	GPRS Geofence	?11,IMEI,{[R,longitude,latitude,longitude,latitude],[C,longitude,latitude,radius(meter)]},In_or_Out,Report_Interval,Number_of_Reports,Report_Format,Return_Phone_Number!	?11,IMEI,OK!

Note :

1. Data Report Format:

Report_Format = 0 → Format0
Report_Format = 1 → Format1

Please refer to description in this chapter later.

2. Return Phone Number:

Return_Phone_Number
TR will send data report and return message back to this return phone number.
If Return_Phone_Number is empty, TR will send report back to SMSDefaultReturnPhoneNumber.
If SMSDefaultReturnPhoneNumber is also empty, TR will send report back to caller ID.

3. Number of Report:

Number_of_Reports = 0 → continuous report
Number_of_Reports = X → X times report

4. Report Interval:

Report_Interval
Set Report Interval in seconds.

► SMS Report functions _ Immediate Report

Immediate Report: When TR151 receives the **SMS command**, it will return a SMS to confirm the receipt of command. TR151 starts to get position fixed within the **Maximum GPS Fixing Time**. If it can not get fixed the position within the period of time, it will return the previous location. When the GPS position is fixed, it will again return the position data.

	Report type	Format	Return message
0	Immediate report	?0,IMEI,Report_Format,Return_Phone_Number!	?0,IMEI,OK!

The description of SMS

Format	Description
?0	Start sign and function code
IMEI	IMEI of TR
Report_Format	Ask TR to return message by Format0 or Format1. (see description below)
Return_Phone_Number	The report message will be sent to the phone number.
!	End sign

Example: Require immediate report in format1 sent to 626-123456
?0,355632000166323,1,626123456!

► SMS Report functions _ Period Report

Period Report: When TR151 receives the SMS, it will return a SMS to confirm the receipt of command. TR151 starts to get position fixed. When the GPS position is fixed, it will again return the position data, and continue to send back the data by the **Interval Time** you set. You can set the number of report in **Number of reports** field. If you set "0", it will not limit the number of report.

	Report type	Format	Return message
1	Period report	?1,IMEI,Report_Interval,Number_of_Reports,Report_Format,Return_Phone_Number!	?1,IMEI,OK!

The description of SMS

Format	Description
?1	Start sign and function code
IMEI	IMEI of TR
Report_Interval	Time interval of sending data report. The unit is second.
Number_of_Reports	How many reports will be sent? Number_of_Reports=0 → continuous report Number_of_Reports=X → X times report
Report_Format	Ask TR to return message by Format0 or Format1. (see description below)
Return_Phone_Number	The report message will be sent to the phone number.
!	End sign

Example 1: Require continuous 120-sec period report in format1 sent to 626123456
?1,355632000166323,120,0,1,626123456!

Example 2: Require 10 times, 180-sec period report in format0 sent to 626123456
?1,355632000166323,180,10,0,626123456!

► SMS Report functions _ Stop Report

Stop Report: When TR151 receives the **SMS**, it will return a SMS to confirm the receipt of command and stop **all report modes** and back to standby status.

	Report type	Format	Return message
2	Stop	?2,IMEI,Return_Phone_Number!	?2,IMEI,OK!

The description of SMS

Format	Description
?2	Start sign and function code
IMEI	IMEI of TR
Return_Phone_Number	The report message will be sent to the phone number. No report message.
!	End sign

Example:

Send Stop command to disable data report and make GPS off. Return message will be sent to 626123456

?2,355632000166323,626123456!

► SMS Report functions _ GPRS Immediate Report

GPRS Immediate Report: When TR151 receives the **SMS command**, it will return a SMS to confirm the receipt of command. TR151 starts to get position fixed within the **Maximum GPS Fixing Time**. If it can not fix the position in the period of time, it will return the previous location. When the GPS position is fixed, it will again return the position data.

	Report type	Format	Return message
8	GPRS Immediate report	?8,IMEI,Return_Phone_Number!	?8,IMEI,OK!

The description of SMS

Format	Description
?8	Start sign and function code
IMEI	IMEI of TR
Return_Phone_Number	The report message will be sent to the phone number.
!	End sign

Example: Require GPRS immediate report sent to 626-123456

?0,355632000166323,626123456!

► SMS Report functions _ GPRS Period Report

GPRS Period Report: When TR151 receives the SMS, it will return a SMS to confirm the receipt of command. TR151 starts to get position fixed. When the GPS position is fixed, it will again return the position data, and continue to send back the data by the **Interval Time** you set.

	Report type	Format	Return message
9	GPRS Period report	?9,IMEI,Report_Interval,Return_Phone_Number!	?9,IMEI,OK!

The description of SMS

Format	Description
?1	Start sign and function code
IMEI	IMEI of TR
Report_Interval	Time interval of sending data report. The unit is second.
Return_Phone_Number	The report message will be sent to the phone number.
!	End sign

Example 1: Require 120-sec period report sent to 626123456

?1,355632000166323,120,626123456!

Example 2: Require 180-sec period report sent to 626123456

?1,355632000166323,180,626123456!

6.3 Tracking/Monitoring TR-151 by GPRS

	Report type	Format	Note	Example	TR-151 will return
0	Immediate report	\$0,IMEI!	*note1	\$0,355632000166323!	\$OK!
1	Period report	\$1,IMEI,sec!	*note2 sec= 5~86400	\$1,355632000166323,30! Report every 30 seconds	\$OK!
2	Stop connect	\$2,IMEI!	*note3	\$2,355632000166323!	\$OK!

*note1: When TR-151 receives this command, it will send the report back immediately. It will send only one time, and the GPRS connection is still on.

*note2: When TR-151 receives this command, it will send back the report every specified second. And the GPRS connection is still on. The time error of return could be 1~3 seconds, or larger if the GPRS connection is not stable.

*note3: When TR-151 receives this command, it will disconnect from GPRS and go to sleep mode.

6.4 Geofence

1. Send SMS command to make TR-151 enter into Geofence mode. The content of the SMS also includes the rectangular or circular areas defined by longitudes and latitudes, getting in the restricted areas or getting out the permissible areas to send alarm, time intervals of alarm report, number of reports, report format and return phone number.
2. After the TR-151 enter into this mode, the device will start GPS fixing and the GPS is always on. Once TR-151 detects the device getting in the restricted areas or getting out the permissible areas, TR-151 will send alarm message back to the preset number by SMS.

	Report type	Format	Return message
4	Geofence	?4,IMEI,{[R,longitude,latitude,longitude,latitude],[C,longitude,latitude,radius(meter)]},In_or_Out,Report_Interval,Number_of_Reports,Report_Format,Return_Phone_Number!	?4,IMEI,OK!
11	GPRS Geofence	?11,IMEI,{[R,longitude,latitude,longitude,latitude],[C,longitude,latitude,radius(meter)]},In_or_Out,Report_Interval,Number_of_Reports,Report_Format,Return_Phone_Number!	?11,IMEI,OK!

The description of SMS

Format	Description
?4 ?11	Start sign and function code ?4 → Send location info to mobile phone. ?11 → Send location info to GPRS Server.
IMEI	IMEI of TR
{[R,longitude,latitude,longitude,latitude],[C,longitude,latitude,radius(meter)]}	Boundary information: R: rectangular shape → Follow by two longitudes, latitudes. C: circular shape → Follow by one longitude, latitude and one radius.
In_or_Out	In_or_Out=in → Send alarm message if TR-150 gets in the restricted areas. In_or_Out=out → Send alarm message if TR-150 gets out the permissible areas.
Report_Interval	Time interval of sending data report. The unit is second.
Number_of_Reports	Set how many reports will be sent? Number_of_Reports=0 → continuous report Number_of_Reports=X → X times report
Report_Format	Set TR-151 to return message by Format0 or Format1. (see description below)
Return_Phone_Number	The alarm message will be sent to the phone number.
!	End sign

Note 1:

User can set up to 10 rectangular or circular boundaries. Each SMS contains one boundary setting. User can send numerous SMS to complete one set of settings, including numerous rectangular or circular boundaries. For example, if user wants to set the boundary includes 2 rectangles and 1 circle. User has to send 3 SMS, two with rectangle information, one with circle information.

SMS1:

```
?4,IMEI,R,longitude,latitude,longitude,latitude,In_or_Out,Report_Interval,
Number_of_Reports,Report_Format,Return_Phone_Number!
```

SMS2:

```
?4,IMEI,R,longitude,latitude,longitude,latitude,In_or_Out,Report_Interval,
Number_of_Reports,Report_Format,Return_Phone_Number!
```

SMS3:

```
?4,IMEI,C,longitude,latitude,radius,In_or_Out,Report_Interval,
Number_of_Reports,Report_Format,Return_Phone_Number!
```

If user uses numerous SMS in one setting, the `IMEI`, `In_or_Out`, `Report_Interval`, `Number_of_Reports`, `Report_Format`, `Return_Phone_Number` must be the same between each SMS. If above parameters are not the same between SMS, TR-151 only follows **last SMS**.

Note 2:

In Boundary information

```
{[R,longitude,latitude,longitude,latitude],[C,longitude,latitude,radius],}
```

User can set

R: rectangular follows by two longitudes and two latitudes.

Or

C: circular follows by one longitude, one latitude and one radius.

Example: Rectangle

```
R,E12128.1883,N2342.8117,E12129.2186,N2459.8915
```

Example: Circle (radius is 1000 meters)

```
C,E12129.2186,N2459.8915,1000
```


Note 3:

Example:

- Send **one SMS** to setup Geofence.
- Boundary includes **one rectangle** (two longitudes and two latitudes → E12128.1883,N2342.8117,E12129.2186,N2459.8915)
- When TR gets out boundary, it would send format1, 10 times, 120 sec interval, alarm message to 626123456.

```
?4,355632000166323,R,E12128.1883,N2342.8117,E12129.2186,N2459.8915,out,120,10,1,616123456!
```

Example:

- Send **three SMS** to setup Geofence.
- Boundary includes **one rectangle** (two longitudes and two latitudes → E12128.1883,N2342.8117,E12129.2186,N2459.8915) and **two circles** (one longitude/latitude is E12228.1883,N2442.8117, and radius is 1000 meter) (the other longitude/latitude is E12328.1883,N2452.8117, and radius is 1500 meter)
- When TR gets out boundary, it would send format1, 10 times, 120 sec interval, alarm message to 626123456.

SMS1:

```
?4,355632000166323,R,E12128.1883,N2342.8117,E12129.2186,N2459.8915,out,120,10,1,616123456!
```

SMS2:

```
?4,355632000166323,C,E12228.1883,N2442.8117,1000,out,120,10,1,616123456!
```

SMS3:

```
?4,355632000166323,C,E12328.1883,N2542.8117,1500,out,120,10,1,616123456!
```

6.5 Voice monitor function

1. Send SMS with IMEI and return phone number to TR-151 to enable voice monitor function.
2. Then TR-151 will call back.

	Report type	Format	Return message
6	Voice monitor	?6,IMEI,Return_Phone_Number!	?6,IMEI,OK!

The description of SMS

Format	Description
?6	Start sign and function code
IMEI	IMEI of TR
Return_Phone_Number	TR will call back to this phone number.
!	End sign

Note: If return phone number is empty, TR will call back to Caller ID

Example:

User send voice command and make TR call back to 626123456

?6,355632000166323,626123456!

6.6. Parking Mode

Use PC or SMS to configure parameters: Enable parking time, telephone number, time interval and number of report.

- While the device is powered on, press the power button to enter parking mode. The status LED will flash specific times to indicate the parking mode is enabled.
- Press the power button again to disable the parking mode.

Note: Parking Mode is for users to make TR-151 to send out an alarm SMS to inform user while it senses vibration.

6.7. Sleeping Mode

DIP switch 4 ON: Enable sleeping mode

DIP switch 4 OFF: Disable sleeping mode

When DIP switch 4 is on and the device is powered on, it would enter the sleeping mode. The status LED will flash 60 times to indicate the sleeping mode is enabled.

Note: Sleeping Mode is for users to make TR-151 to send out an alarm SMS to inform user while it senses vibration. During sleeping mode, TR-151 stops receiving any SMS.

6.8 The return format from TR-151

Return SMS format from TR-151

The data format is configurable in the SMS tracking commands. The return data format can be following two formats.

Format0 is for general end users who send SMS commands to TR-151 by their cell phone or PDA phone. This format is very easy to read by end users.

Format1 is specifically read by software Call Center that is developed by service provider.

Data Report Format:

Report_Format=0 → **Format0**

Report_Format=1 → **Format1**

Format0:	Example:
Position report Name Time Date GPS position Fix or not	Position report Name 2006/9/15 10:20:39 N2459.8915,E12129.2186 GPS fixed

Format1:
?IMEI,Status,GPS_Fix,Date,Time,Longitude,Latitude,Altitude,Speed,Heading,Number_of_Satellites_In_Use,HDOP!
Example:
?353857014816785,2,3,280807,035825,E12129.2616,N2459.7918,97.2,0.13,142.31,04,2.4!

The description of Format1

Format	Value	Note
?	?	Command Head
IMEI	The number of IMEI	
Status	0 1	0: Immediate report 1: Period report
GPS_Fix	1 2 3	1: Fix not available 2: GPS 2D Fix 3: GPS 3D Fix
Date	ddmmyy	
Time	hhmmss	
Longitude	(E or W)ddmm.mmmm	Example: E12129.2186 → E 121°29.2186'
Latitude	(N or S)ddmm.mmmm	Example: N2459.8915 → N 24°59.8915'
Altitude	xxxxx.x	unit: meters
Speed	xxxxx.xx	unit: knots (1knots = 1.852km)
Heading	ddd	
Number_of_Satellites_In_Use	xx	
HDOP	x.x	
!	!	Command End

Format of return GPRS from TR-151

Format:

Command_Head,IMEI,status,GPS_fix,date,time,longitude,latitude,altitude,speed,heading,number of satellites in use,HDOP,Command_End

Example:

\$355632000166323,1,1,040202,093633,E12129.2252,N2459.8891,00161,0.0100,147,07,2.4!

Format	Value	Note
Command_Head	\$	
IMEI	(The number of IMEI)	
Status	0 1 2	0: Immediate report 1: Period report 2: Stop connect
GPS_fix	1 2 3	1: Fix not available 2: GPS 2D Fix 3: GPS 3D Fix
date	ddmmyy	
time	hhmmss	
longitude	(E or W)dddmm.mmmm	Example: E12129.2186 → E 121°29.2186'
latitude	(N or S)ddmm.mmmm	Example: N2459.8915 →N 24°59.8915'
altitude	xxxxx.x	unit: meters
speed	xxxxx.xx	unit: knots (1knots = 1.852km)
heading	ddd	
number of satellites in use	xx	
HDOP	x,x	
Command END	!	

6.9 SOS function

Press the SOS Button, the status LED will flash 3 times to indicate that the button is activated. TR-151 will immediately send out emergency messages along with its GPS report to 3 preset phone numbers.

6.10 SMS Configuration

User can configure following parameters into TR-151 by SMS. There are four parts setting as below.

- SMS Default Return Phone Number
- Maximum GPS Fixing Time
- Default Report Mode Setting
- SOS Numbers

Report type	Format	Return message
SMS Default Return Phone Number	?7,IMEI,1,Enable_SMSDefaultReturnPhoneNumber, SMSDefaultReturnPhoneNumber,Return_Phone_Number!	?7,IMEI,OK!
Maximum GPS Fixing Time	?7,IMEI,2,Maximum_GPS_Fixing_Time, Return_Phone_Number!	?7,IMEI,OK!
Default Report Mode Setting	?7,IMEI,3,Default_Report_Mode,Report_Interval, Number_of_Reports,Report_Format, ReturnPhoneNnumberForDefaultReportMode, Return_Phone_Number!	?7,IMEI,OK!
SOS Numbers	?7,IMEI,4,SOS1,SOS2,SOS3,Return_Phone_Number!	?7,IMEI,OK!
Parking Setting	?7,IMEI,5,Park_Time,Park_Interval, sensitivity, Park_Number_of_Reports,Park_Return_Number, Return_Phone_Number!	?7,IMEI,OK!
Sleeping Setting	?7,IMEI,6,Sleep_Time,Sleep_Interval, Sleep_Number_of_Reports,sensitivity, Sleep_Return_Number,Return_Phone_Number!	?7,IMEI,OK!
GPRS Setting	?7,IMEI,7,Port,APN,GPRS_Name,GPRS_pwd,DNS1,DNS2, Host_Name,Return_Phone_Number!	?7,IMEI,OK!

- **Default_Report_Mode:**
 - Default_Report_Mode = 0 → immediate report
 - Default_Report_Mode = 1 → period report
 - Default_Report_Mode = 2 → stop
- **Enable_SMSDefaultReturnPhoneNumber:**
 - Enable or disable SMS Default Return Phone Number.
 - Enable_SMSDefaultReturnPhoneNumber = 0 → Disable
 - Enable_SMSDefaultReturnPhoneNumber = 1 → Enable
- **Maximum_GPS_Fixing_Time:**
 - If GPS is not fixed within the time, it returns previous location and close GPS.
 - The unit is minute.
- **Number_of_Reports:**
 - Set how many report will be sent.
 - Number_of_Reports = 0 → continuous report
 - Number_of_Reports = X → X times report
- **Report_Format:** Ask TR to return message by Format0 or Format1.
- **Report_Interval:** Time interval of sending data report. The unit is second.

- **Return_Phone_Number:** TR-151 will send confirmed message back to this **Return_Phone_Number**.
If user let **Return_Phone_Number** be empty, TR-151 will send report back to **SMSDefaultReturnPhoneNumber**.
If **Return_Phone_Number** and **SMSDefaultReturnPhoneNumber** are both empty, TR-151 will send report back to caller ID.
- **ReturnPhoneNnumberForDefaultReportMode:** Return phone number for default report mode. TR-151 will send report to this number after it is turned on when Default Report Mode is set to immediate report or period report.
- **SMSDefaultReturnPhoneNumber:** Set SMS Default Return Phone Number.

► SMS Configuration _ SMS Default Return Phone Number

Report type	Format	Return message
SMS Default Return Phone Number	?7,IMEI,1,Enable_SMSDefaultReturnPhoneNumber, SMSDefaultReturnPhoneNumber,Return_Phone_Number!	?7,IMEI,OK!

The description of SMS

Format	Description
?7	Start sign and function code
IMEI	IMEI of TR
1	Setting code for SMS Default Return Phone Number
Enable_SMSDefaultReturnPhoneNumber	0 → Disable 1 → Enable
SMSDefaultReturnPhoneNumber	In the SMS tracking commands (immediate report, period report, stop report, Geofence), if the field Return_Phone_Number is empty, TR-151 will send data report to this SMSDefaultReturnPhoneNumber .
Return_Phone_Number	The confirmed SMS sent to the phone number to indicate the setting is successful.
!	End sign

Example: To configure SMS default return phone number as 313-987654, and send confirmed SMS to 626-123456.

?7,355632000166323,1,1,313987654,626123456!

Example: To Disable SMS default return phone number and send confirmed SMS to 626-123456.

?7,355632000166323,1,0,,626123456!

► SMS Configuration _ Maximum GPS Fixing Time

Report type	Format	Return message
Maximum GPS fixing time	?7,IMEI,2,Maximum_GPS_Fixing_Time, Return_Phone_Number!	?7,IMEI,OK!

The description of SMS

Format	Description
?7	Start sign and function code
IMEI	IMEI of TR
2	Setting code for Maximum GPS fixing time
Maximum_GPS_Fixing_Time	The time that allows for GPS fixing. If GPS fixing is not achieved within the time, it will close GPS and send back the previous location info.
Return_Phone_Number	The confirmed SMS sent to the phone number to indicate the setting is successful.
!	End sign

Example: To configure Maximum GPS fixing time to 5 minutes and send confirmed SMS to 626-123456.

?7,355632000166323,2,5,626123456!

► SMS Configuration _ Default Report Mode Setting

Report type	Format	Return message
Default report mode setting	?7,IMEI,3,Default_Report_Mode,Report_Interval,Number_of_Reports,Report_Format,ReturnPhoneNnumberForDefaultReportMode,Return_Phone_Number!	?7,IMEI,OK!

The description of SMS

Format	Description
?7	Start sign and function code
IMEI	IMEI of TR
3	Setting code for Default report mode setting
Default_Report_Mode	0 → immediate report 1 → period report 2 → stop
Report_Interval	Time interval of sending data report. The unit is second.
Number_of_Reports	Set how many report will be sent. 0 → continuous report x → X times report
Report_Format	0 → Format0 1 → Format1
ReturnPhoneNnumberForDefaultReportMode	Return phone number for default report mode.
Return_Phone_Number	The confirmed SMS sent to the phone number to indicate the setting is successful.
!	End sign

Note:

The configuration is for default report mode (Immediate, Period or Stop) settings. In immediate and stop settings, some fields are unnecessary, please leave these fields empty and separate them by a comma. Please see following examples for detail.

Example: Immediately report. Configure default report mode as **immediate report**, send format1 report data to 313-987654, and send confirmed SMS to 626-123456.

?7,355632000166323,3,0,,,1,313987654,626123456!

Example: Period report. Configure default report mode as **period report**, send 10 times, 180-sec period report in format0 to 313-987654, and send confirmed SMS to 626-123456.

?7,355632000166323,3,1,180,10,0,313987654,626123456!

Example: Stop. Configure default report mode as **stop (standby)**, and send confirmed SMS to 626-123456.

?7,355632000166323,3,2,,,,,626123456!

► SMS Configuration _ SOS Numbers

Report type	Format	Return message
SOS numbers	?7,IMEI,4,SOS1,SOS2,SOS3,Return_Phone_Number!	?7,IMEI,OK!

The description of SMS

Format	Description
?7	Start sign and function code
IMEI	IMEI of TR
4	Setting code for SOS numbers
SOS	SOS numbers
Return_Phone_Number	The confirmed SMS sent to the phone number to indicate the setting is successful.
!	End sign

Example: Configure SOS1, SOS2 and SOS3 as 616123456, 717123456, 818123456, and send confirmed SMS to 626-123456.

?7,355632000166323,4,616123456,717123456,818123456,626123456!

► SMS Configuration _ Parking Setting

Report type	Format	Return message
Parking Setting	?7,IMEI,5,Park_Time,Park_Interval,Park_Number_of_Reports,Sensitivity,Park_Return_Number,Return_Phone_Number!	?7,IMEI,OK!

The description of SMS

Format	Description
?7	Start sign and function code
IMEI	IMEI of TR
5	Setting code for Parking setting
Park_Time	Set the active time for entering parking mode. The unit is second.
Park_Interval	Time interval of sending data report. The unit is second.
Park_Number_of_Reports	Set how many report will be sent. 0 → continuous report x → X times report
Sensitivity	Set the number of vibration which enables TR-151 to send out alarm. The number you can set is 1~255. Larger value means less sensitive.
Park_Return_Number	Return phone number for default report mode.
Return_Phone_Number	The confirmed SMS sent to the phone number to indicate the setting is successful.
!	End sign

► SMS Configuration _ Sleeping Setting

Report type	Format	Return message
Sleeping Setting	7,IMEI,6,Sleep_Time,Sleep_Interval,Sleep_Number_of_Reports,Sensitivity,Sleep_Return_Number,Return_Phone_Number!	?7,IMEI,OK!

The description of SMS

Format	Description
?7	Start sign and function code
IMEI	IMEI of TR
6	Setting code for Sleeping setting
Sleep_Time	Set the Sleeping Time. The unit is hour. When it reaches the Sleep Time, TR-150 will wake up and send a SMS message, then go back to Sleeping mode.
Sleep_Interval	Time interval of sending data report. The unit is second.
Sensitivity	
Sleep_Number_of_Reports	Set how many report will be sent. 0 → continuous report x → X times report
Sensitivity	Set the number of vibration which enables TR-151 to send out alarm. The number you can set is 1~255. Larger value means less sensitive.
Sleep_Return_Number	Return phone number for default report mode.
Return_Phone_Number	The confirmed SMS sent to the phone number to indicate the setting is successful.
!	End sign

► SMS Configuration _ GPRS Setting

Report type	Format	Return message
GPRS Setting	?7,IMEI,7,Port,APN,GPRS_Name,GPRS_pwd,DNS1,DNS2,Host_Name,Return_Phone_Number!	?7,IMEI,OK!

The description of SMS

Format	Description
?7	Start sign and function code
IMEI	IMEI of TR
7	Setting code for GPRS setting
Port	GPRS Port of the Server
APN	Please consult your GPRS network service provider for these parameter values.
GPRS_Name	
GPRS_pwd	
DNS1	
DNS2	
Host_Name	GPRS Server host name
Return_Phone_Number	The confirmed SMS sent to the phone number to indicate the setting is successful.
!	End sign

Note: TR-151 is designed for vehicle and asset for tracking purpose, not for carried by people.