



HUAWEI MU736 HSPA+ M.2 Module

GPS Application Guide

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About This Document

Revision History

Document Version	Date	Chapter	Descriptions
01	2013-03-22		Creation



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1 Introduction

The MU736 module incorporates a Global Positioning System (GPS) chipset capable of GPS and network assisted GPS (A-GPS). The standalone GPS depends on GPS satellites to provide location information, while the A-GPS functions in conjunction with base stations as well as GPS satellites to improve the time to first fix (TTFF).

The purpose of this document is to guide how to do the GPS test.

2 GPS Test Procedure

2.1 Enabling or Disabling GPS

The MU736 GPS module can have its GPS function enabled or disabled.

- To disable GPS: Before the MU736 is powered on, pull down the GPS_DISABLE_N (PIN 25) pin. Then after the MU736 is powered on, GPS is disabled and cannot be enabled by using AT commands.
- To enable GPS: Before the MU736 is powered on, pull up the GPS_DISABLE_N (PIN 25) pin. Then after the MU736 is powered on, GPS is enabled and can be disabled by using AT commands.

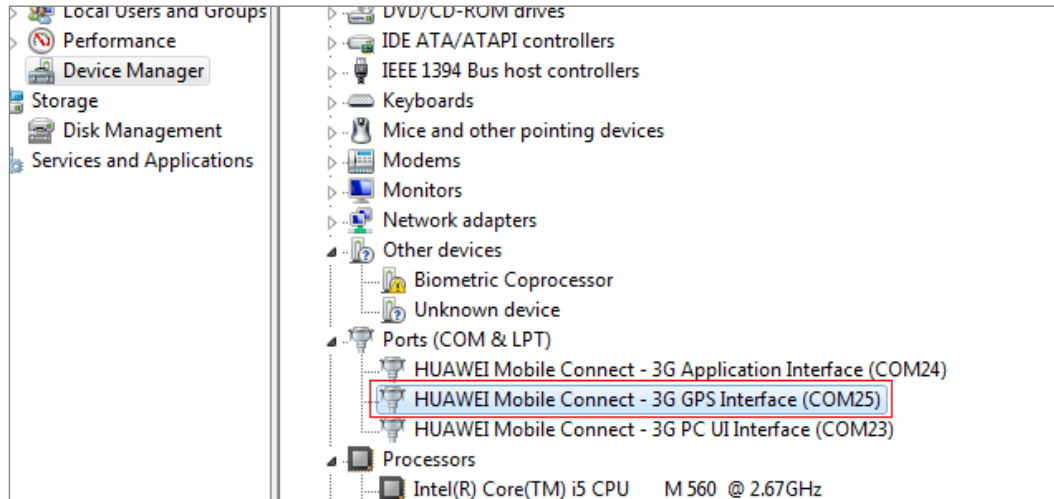
2.2 GPS Test

Ensure that the GPS antenna is located in an open sky environment.


In Windows 7 or Windows XP

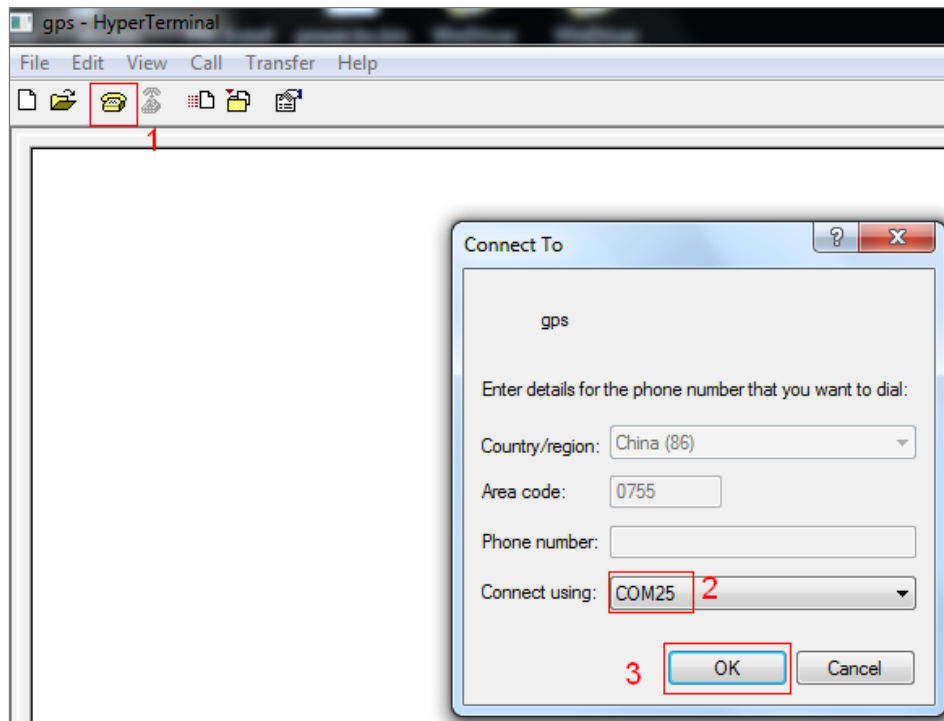
On a computer running Windows 7 or Windows XP, use HyperTerminal to test the GPS.

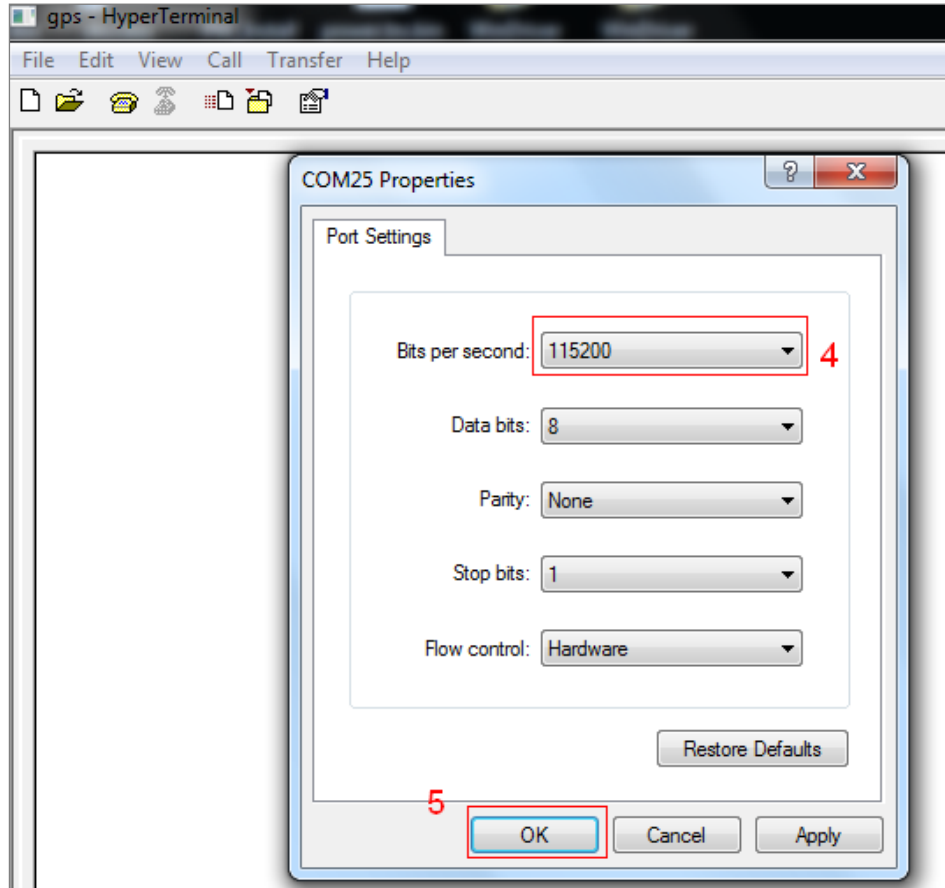
- Step 1 Right-click **My Computer**, and choose **Manage** from the shortcut menu. In the displayed **Computer Management** window, click **Device Manager** in the left pane, and check for **HUAWEI Mobile Connect-3G GPS Interface (COM 25)** under **Ports** in the right pane.



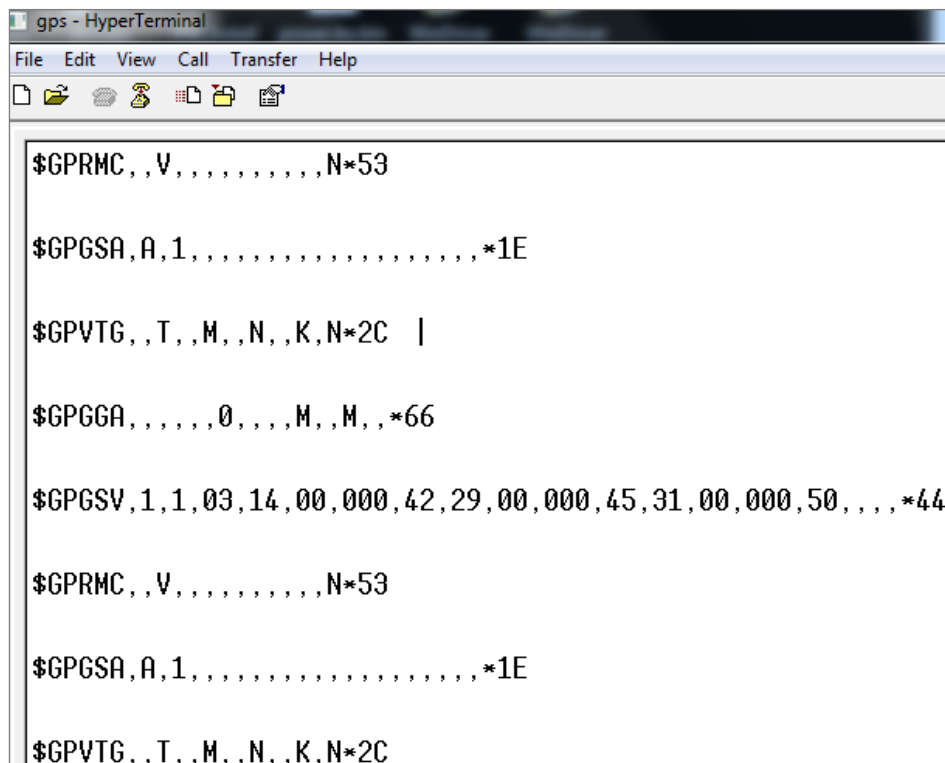
Step 2 Open the HyperTerminal and select the GPS port.

- 1) Click the icon .
- 2) Select **COM25** in the **Connect using** list, and then click **OK**.
- 3) Select **115200** in the **Bits per second** list, and then click **OK**.

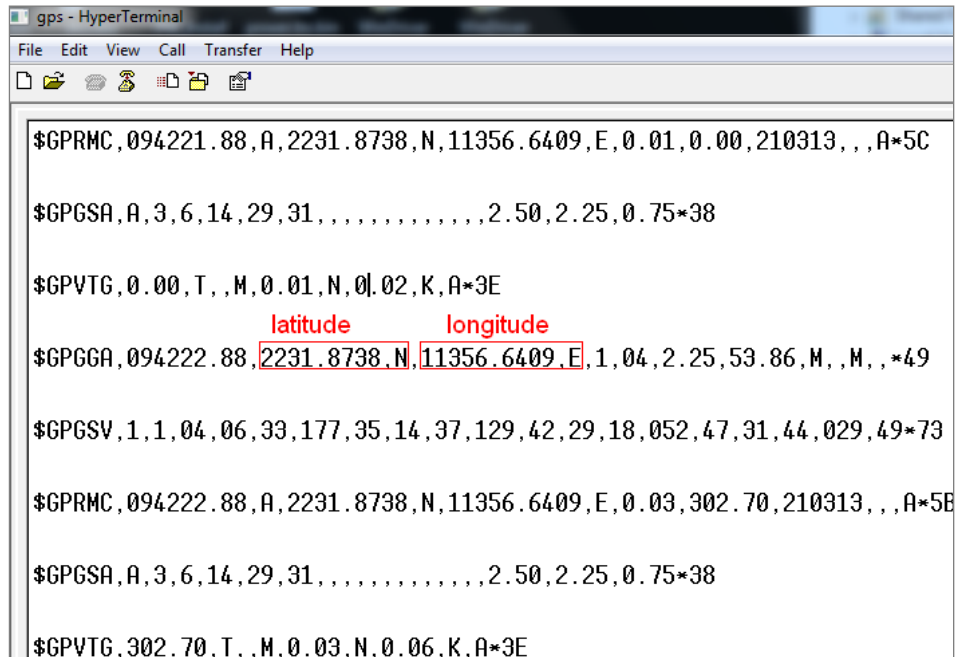




Step 3 The module starts to search the current location, and reports NMEA data.

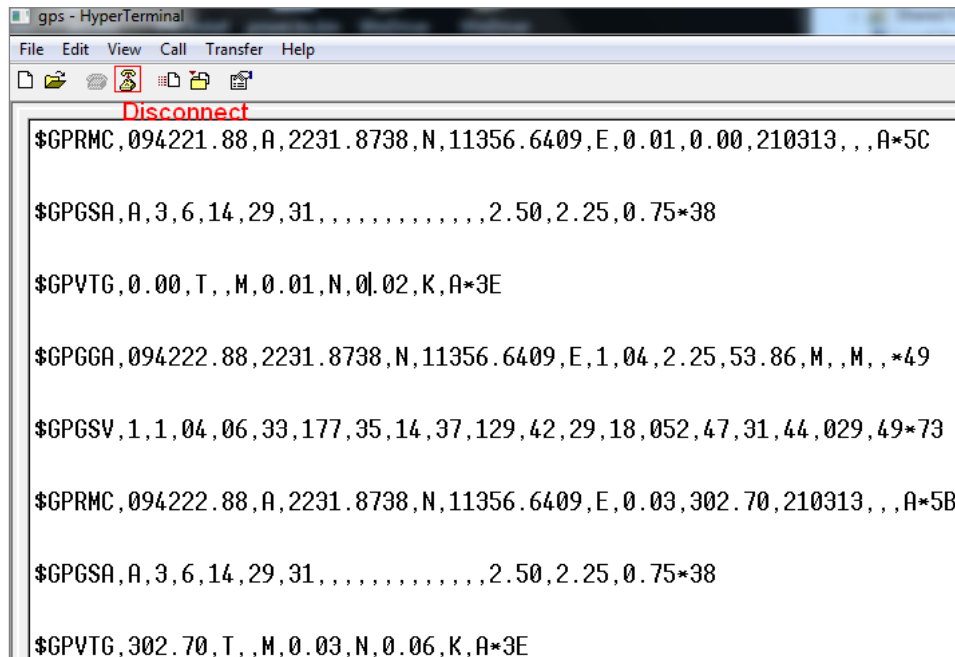


If the NMEA data contains latitude and longitude values (for example, 2231.8378,N,11356.6409E), it means that the module obtains the current location information.



```
gps - HyperTerminal
File Edit View Call Transfer Help
$GPRMC,094221.88,A,2231.8738,N,11356.6409,E,0.01,0.00,210313,,A*5C
$GPGSA,A,3,6,14,29,31,,,,,,,,,,,,,2.50,2.25,0.75*38
$GPVTG,0.00,T,,M,0.01,N,0.02,K,A*3E
$GPGGA,094222.88,2231.8738,N,11356.6409,E,1,04,2.25,53.86,M,,M,,*49
$GPGSV,1,1,04,06,33,177,35,14,37,129,42,29,18,052,47,31,44,029,49*73
$GPRMC,094222.88,A,2231.8738,N,11356.6409,E,0.03,302.70,210313,,A*5B
$GPGSA,A,3,6,14,29,31,,,,,,,,,,,,,2.50,2.25,0.75*38
$GPVTG,302.70,T,,M,0.03,N,0.06,K,A*3E
```

Step 4 Disconnect the GPS port on HyperTerminal to stop GPS location and NMEA data reporting.



```
gps - HyperTerminal
File Edit View Call Transfer Help
Disconnect
$GPRMC,094221.88,A,2231.8738,N,11356.6409,E,0.01,0.00,210313,,A*5C
$GPGSA,A,3,6,14,29,31,,,,,,,,,,,,,2.50,2.25,0.75*38
$GPVTG,0.00,T,,M,0.01,N,0.02,K,A*3E
$GPGGA,094222.88,2231.8738,N,11356.6409,E,1,04,2.25,53.86,M,,M,,*49
$GPGSV,1,1,04,06,33,177,35,14,37,129,42,29,18,052,47,31,44,029,49*73
$GPRMC,094222.88,A,2231.8738,N,11356.6409,E,0.03,302.70,210313,,A*5B
$GPGSA,A,3,6,14,29,31,,,,,,,,,,,,,2.50,2.25,0.75*38
$GPVTG,302.70,T,,M,0.03,N,0.06,K,A*3E
```



In Windows 8

On a computer running Windows 8, open a GPS-enabled map application to start GPS location.

2.3 A-GPS Test

- Step 1 Load the Secure User Plane Location (SUPL) server and certificate information onto the nonvolatile storage of the MU736 module.

The MU736 module has integrated the server and certificate information, and no additional configuration is required. If an original equipment manufacturer (OEM) needs to load the certificate other than the integrated one, the OEM can contact Huawei to integrate the certificate into the PC Vendor tool. Once the certificate is integrated into the PC Vendor, one-click is required to load the certificate and relevant server information into the MU736 module.

- Step 2 Insert a SIM card that has subscribed to network services into the MU736 module. Then set up a dial-up connection.

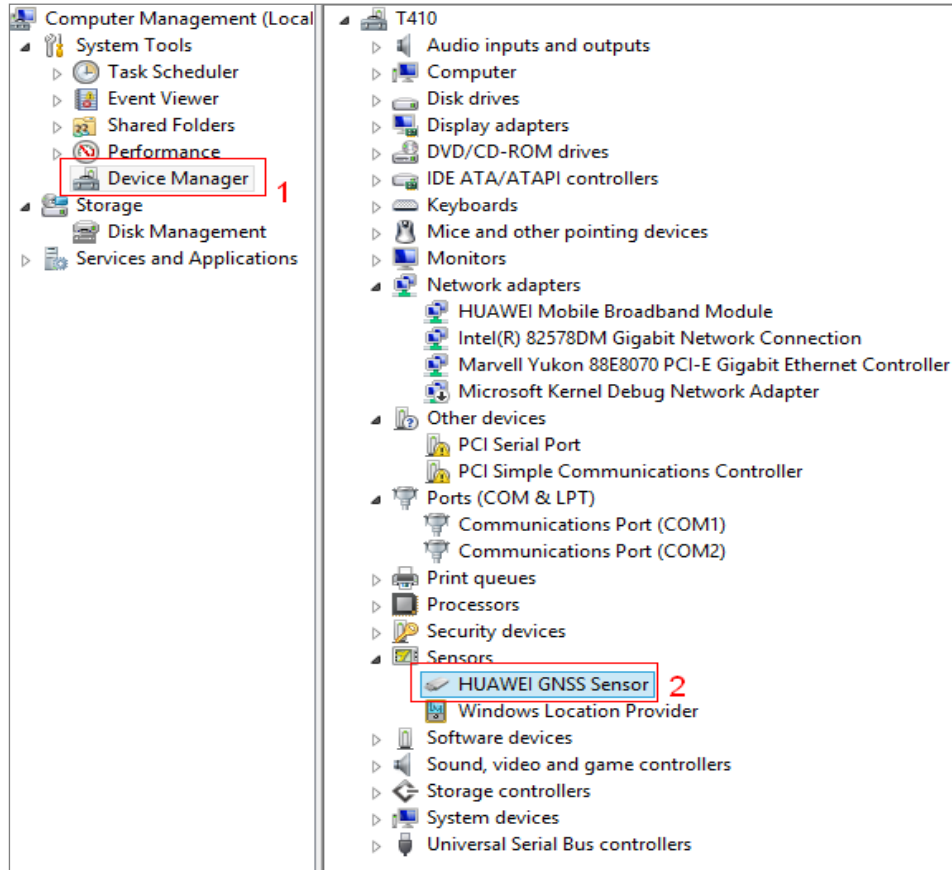
The MU736 starts the A-GPS positioning.

2.4 GPS Positioning in Windows 8

2.4.1 Using the Sensor Diagnostic Tool

To use the Sensor Diagnostic Tool provided in the Windows driver program installation kit:

- Step 1 Connect the MU736 module to one of the USB ports on a PC.
- Step 2 Right-click **My Computer**, and choose **Manage** from the shortcut menu. In the displayed **Computer Management** window, click **Device Manager** in the left pane, and check for **HUAWEI GNSS Sensor** under **Sensors** in the right pane.

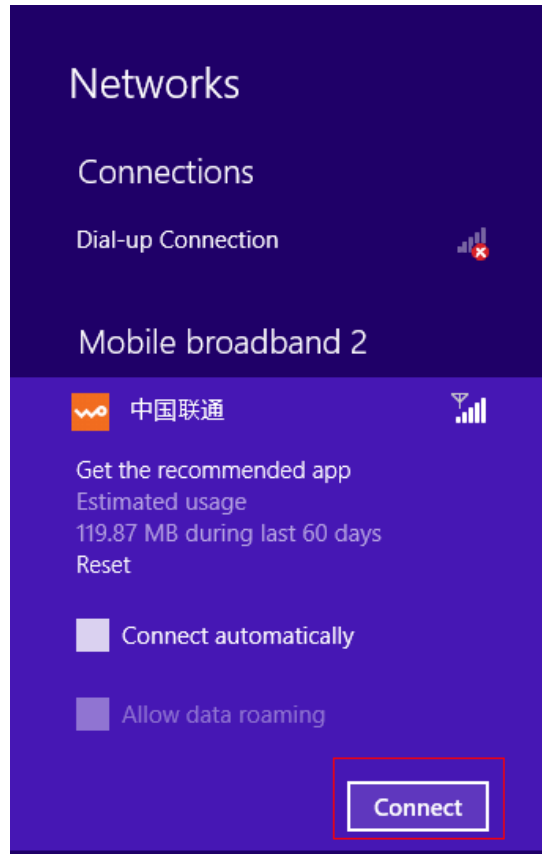


Step 3 Close the window. Perform either of the following:

- If you are using A-GPS positioning, go to Step 4.
- If you are using GPS positioning, go to Step 5.

Step 4 Set up a dial-up connection.

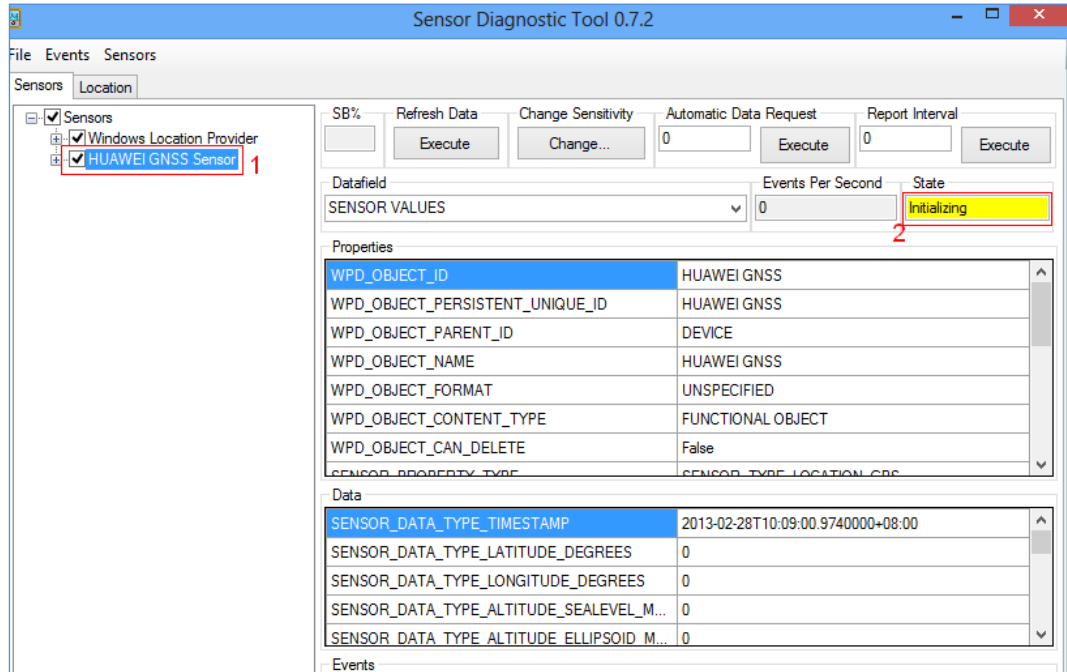
After the dial-up connection is set up, you can use the A-GPS positioning.



Step 5 While the GPS antenna is located in an open sky environment, open the Sensor Diagnostic Tool. The Sensor Diagnostic Tool user interface is displayed, and GPS positioning starts.

Step 6 In the left pane, select **HUAWEI GNSS Sensor** under **Sensors**.

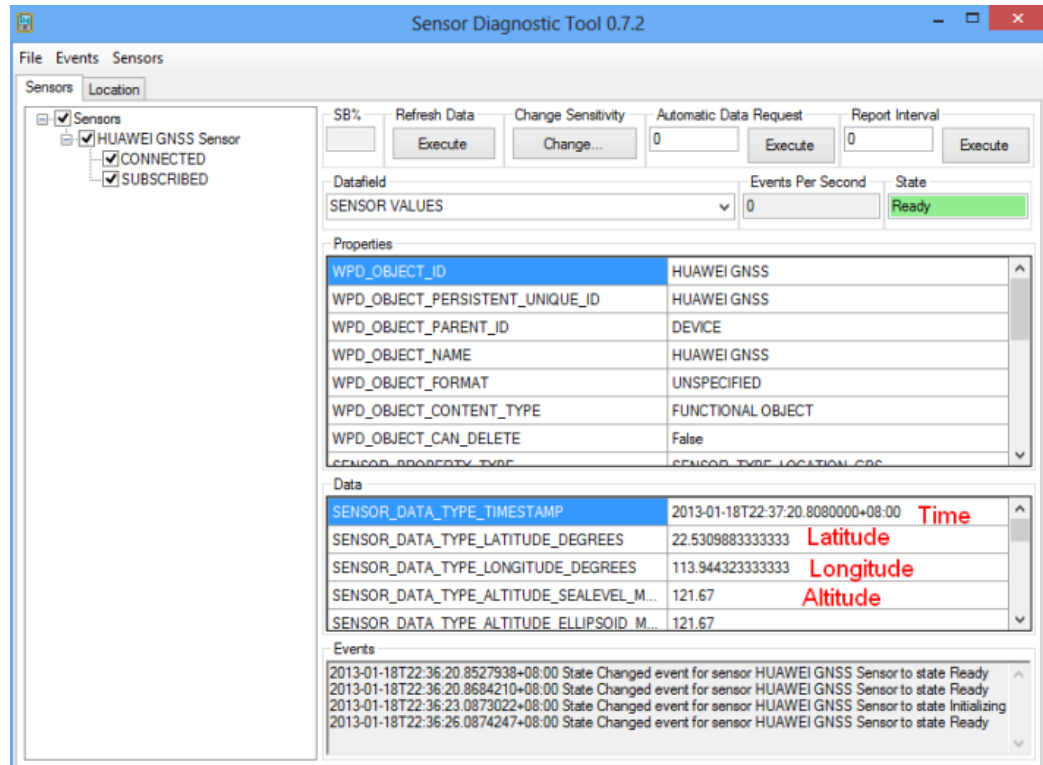
Initializing is displayed in **State**, indicating that the GPS positioning is in progress.



NOTE

Under **Properties**, the HUAWEI GNSS port information is displayed. Under **Data**, the latitude, longitude, system time, and moving speed of the MU736 are displayed. If the GPS positioning does not complete, only the system time of the MU736 is displayed.

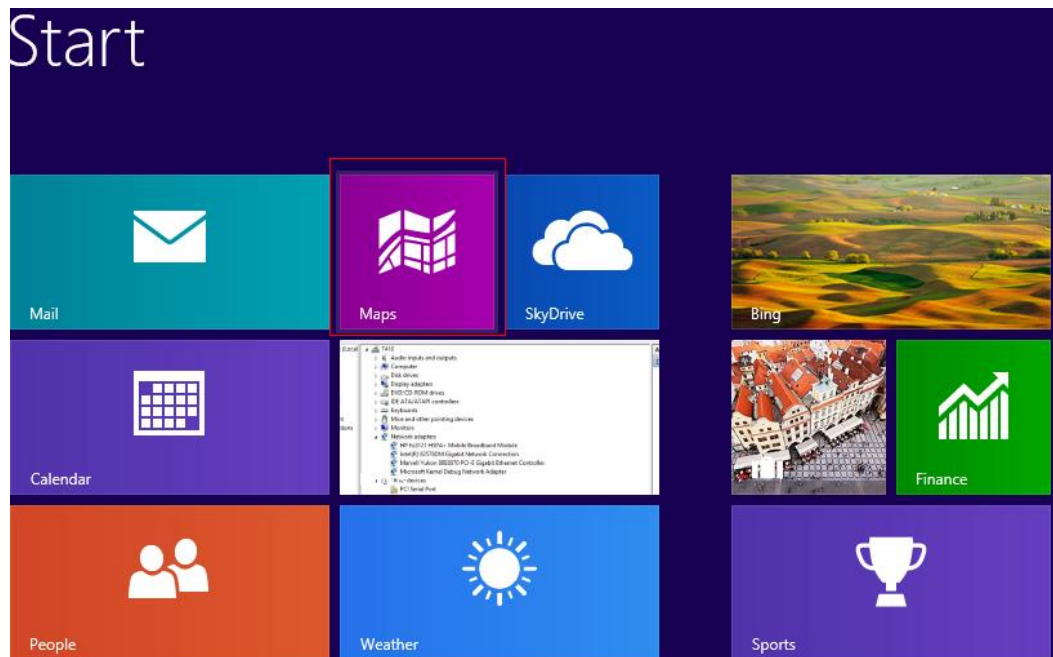
When the content of **State** turns from **Initializing** to **Ready**, the MU736 has obtained its current position information. Under **Data**, you can view the GPS location information, including the latitude, longitude, altitude, and system time of the MU736.



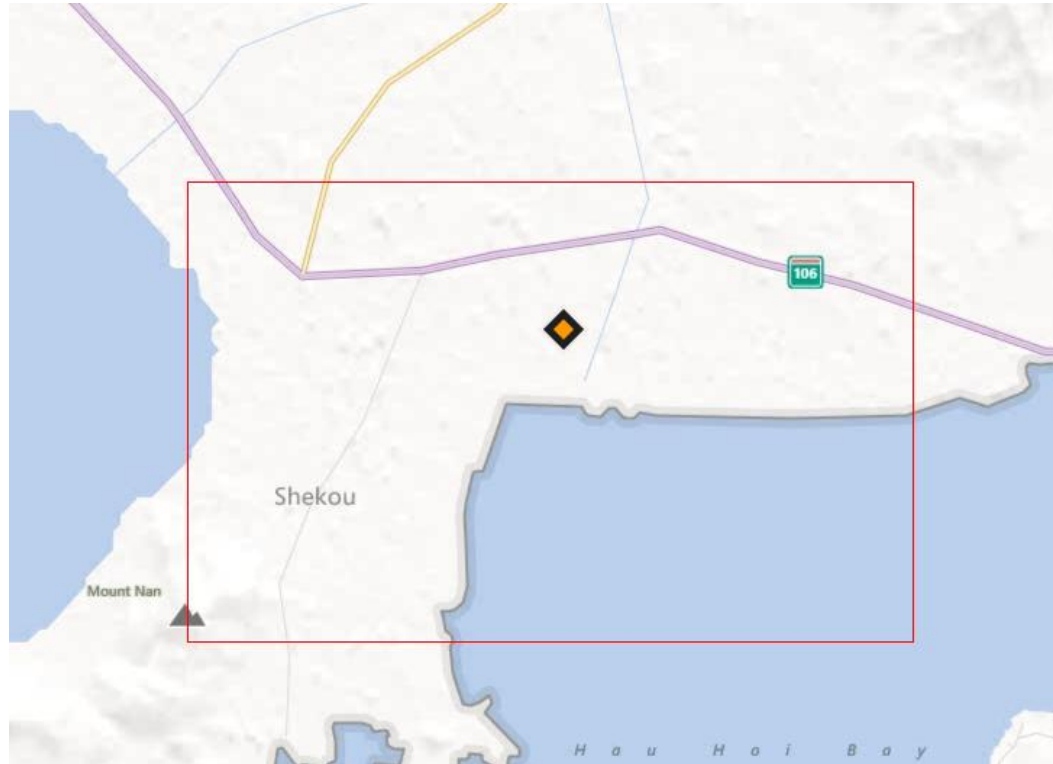
2.4.2 Using the Maps Application

To use the Maps application for GPS positioning:

Step 1 Open Maps.

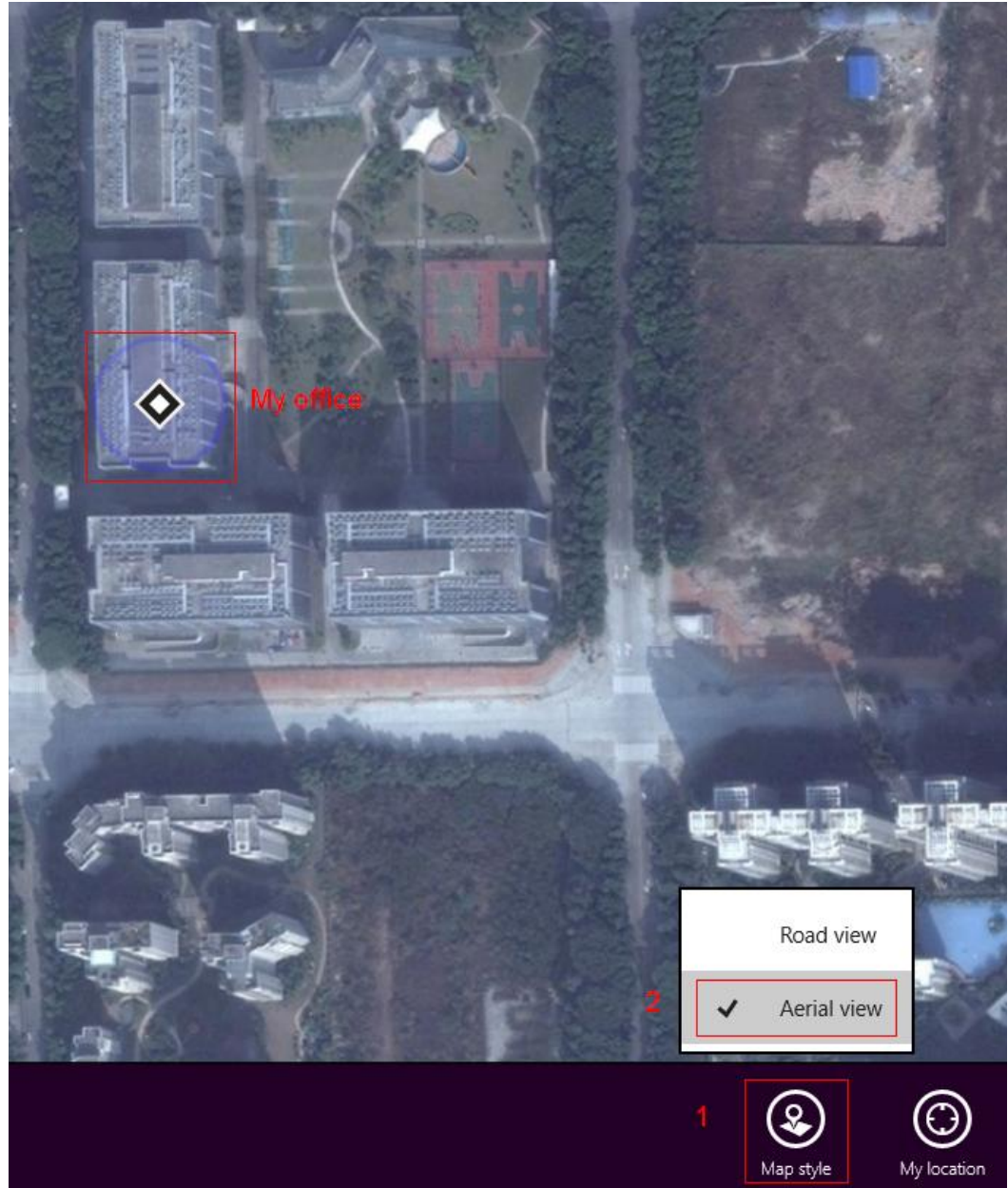


Your current location is displayed on the map within 1 minute. In this example, the location of the Huawei Device building is displayed.



Step 2 To have a better view of the current location, click **Map style** at the bottom and select **Aerial view**.

The current location is updated per second. To check the NMEA sentences, access the Bus Hound.



3 GPS Tool User Guide

3.1 Overview

The MU736 GPS Tool is used to test the GPS functions.

Prepare Tools:

NO.	Name	Comment
1	GPS Tool 1.6.0.0	Run the GPS test

3.2 Test Procedure

3.2.1 Setting the Debug Mode

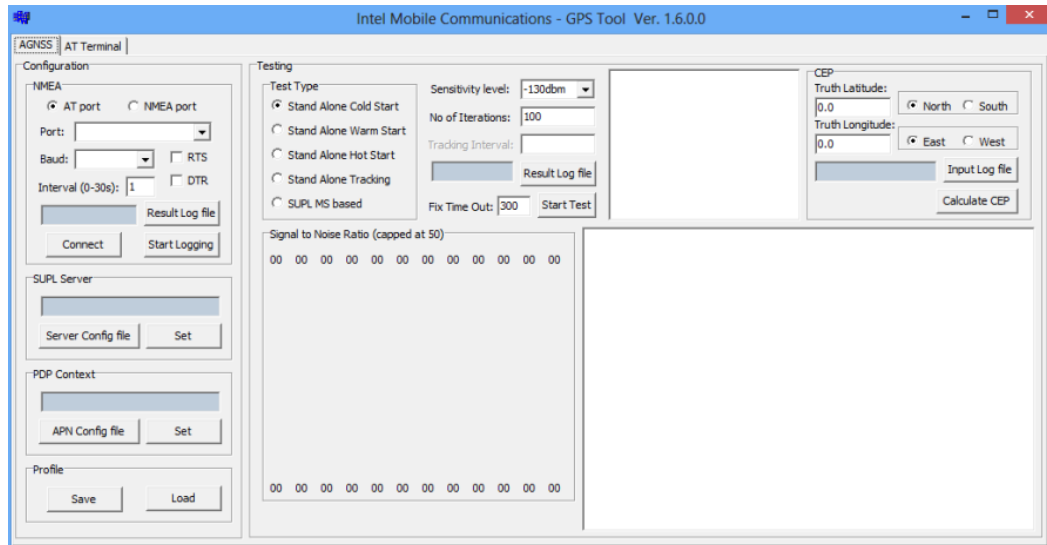
The purpose of this step is to expose the GPS Interface and PC UI Interface in the **Windows 8** system. So if your computer system is Windows 7/Windows XP, please skip this step and run the next step (chapter 3.2.2) directly.

The GPS Tool 1.6.0.0 will enable debug mode **automatically** once you open the GPS Tool; and it will exit debug mode when you close the GPS Tool.

However the driver has the bug that cannot display the interface friendly name. We will resolve it as soon as possible.

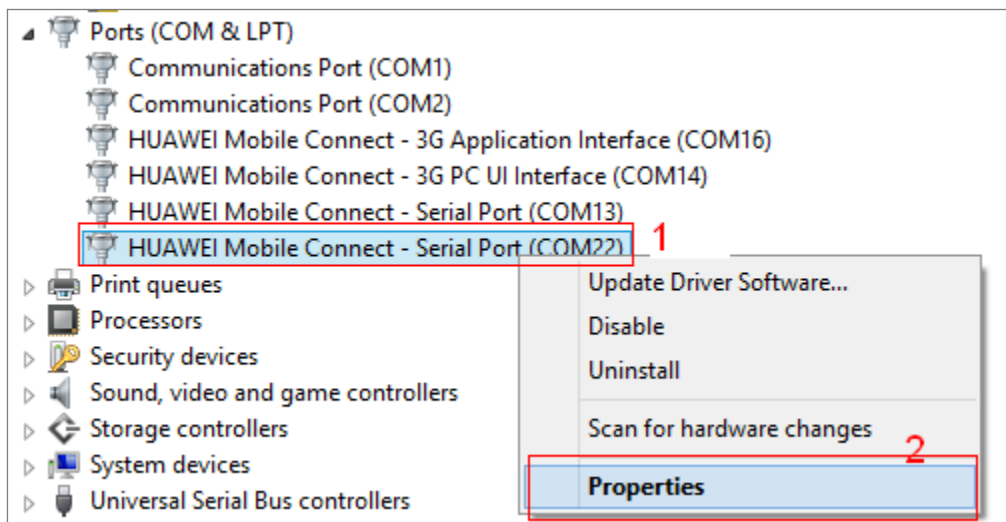
Now the contingency scheme is to distinguish the interface by the following steps.

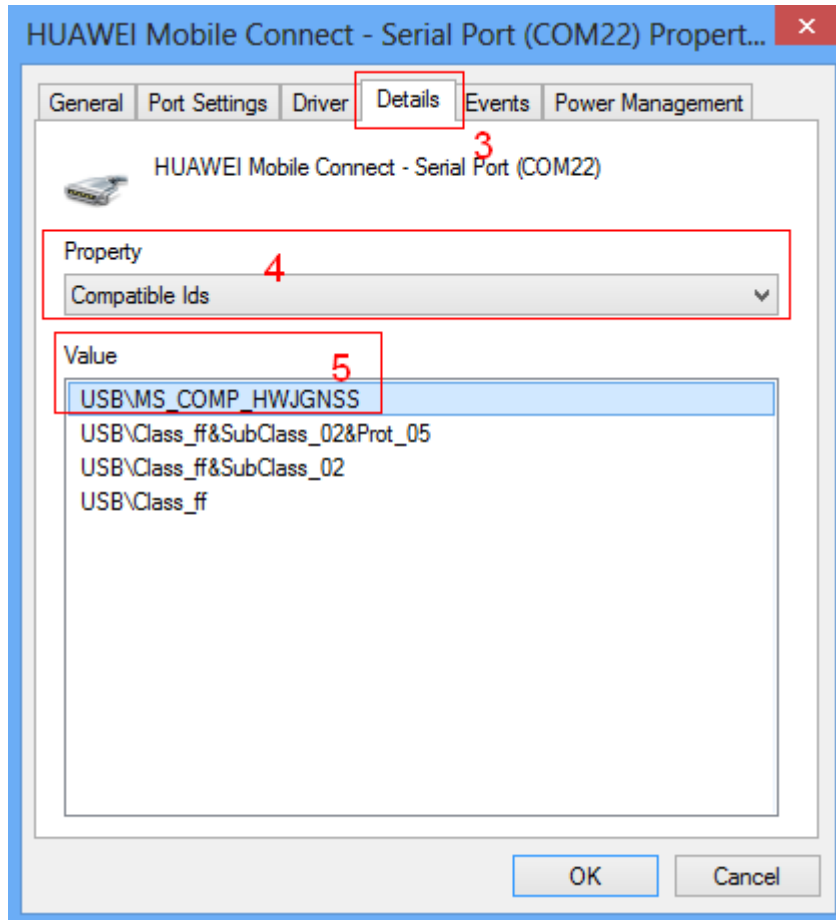
Step 1 Open the GPS Tool.



Step 2 Get the interface friendly name.

- 1) Open the **Ports** list, and choose **HUAWEI Mobile Connect – Serial Port(COM22)**
- 2) Select the **Properties**
- 3) Select the **Details**
- 4) Select the **Compatible Ids** in **Property** list
- 5) Check the interface friendly name in **Value** (It is means that COM22 **USB/MS_COMP_HWJGNSS** is the GPS interface exactly)



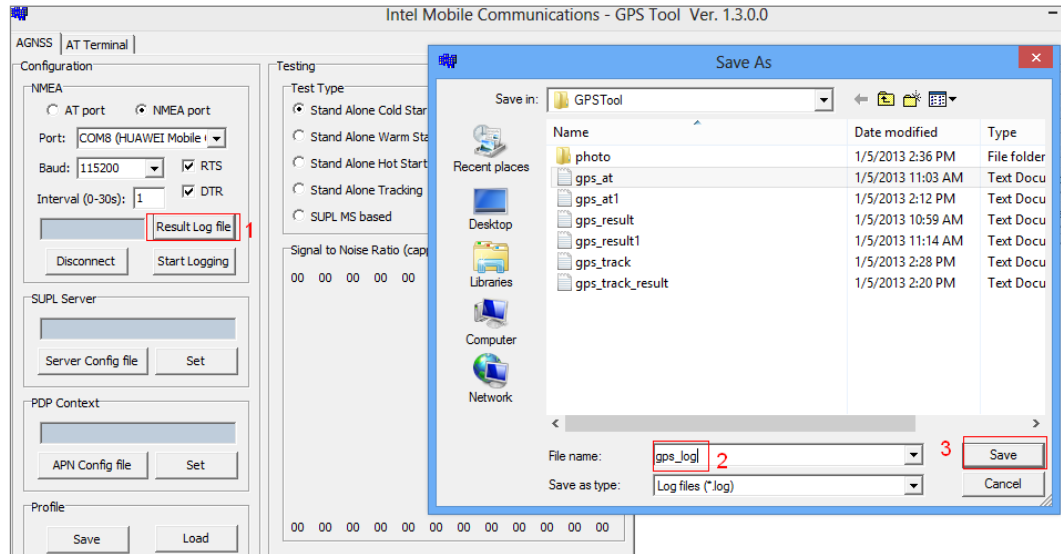


3.2.2 Configuring the Dialog Windows

Create a New Result Log File

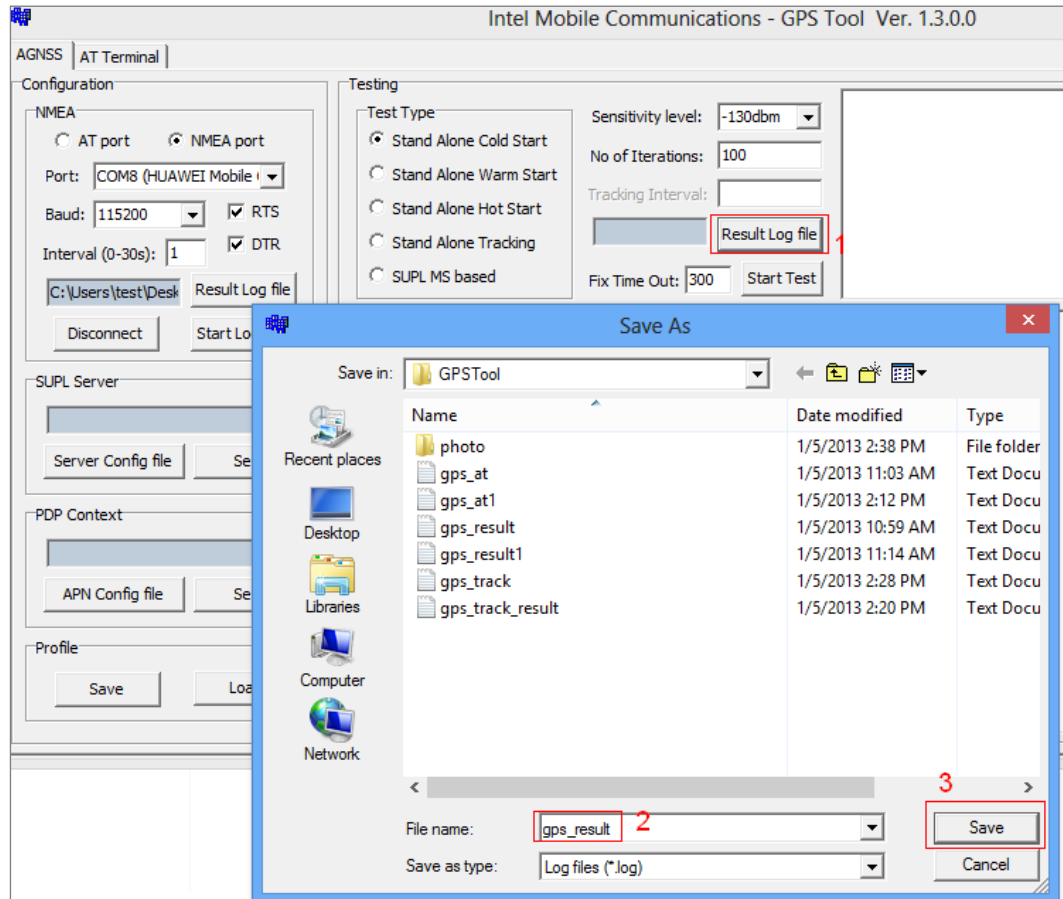
Step 1 Create a new **Result Log file** to store the **locate process log** (named gps_log) in **Configuration > NMEA**.

- 1) Press **Result Log file** button
- 2) Write down a **File name** (gps_log)
- 3) Press **Save** button

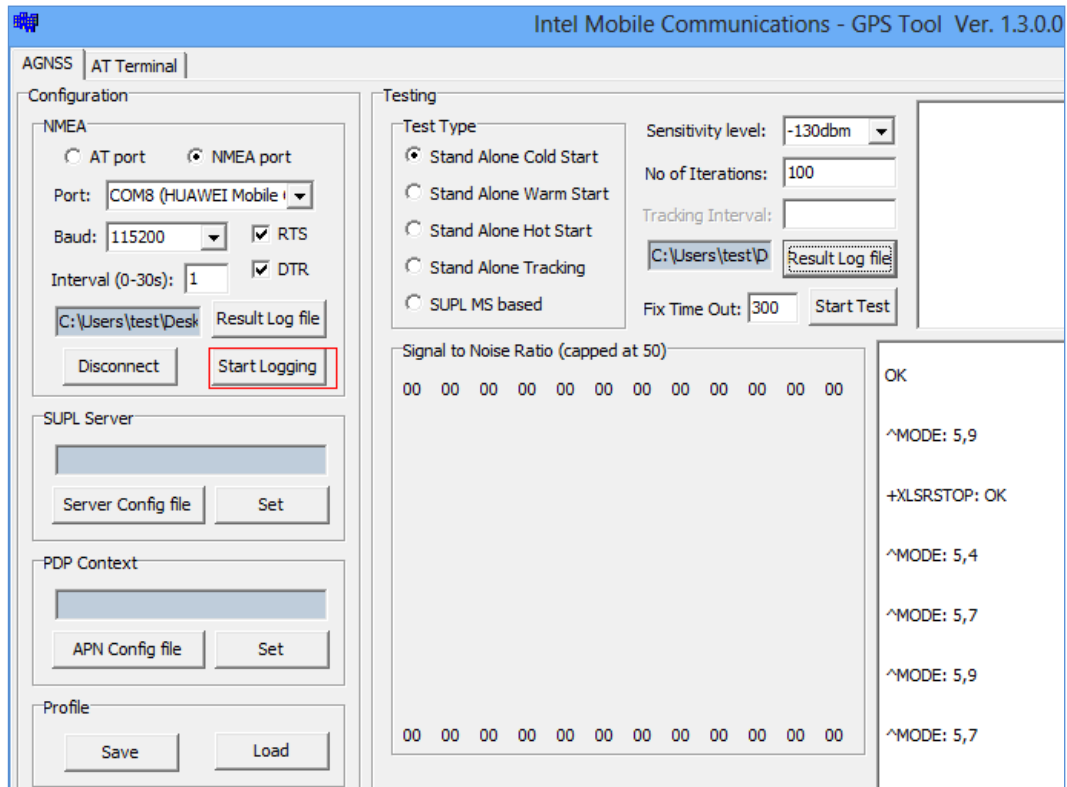


Step 2 Create a new **Result Log file** to store the **position data output** (named **gps_result**) in **Testing**.

- 1) Press **Result Log file** button
- 2) Write down a **File name** (**gps_result**)
- 3) Press **Save** button

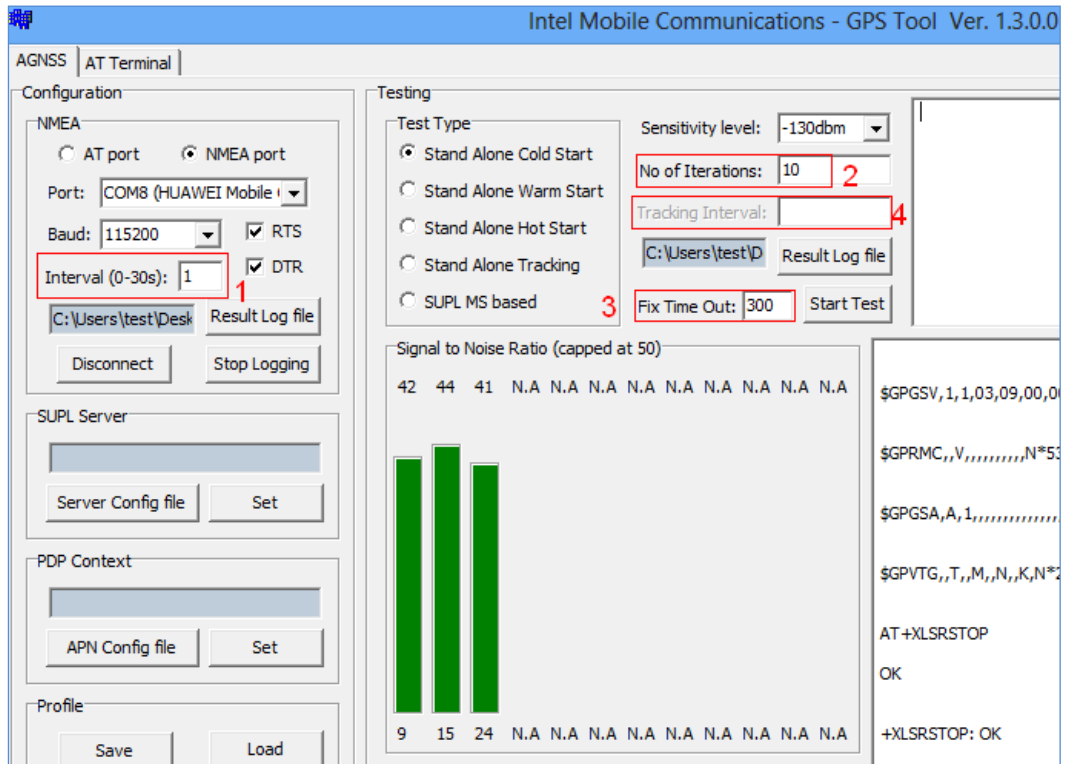


Step 3 Press **Start Logging** button.



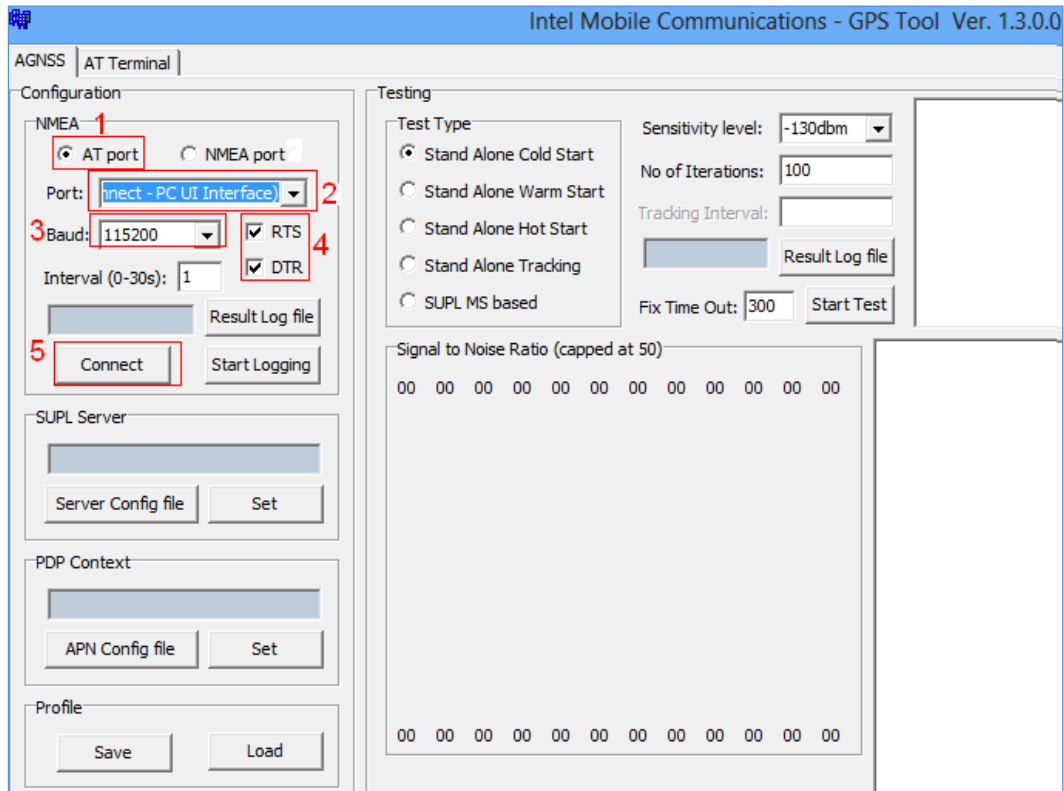
Configure the Fix Settings

- Step 1 Set the NMEA output **Interval**, by which you can set the NMEA sentences output interval. (The default value is 1s.)
- Step 2 Set the **NO. of Iterations**, by which you can decide how many GPS sessions you want to try (It depends on yourself, if you have enough time, the more is the better.)
- Step 3 Set the **Fix Time Out**, by which you can set a GPS session duration. (The default value is 300s.)
- Step 4 Set the **Tracking Interval**, by which you can set a GPS Tracking session interval (only for Stand Alone Tracking test, in which the NMEA output Interval must be the multiple times of Tracking Interval).



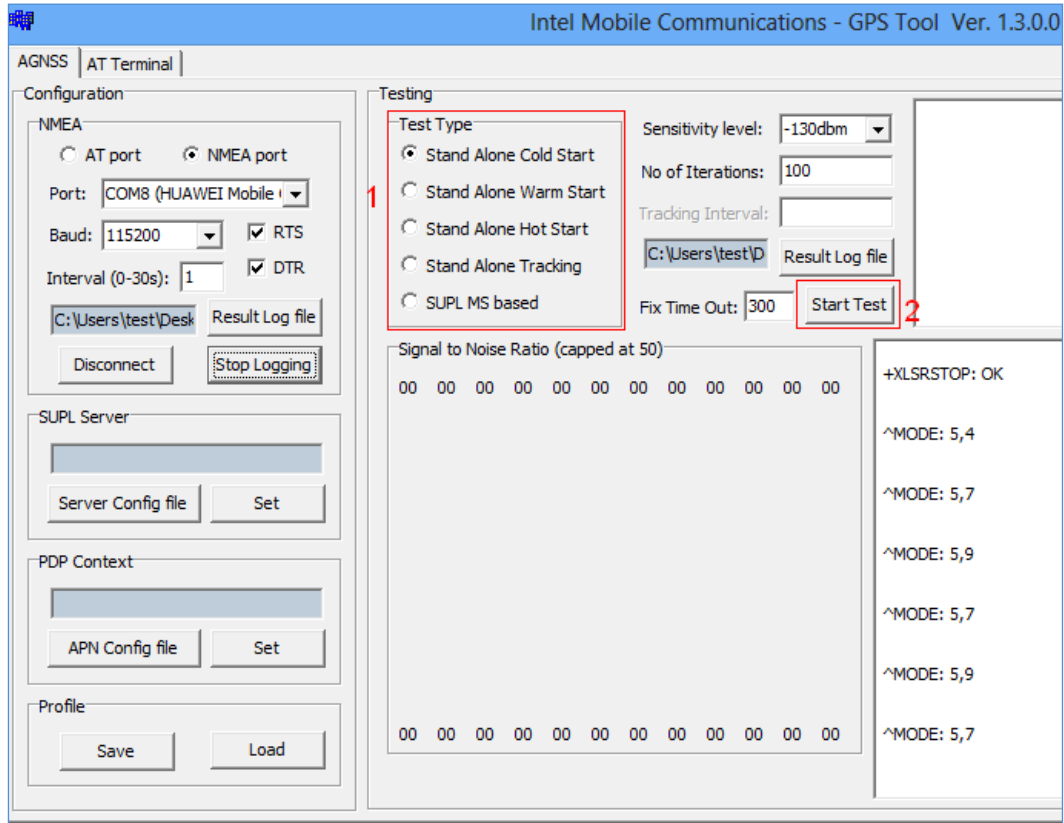
Configure the AT Port

- Step 1 Select the **AT port**.
- Step 2 Select the **PC UI Interface** in **Port** list.
- Step 3 Set the **Baud** rate to **115200**.
- Step 4 Mark the checkboxes (**RTS** and **DTR**).
- Step 5 **Connect** the PC UI Interface as AT port.



Start the GPS Test

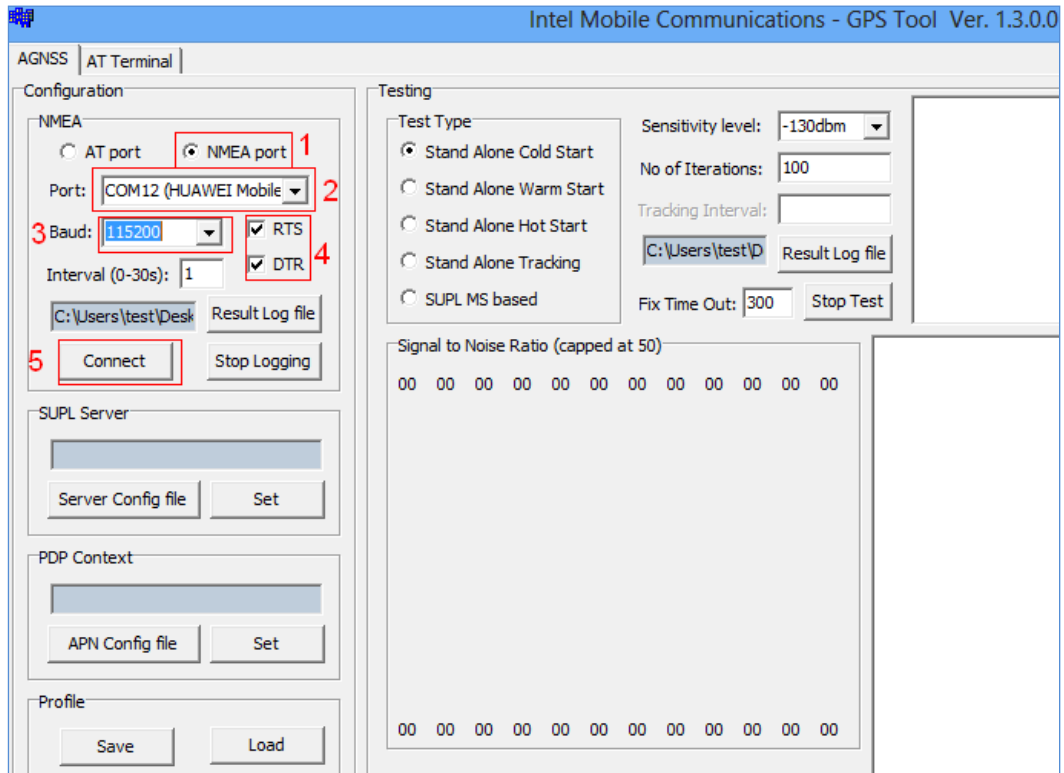
- Step 1 Select **Test Type**, such as **Stand Alone Cold Start**. Note that if you want to select the **SUPL MS based**, you should dial-up and surf on internet at first.
- Step 2 Press **Start Test** button to start the GPS session.



Configure the NMEA Port

Make sure you have pressed **Start Test** before this step.

- Step 1 Select the **NMEA port**.
- Step 2 Select the **GPS Interface** in **Port** list.
- Step 3 Set the **Baud** rate to **115200**.
- Step 4 Mark the checkboxes (**RTS** and **DTR**).
- Step 5 **Connect** the GPS Interface as NMEA port.

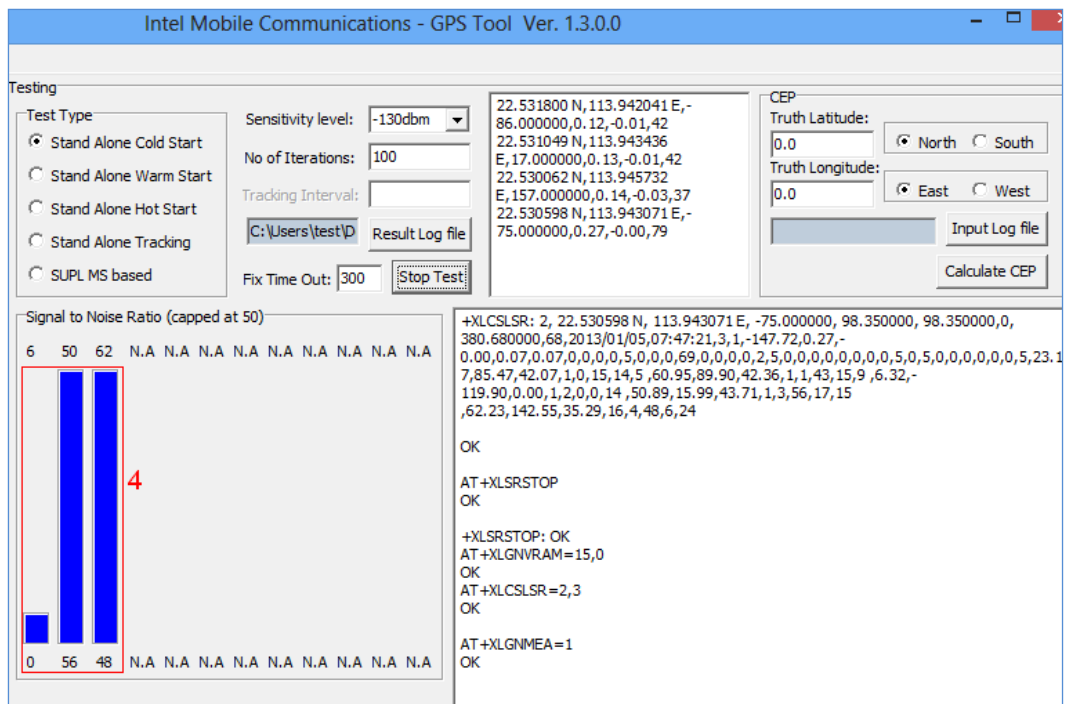
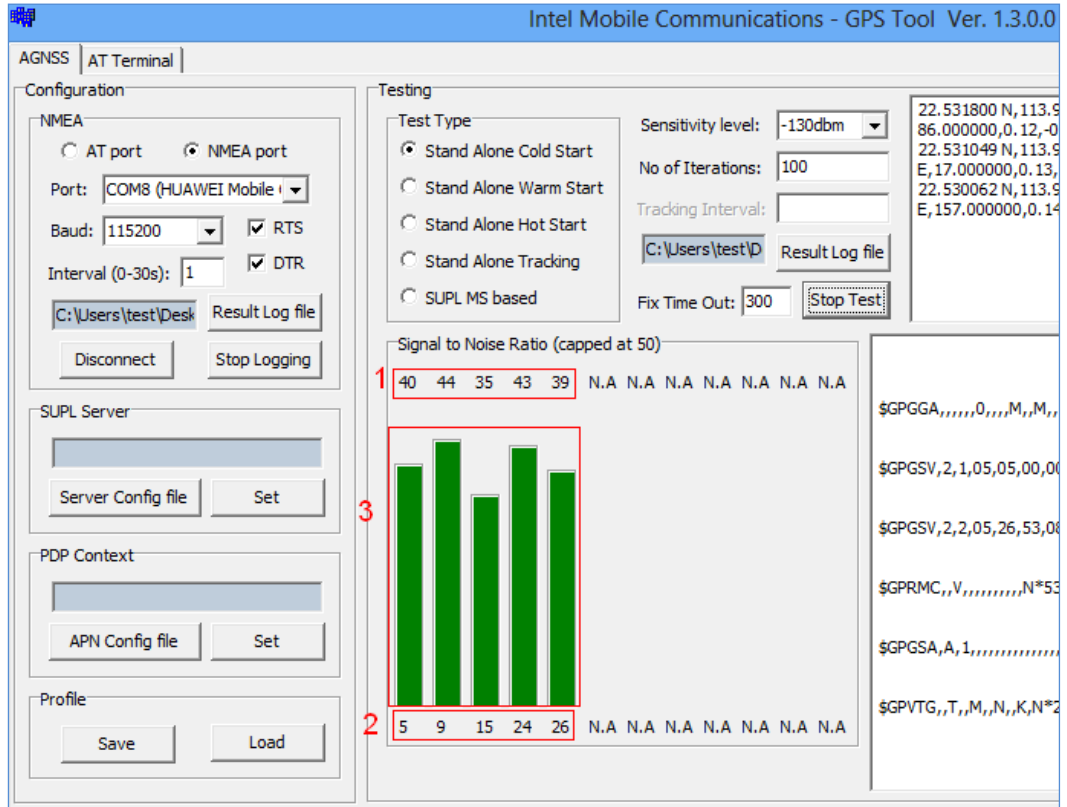


3.3 Checking Window Display

3.3.1 Checking Signal Quality Window

You can get the following data from NMEA sentences:

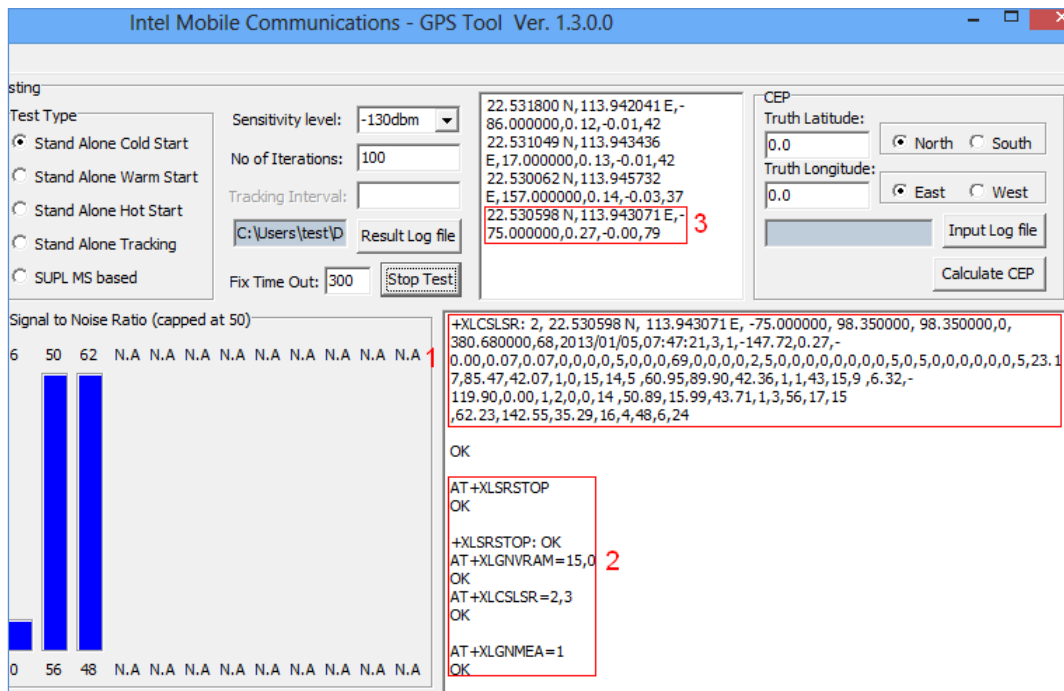
NO.	Item	Description
1	SNR	Raw SNR value is displayed at the top of each bar which is capped at 50.
2	Satellite ID	They are shown at the bottom of each bar.
3	Green bars	The color of bars changes to green during acquisition.
4	Blue bars	The color of bars changes to blue after position is acquired.



3.3.2 Checking Location Data Window

Once the position is acquired, the following data will be shown in the window and logged in the result log file.

NO.	Item	Description
1	Specific Location Data	Contains all data you can get from NMEA sentences.
2	AT Command	Starts the next time location.
3	Summary Location Data	Contains summary location data which are: <ul style="list-style-type: none"> • Latitude and Longitude, Directions • Altitude • Speed (Horizontal & Vertical) • TTFF



The screenshot shows the 'GPS Tool' interface with the following elements:

- Test Type:** Stand Alone Cold Start (selected).
- Sensitivity level:** -130dbm.
- No of Iterations:** 100.
- Tracking Interval:** (empty).
- Result Log file:** C:\Users\test\...
- Fix Time Out:** 300.
- CEP (Circular Error Probability):** Truth Latitude: 0.0, Truth Longitude: 0.0.
- Signal to Noise Ratio (SNR) bars:** A bar chart showing SNR values for various channels. The first bar is at 50, the second at 62, and others are N.A.
- Specific Location Data (3):**

```

22.531800 N, 113.942041 E, -86.000000, 0.12, -0.01, 42
22.531049 N, 113.943436 E, 17.000000, 0.13, -0.01, 42
22.530062 N, 113.945732 E, 157.000000, 0.14, -0.03, 37
22.530598 N, 113.943071 E, -75.000000, 0.27, -0.00, 79

```
- AT Command (2):**

```

+XLSRSTOP
OK
+XLSRSTOP: OK
AT+XLGNVRAM=15,0
OK
AT+XLSR=2,3
OK
AT+XLGNMEA=1
OK

```
- Summary Location Data (1):**

```

+XLSR: 2, 22.530598 N, 113.943071 E, -75.000000, 98.350000, 98.350000, 0, 380.680000, 68, 2013/01/05, 07:47:21, 3, 1, -147.72, 0.27, -0.00, 0.07, 0.07, 0.00, 0.00, 5.0, 0.0, 69.0, 0.0, 2.5, 0.0, 0.0, 0.0, 0.0, 5.0, 5.0, 0.0, 0.0, 5.23, 17.85, 47.42, 0.7, 1.0, 15.14, 5.60, 95.89, 90.42, 36.1, 1.43, 15.9, 6.32, -119.90, 0.00, 1.2, 0.0, 14.50, 89.15, 99.43, 71.1, 3.56, 17.15, 62.23, 142.55, 35.29, 16.4, 48.6, 24

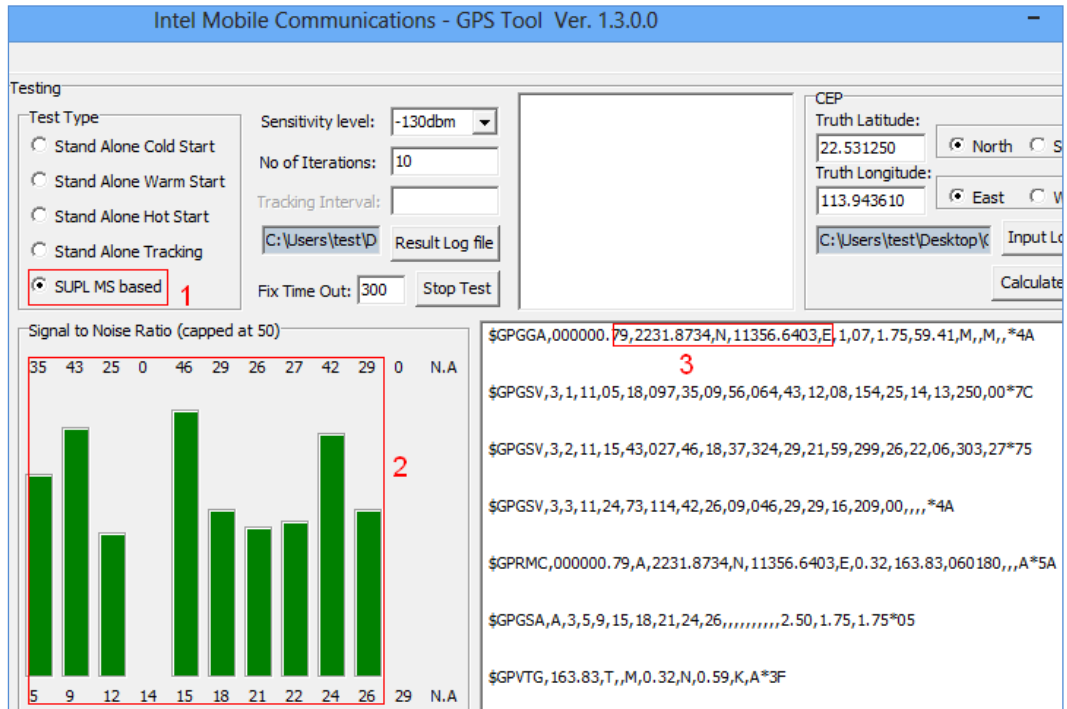
```

3.3.3 Checking A-GPS Location Window

Because there is no need to get the TTFF in A-GPS mode, and our specification is track fix.

NO.	Item	Description
1	Test Type	SUPL MS based
2	SNR bars	Doesn't change color in A-GPS.

NO.	Item	Description
3	Location data	When the Latitude, Longitude and Directions displayed, it means that we have acquired the position.



Intel Mobile Communications - GPS Tool Ver. 1.3.0.0

Testing

Test Type

- Stand Alone Cold Start
- Stand Alone Warm Start
- Stand Alone Hot Start
- Stand Alone Tracking
- SUPL MS based **1**

Sensitivity level: -130dbm

No of Iterations: 10

Tracking Interval: []

[C:\Users\test\D] Result Log file

Fix Time Out: 300 Stop Test

CEP

Truth Latitude: 22.531250 North S

Truth Longitude: 113.943610 East W

[C:\Users\test\Desktop\] Input Lc Calculate

Signal to Noise Ratio (capped at 50)

35	43	25	0	46	29	26	27	42	29	0	N.A
5	9	12	14	15	18	21	22	24	26	29	N.A

2

```

$GPGGA,0.000000,79,2231.8734,N,11356.6403,E,1,07,1.75,59.41,M,,,*4A
$GPGSV,3,1,11,05,18,097,35,09,56,064,43,12,08,154,25,14,13,250,00*7C
$GPGSV,3,2,11,15,43,027,46,18,37,324,29,21,59,299,26,22,06,303,27*75
$GPGSV,3,3,11,24,73,114,42,26,09,046,29,29,16,209,00,,,,*4A
$GPRMC,0.000000,79,A,2231.8734,N,11356.6403,E,0.32,163.83,060180,,,A*5A
$GPGSA,A,3,5,9,15,18,21,24,26,,,,,,,,,2.50,1.75,1.75*05
$GPVTG,163.83,T,,M,0.32,N,0.59,K,A*3F

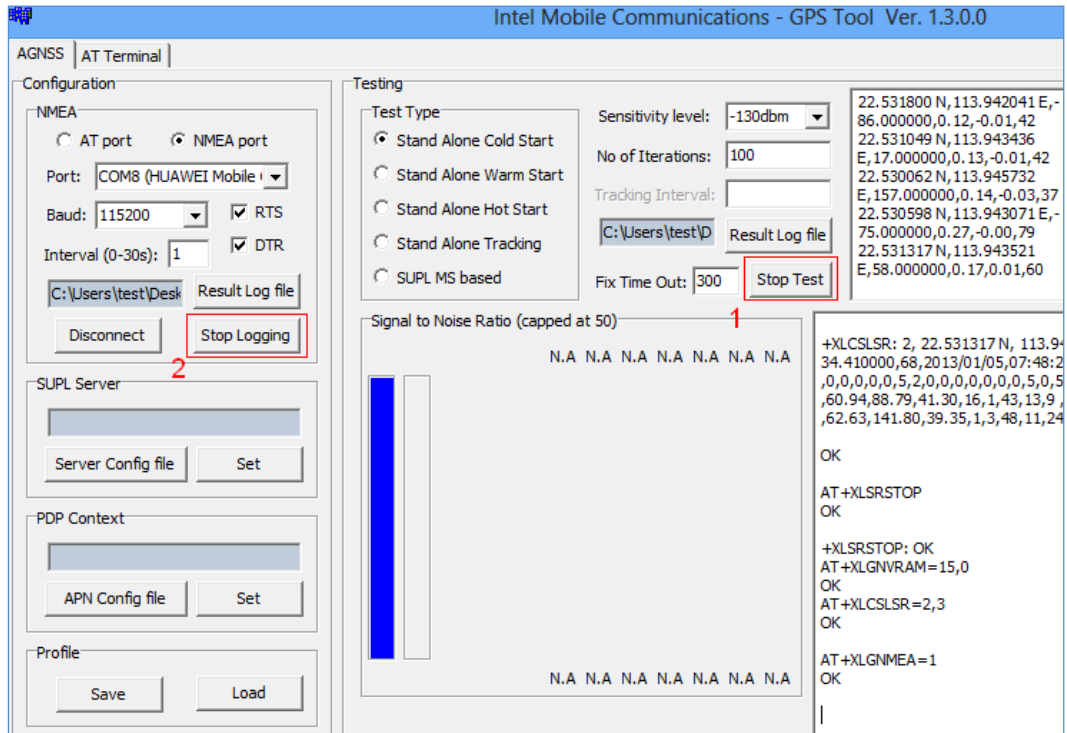
```

3

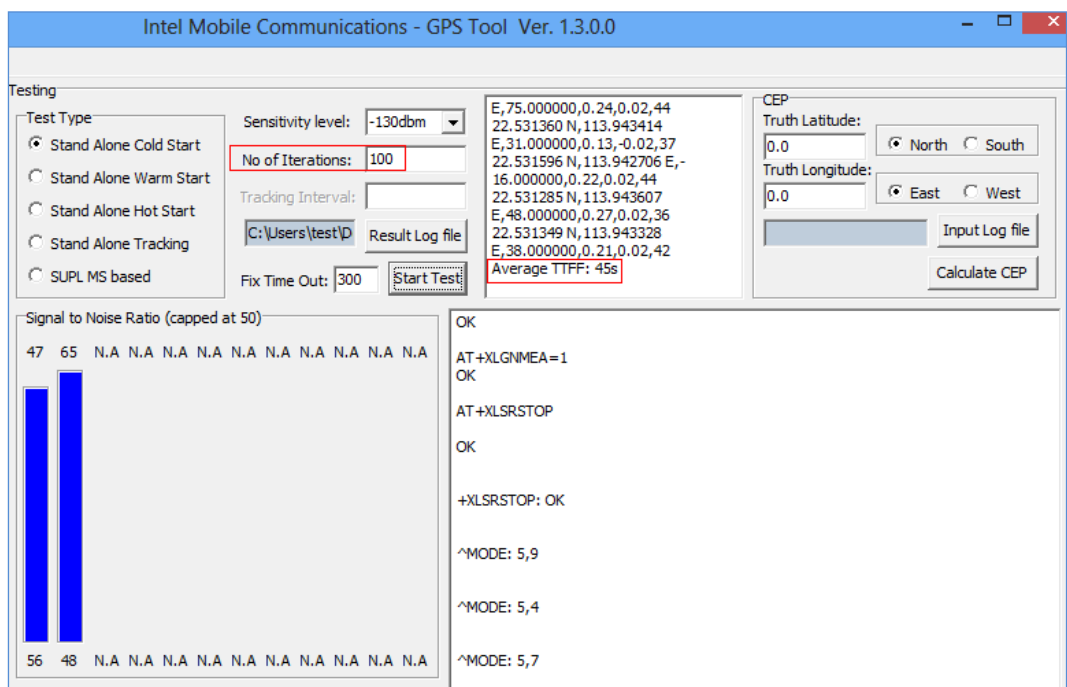
3.4 Calculating CEP

3.4.1 Averaging TTFF

After all tests (**NO. of iterations**) have finished or you artificially press the **Stop Test**, you should **Stop Logging** subsequently.



Then the **Average TTFF** will be calculated.



You can see the detailed position result in the **position data** output document (named gps_result.txt).

```

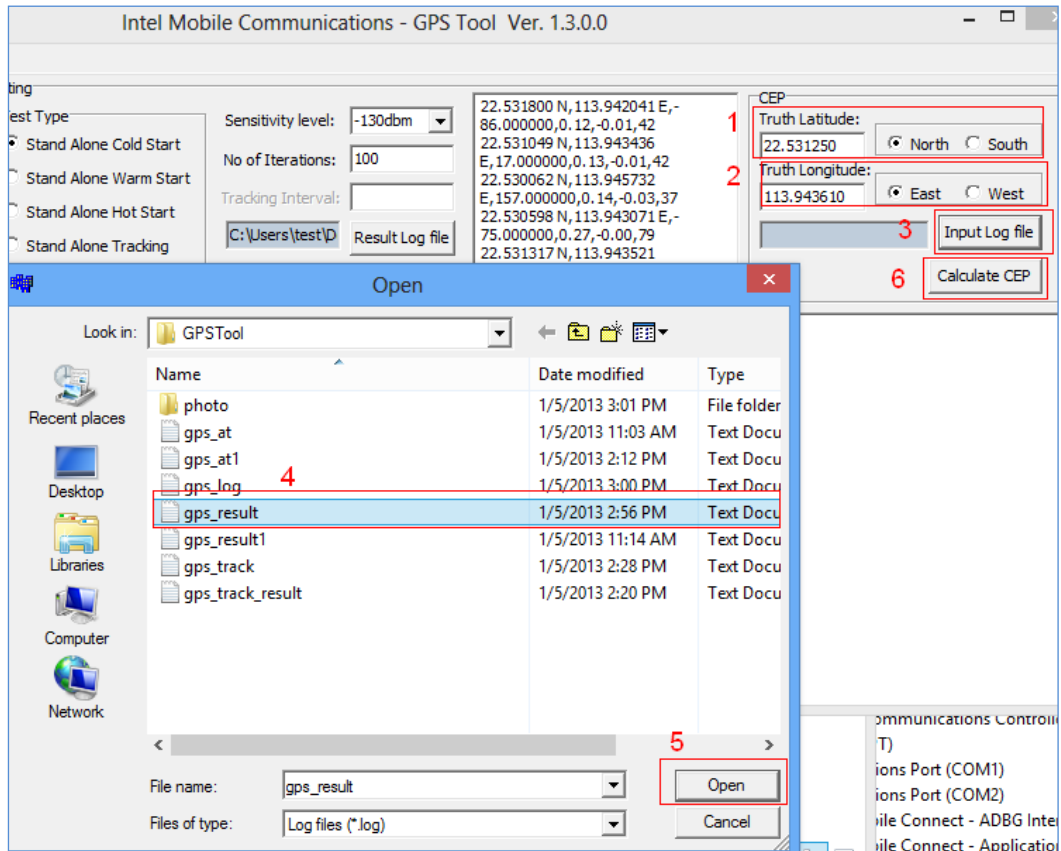
gps_result - Notepad
File Edit Format View Help
22.530877 N,113.943157 E,61.000000,0.09,0.01,240
22.530952 N,113.943457 E,132.000000,0.13,-0.02,50
22.531167 N,113.943886 E,47.000000,0.19,-0.01,45
22.531124 N,113.943843 E,21.000000,0.21,-0.02,35
22.531381 N,113.943393 E,72.000000,0.15,0.01,57
22.531360 N,113.944015 E,43.000000,0.04,0.00,57
22.530974 N,113.943414 E,129.000000,0.07,-0.01,88
22.531113 N,113.943758 E,-13.000000,0.09,-0.00,51
22.531800 N,113.942041 E,-86.000000,0.12,-0.01,42
22.531049 N,113.943436 E,17.000000,0.13,-0.01,42
22.530062 N,113.945732 E,157.000000,0.14,-0.03,37
22.530598 N,113.943071 E,-75.000000,0.27,-0.00,79
22.531317 N,113.943521 E,58.000000,0.17,0.01,60
22.531027 N,113.943178 E,-31.000000,0.17,-0.00,48
22.530963 N,113.943436 E,-7.000000,0.11,-0.01,35
22.531135 N,113.943779 E,37.000000,0.42,-0.01,43
22.531360 N,113.943779 E,66.000000,0.08,0.01,56
22.531349 N,113.943886 E,63.000000,0.20,0.02,37
22.531349 N,113.943865 E,75.000000,0.24,0.02,44
22.531360 N,113.943414 E,31.000000,0.13,-0.02,37
22.531596 N,113.942706 E,-16.000000,0.22,0.02,44
22.531285 N,113.943607 E,48.000000,0.27,0.02,36
22.531349 N,113.943328 E,38.000000,0.21,0.02,42
  
```

Take the example of **22.531349 N,113.943328 E, 38.000000,0.21,0.02,42**, the specific meaning of these data:

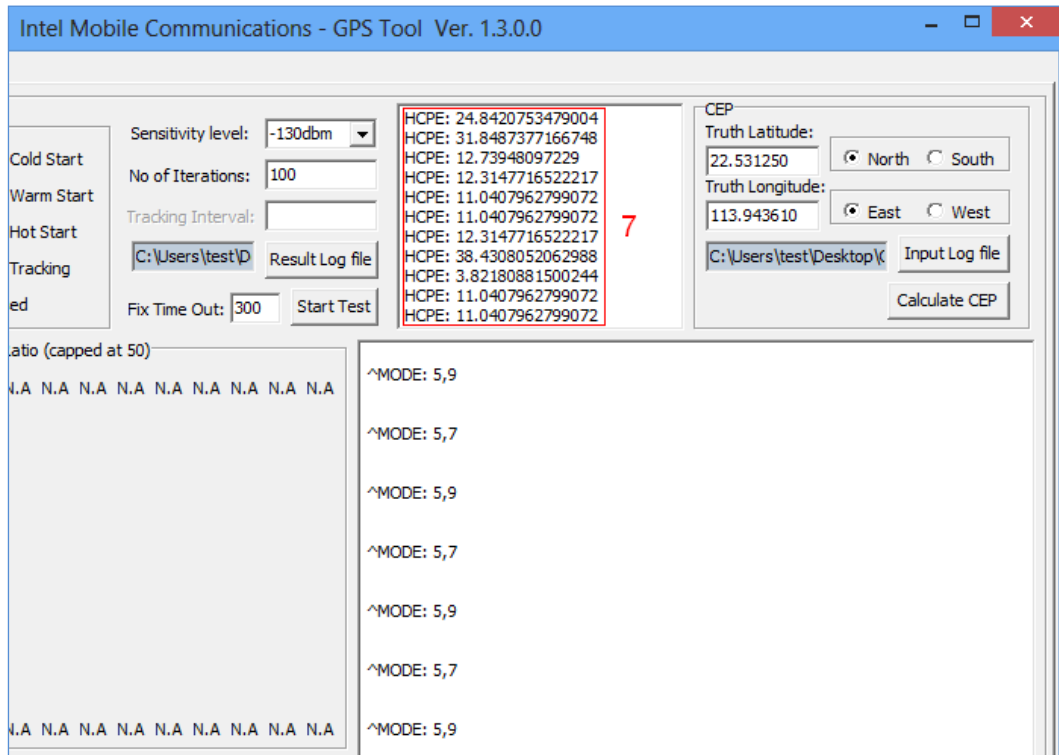
22.531349	Latitude
N	Directions
113.943328	Longitude
E	Directions
38.000000	Altitude(m)
0.21	Horizontal Speed(km/h)
0.02	Vertical Speed(km/h)
42	TTFF(s)

3.4.2 Calculating CEP

- Step 1 Input **Truth Latitude** value with direction.
- Step 2 Input **Truth Longitude** value with direction.
- Step 3 Input **log file** (the same as the **position data** output document (named gps_result.txt) as substep 3-5 in the following figure.
- Step 4 Press **Calculate CEP** button as substep 6.



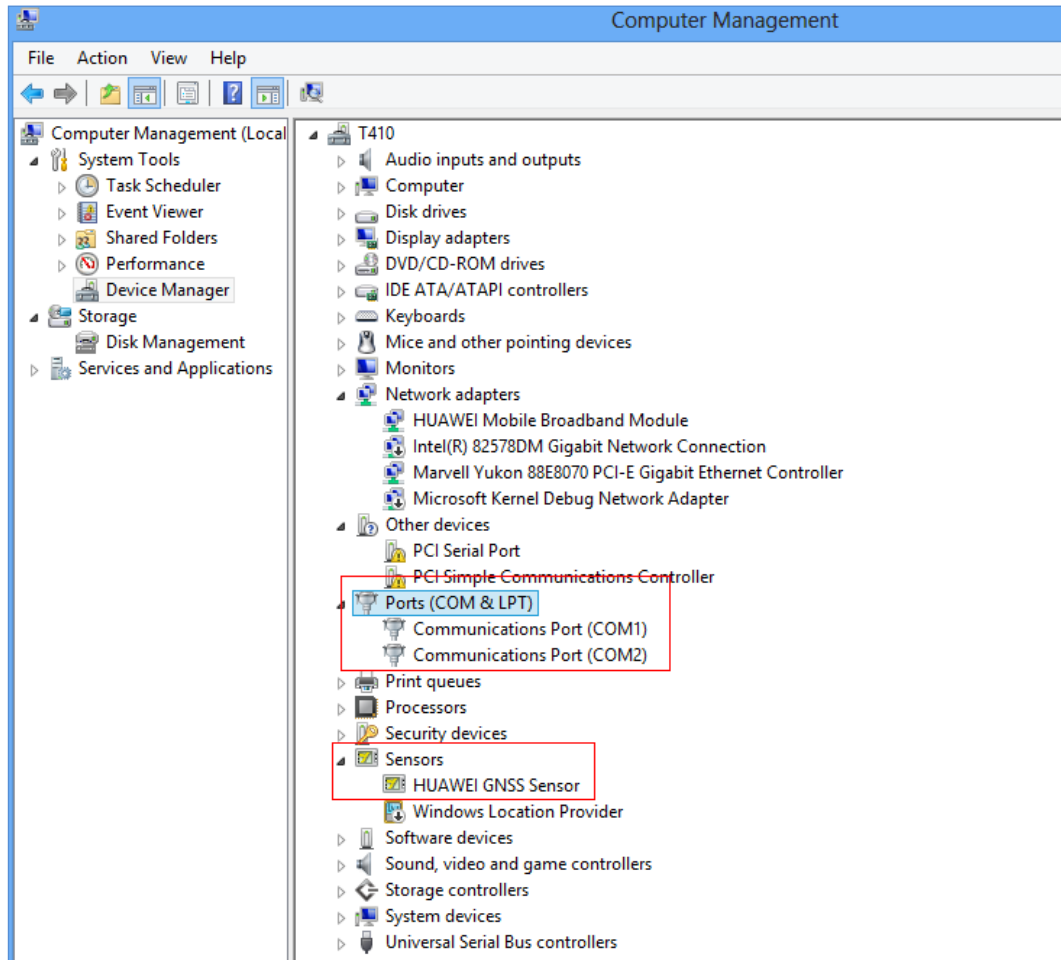
The **HCPE** result will be saved in the <Result Log File>_CEP.txt (named gps_result_CEP.txt here), and you can see it in the window too.



3.5 Exiting the GPS Tool

The module will exit the debug mode once you close the GPS Tool.

Then you cannot see the GPS interface and PC UI interface in the **Device Manager**. But the **HUAWEI GNSS Sensor** is still shown in the **Sensors** list.



4 Acronyms and Abbreviations

Acronym or Abbreviation	Expansion
A-GPS/AGPS	Assisted GPS
CEP/CPE	Circular Error Probable
GPS	Global Position System
HCPE	Horizontal Circular Probable Error
NMEA	National Marine Electronics Association
NVM	Non-Volatile Memory
SUPL	Secure User Plane Location
TTFF	Time To First Fix