

ST-1612-DG/B Evaluation Kits

Quick Guide

V 1.0

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LOCOSYS

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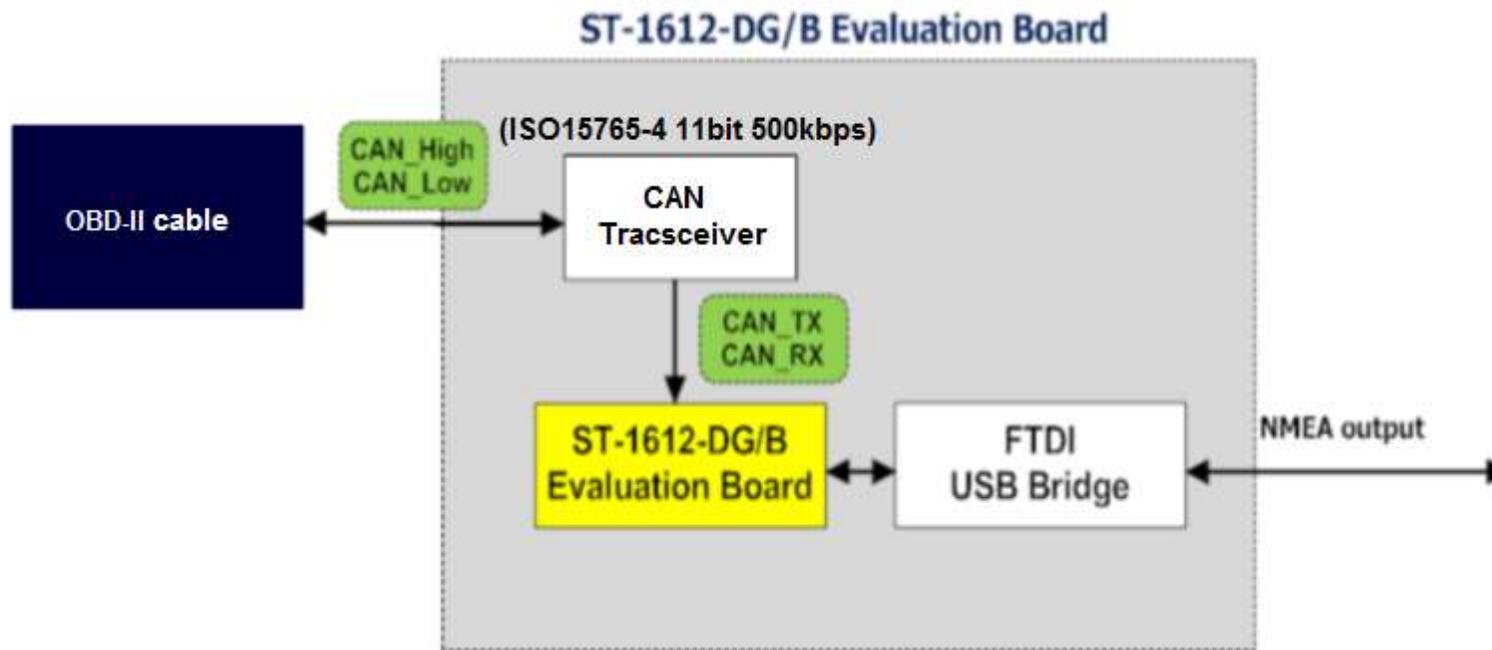
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Part 1. Prepare for Evaluation

➤ Introduction

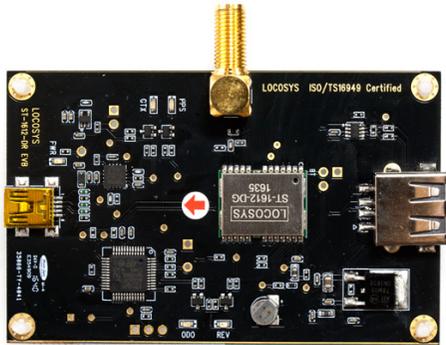
ST-1612-DG/B evaluation kits combine with dead reckoning (DR) GNSS module and OBD-II Cable accomplished the high performance positioning module easy and simple.

➤ ST-1612-DG/B Evaluation Board Diagram



➤ What you can find in the Evaluation Kits?

A. Evaluation Board (EVB)



B. USB Cable



C. GNSS Antenna

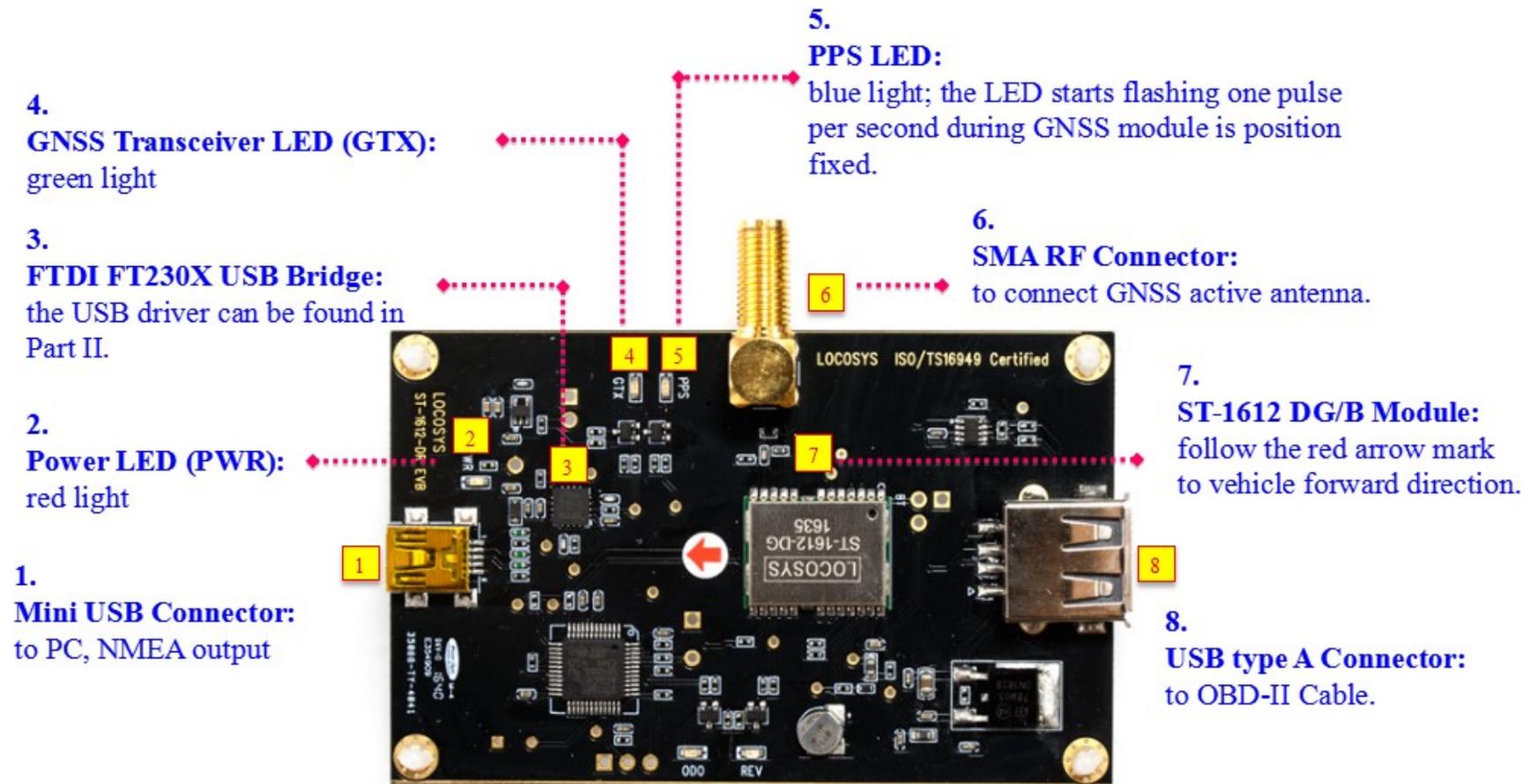


D. OBD-II Cable



OBD-II supported
• **ISO 15765-4 CAN Bus**
(500kbps,11bit)

➤ Board Description



Part II. Installing for USB driver

- **System Requirements:**

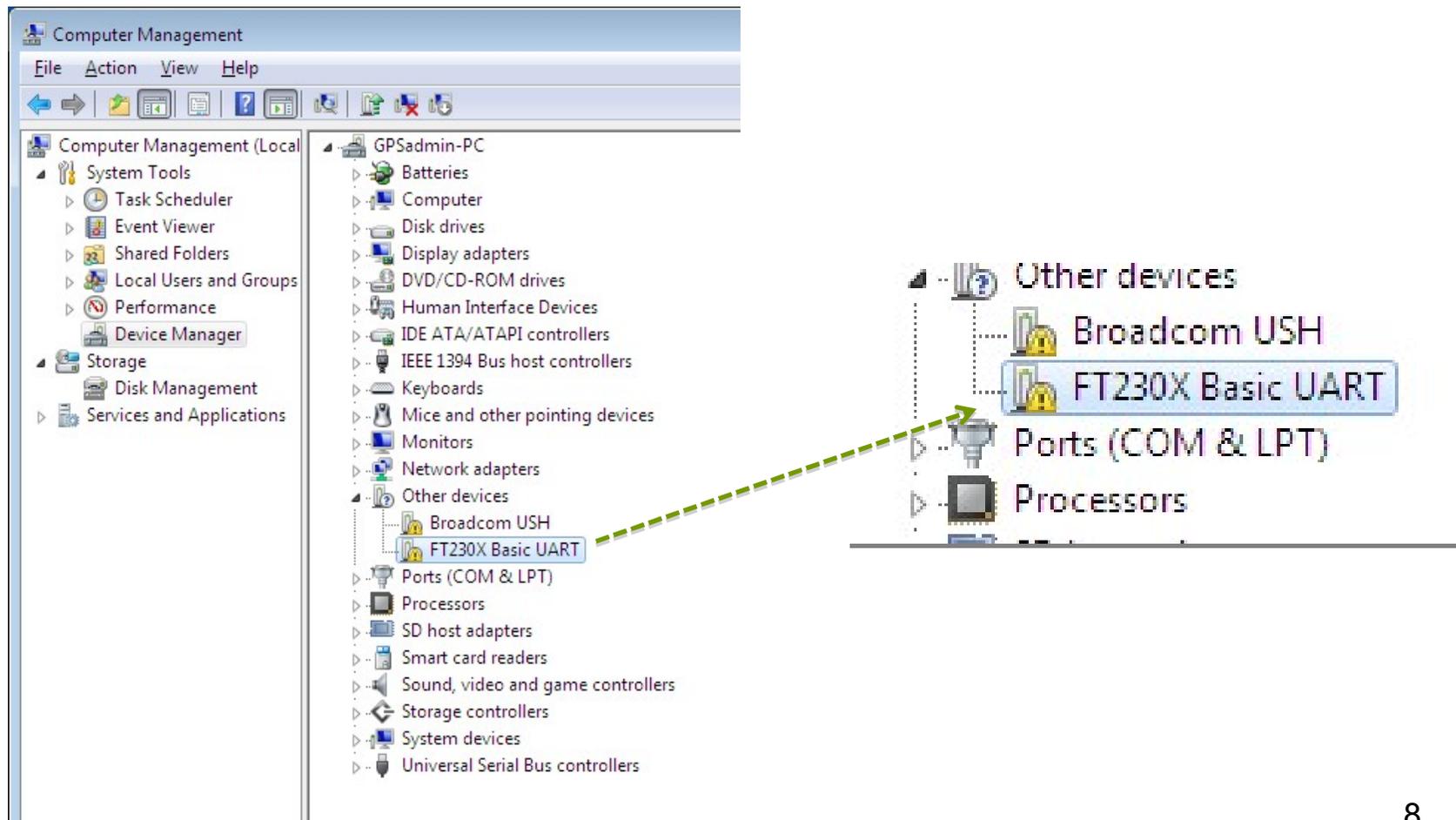
You will need...

- A computer running one of the following Microsoft operating systems:
 - Windows 7
 - Windows Vista
 - Windows XP with Service Pack3
- A free USB port on the computer
- Internet access

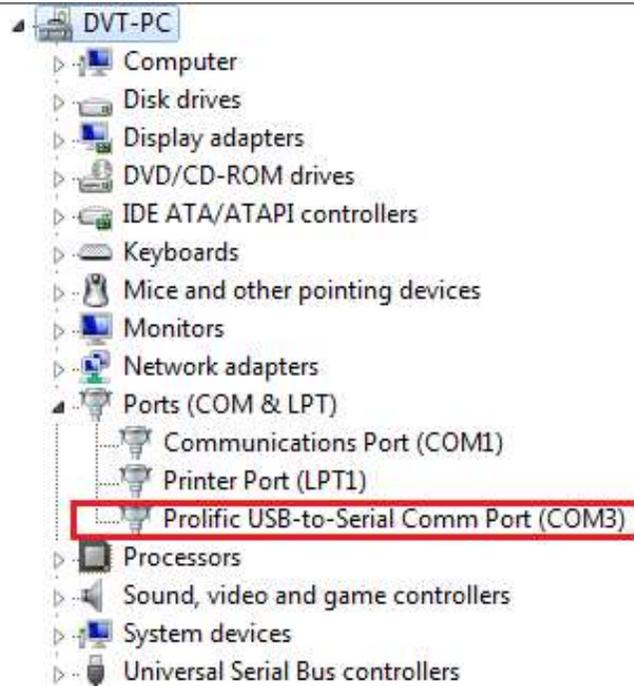
➤ Install FTDI USB Driver

FTDI USB driver download: <http://www.ftdichip/Drivers/VCP.htm>

When plugging in module on your laptop, your host pc will pop out a notice and shows “find a new hardware device”, get into Device Manager and find “FT230X Basic UART”, click right to start update driver software.



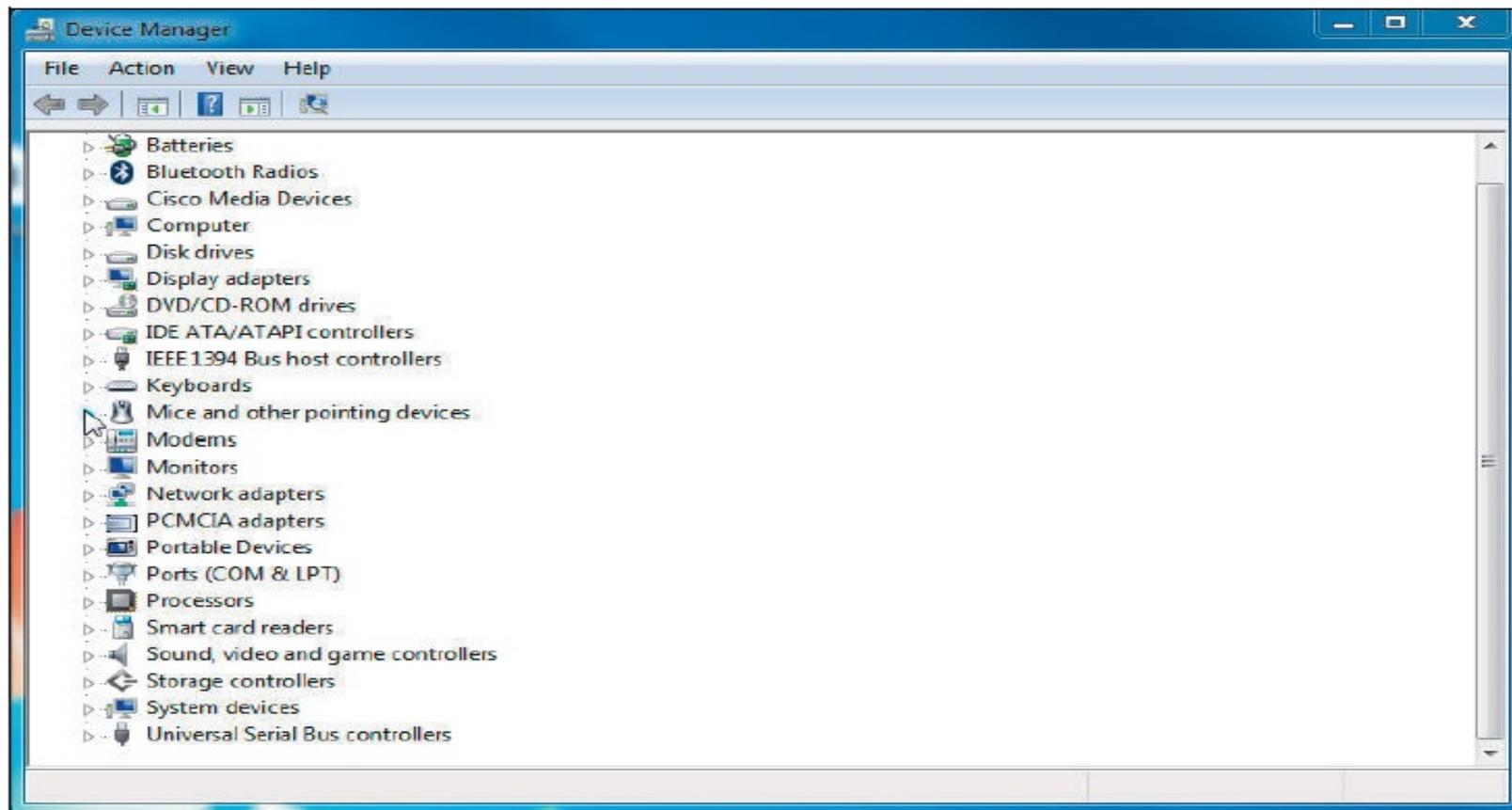
After complete the installation of USB Driver, a new USB comport will be founded as followed.



➤ Disabling the Microsoft serial ballpoint driver

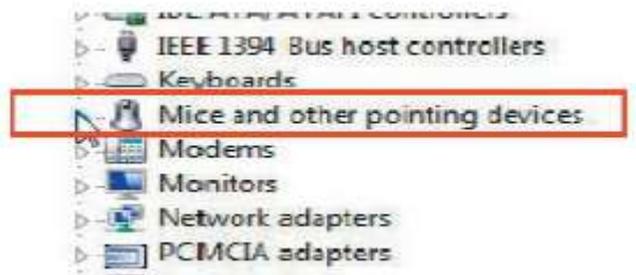
If the mouse pointer jumps around on the screen, check the system tray to see if the Microsoft serial ballpoint (mouse pointer) device has been enabled. If this is the case, do the following to disable it:

1. Unplugging USB connector on your laptop to stop the pointer jumping.
2. On the computer, open the Device Manager:



(Note: In the Windows 7 Start menu,enter Device Manager in the Search field and then select it from the results list under the Control Panel heading.)

3. Expand the Mice and other pointing devices node.



4. If Microsoft Serial BallPoint is listed,right-click it and then select Disable.



5. plugging USB connector on your laptop again.

Part III. Demonstrate the EVK on Vehicle

*To fulfilled calibration of ST-1612-DG/B Evaluation Kit,
we advise you to meet demonstration requirements*

- **Required environment: Open Sky**
- **Type of Advised Testing Vehicle: Sedan**



(In this quick guide, we drive Nissan Cefiro & TOYOTA Camry for demonstration)

➤ **Step 1. Place EVB on the center of Console**

Horizontally place the Evaluation Board (EVB) on the center of Console.

To avoid the EVB displacement or rotation, stick a foam tape can make it stably.

➤ **IMPORTANT**

1. The red arrow “” which can be found on the EVB, should be pointed to the vehicle front.
2. In the real situation, the module is equipped inside the dashboard.

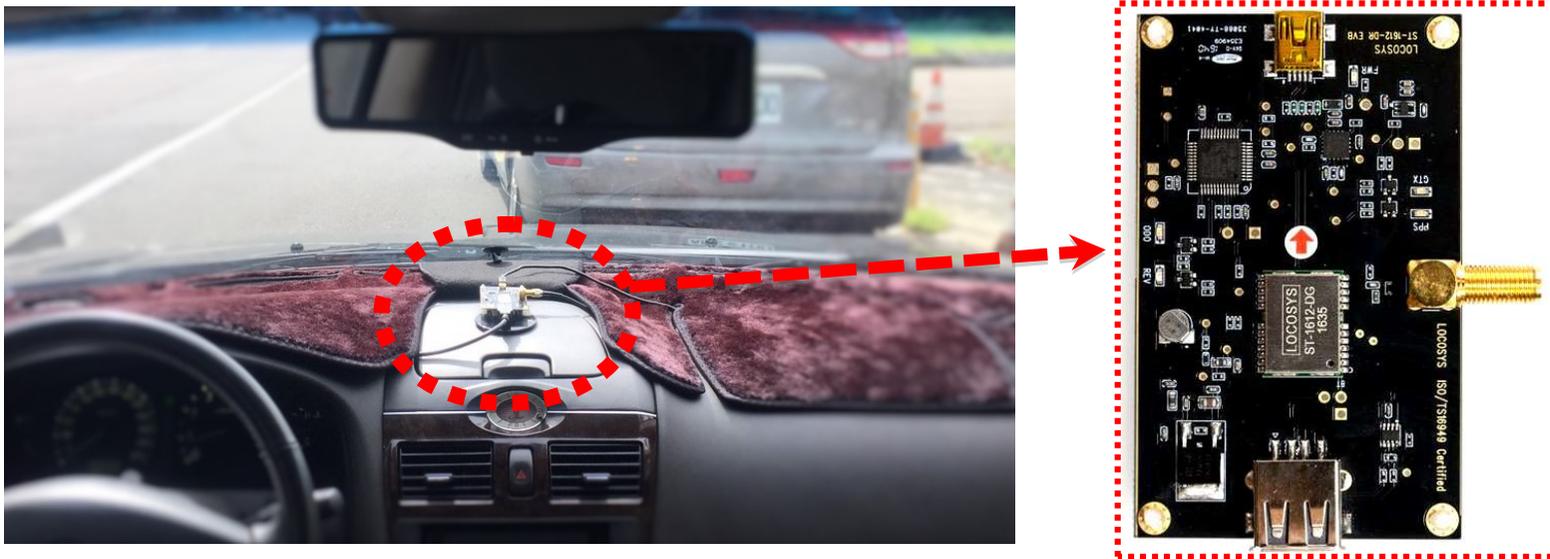


Figure 1. Place EVB on the center of Console

➤ **Step 2. Connect to EVB**

(Warning: To plug out the OBDII reader, the engine MUST be turn off. If the engine is on, it may cause the EVB to work not properly.)

- Connect to 1. GNSS Antenna, 2. USB Cable, 3. OBD-II Cable

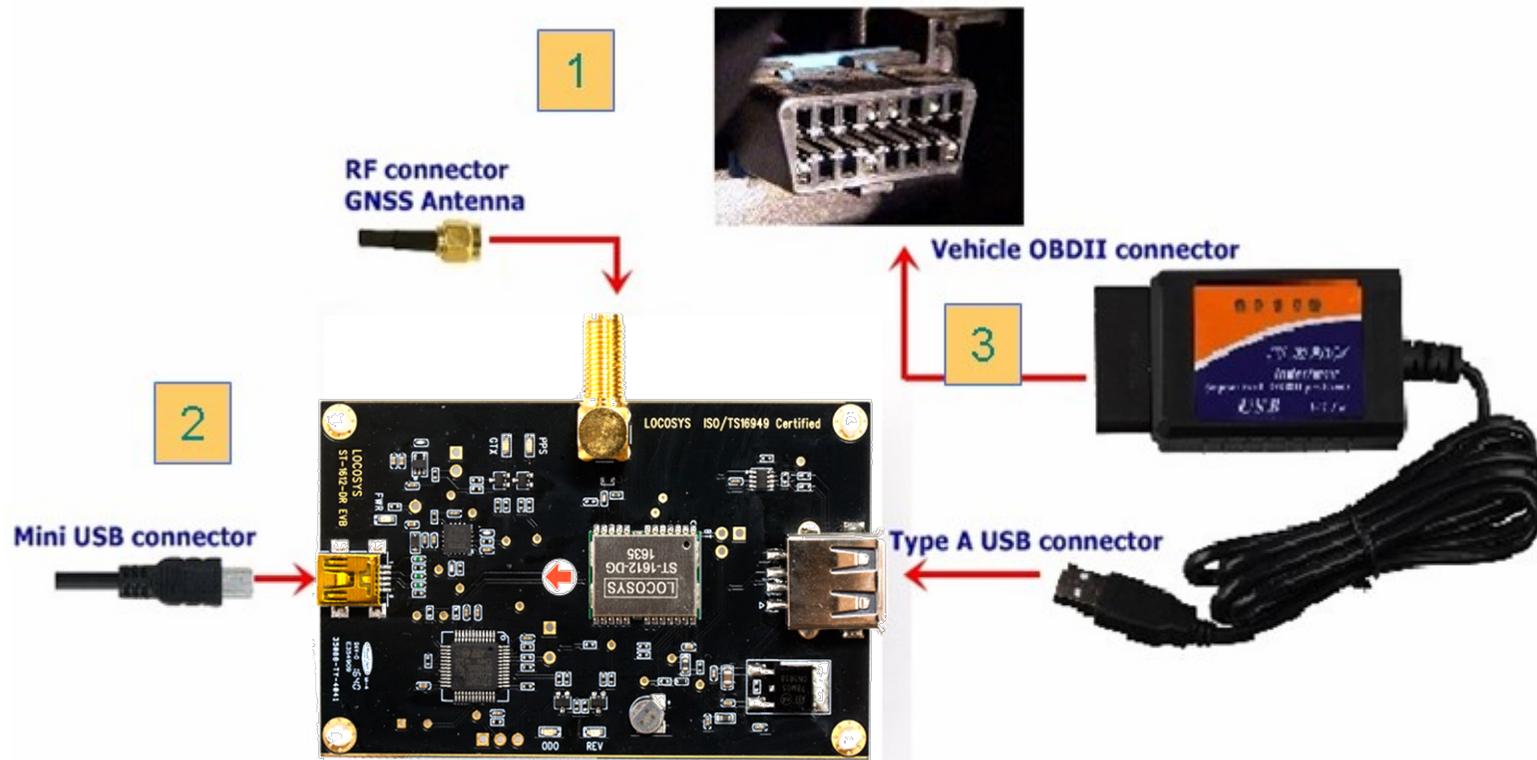


Figure 2. EVB & 3 connectors

Part IV. How to work calibration with



After placing EVB on the console, start the LOCOSYS GPSFox.

➤ LOCOSYS GPSFox – Screen

The screenshot displays the LOCOSYS GPSFox software interface with several key components:

- COM Port Setting:** Shows COM9 and 115200 baud rate.
- Tool Bar:** Includes icons for signal, pause, map, and help.
- Signal Level View:** A bar chart showing signal strength in dB-Hz for multiple satellites.
- Table:**

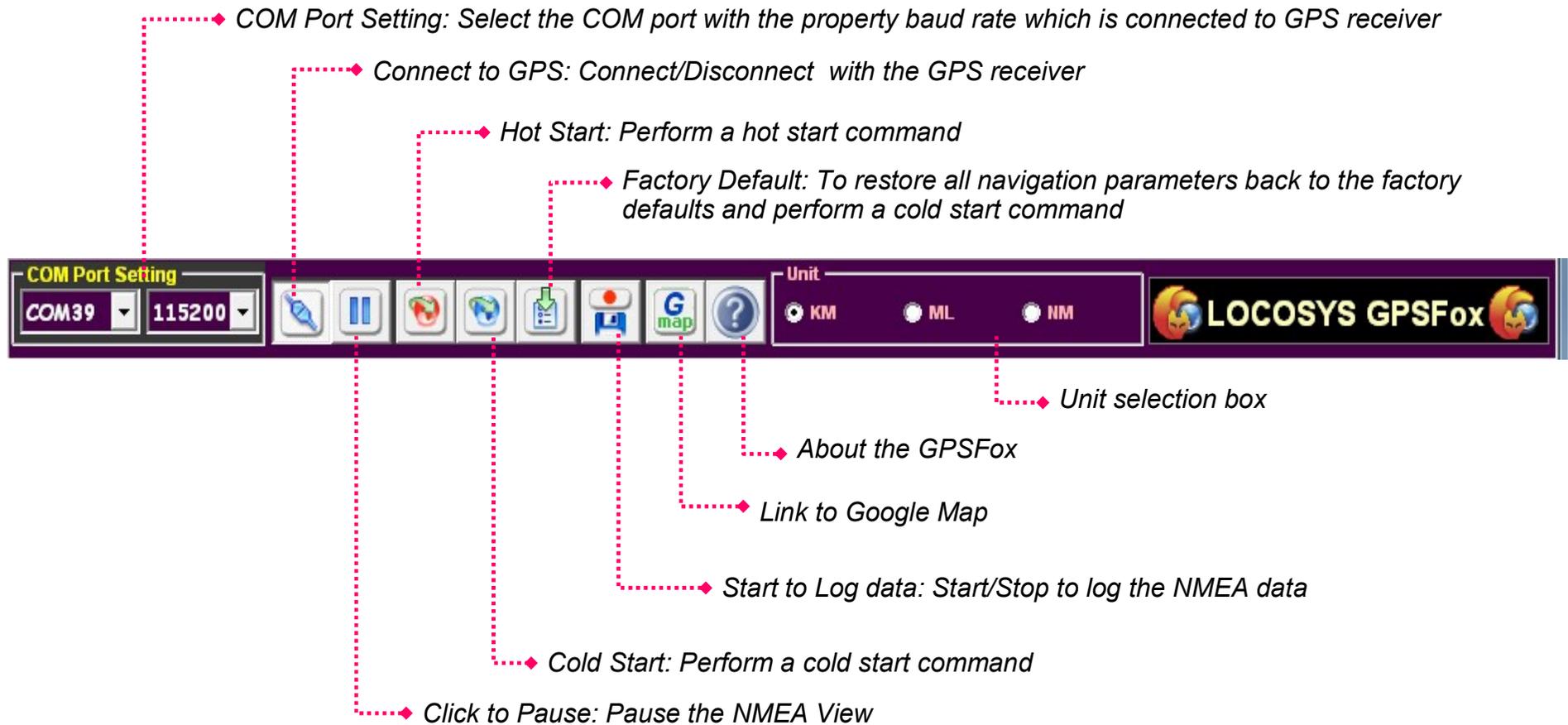
CNo	36	47	44	39	40	43	39	40	44	40	46	33	43
SV	4	10	12	14	15	18	21	24	25	31	32	42	193
Az	0	290	61	309	100	174	195	45	131	254	330	0	165
EI	0	74	42	24	10	67	11	19	62	30	42	0	58
- Radar View:** A circular radar display showing satellite positions and bearings.
- COG&SOG View:** A speedometer-style gauge showing speed in Km/H (0000) and heading.
- NMEA View:** A text window displaying NMEA sentences such as \$GNZDA, \$GNRMC, \$GNGGA, \$GNVTG, \$GNGSA, \$GNGSV, and \$GNCLL.
- Navigation View:**
 - Latitude: N 25.0619187°
 - Longitude: E 121.6457428°
 - Altitude: 119.0 m
 - Fix Mode: 3D
 - Speed (SOG): 0.0 Km/H
 - Number of SVs Used: 11
 - UTC Time: 2017/02/06 05:12:18.000
 - Local Time: 2017/02/06 13:12:18.000
 - PDOP: 1.40 | HDOP: 0.80 | VDOP: 1.10
- DR Info Panel:** A panel with buttons for 'Start calibration', 'OSP120S', 'DS30KM', 'L3+R3', and 'DR Info.'.
- Status Bar:** Shows GPS Baud Rate: 115200, Open (COM9, 115200 bps), NMEA, Rx(Bps): 743, Fix (F): +00:00:38.3, and 00:03:17.

Hand-drawn annotations in pink and yellow highlight specific areas:

- Communication Indicator:** Points to the NMEA View window.
- COM Port Status:** Points to the COM9 and 115200 settings.
- GNSS Protocol:** Points to the NMEA option in the status bar.
- TTF Panel:** Points to the DR Info. panel.
- Start calibration:** Points to the 'Start calibration' button in the DR Info. panel.

➤ LOCOSYS GPSFox - Tool Bar

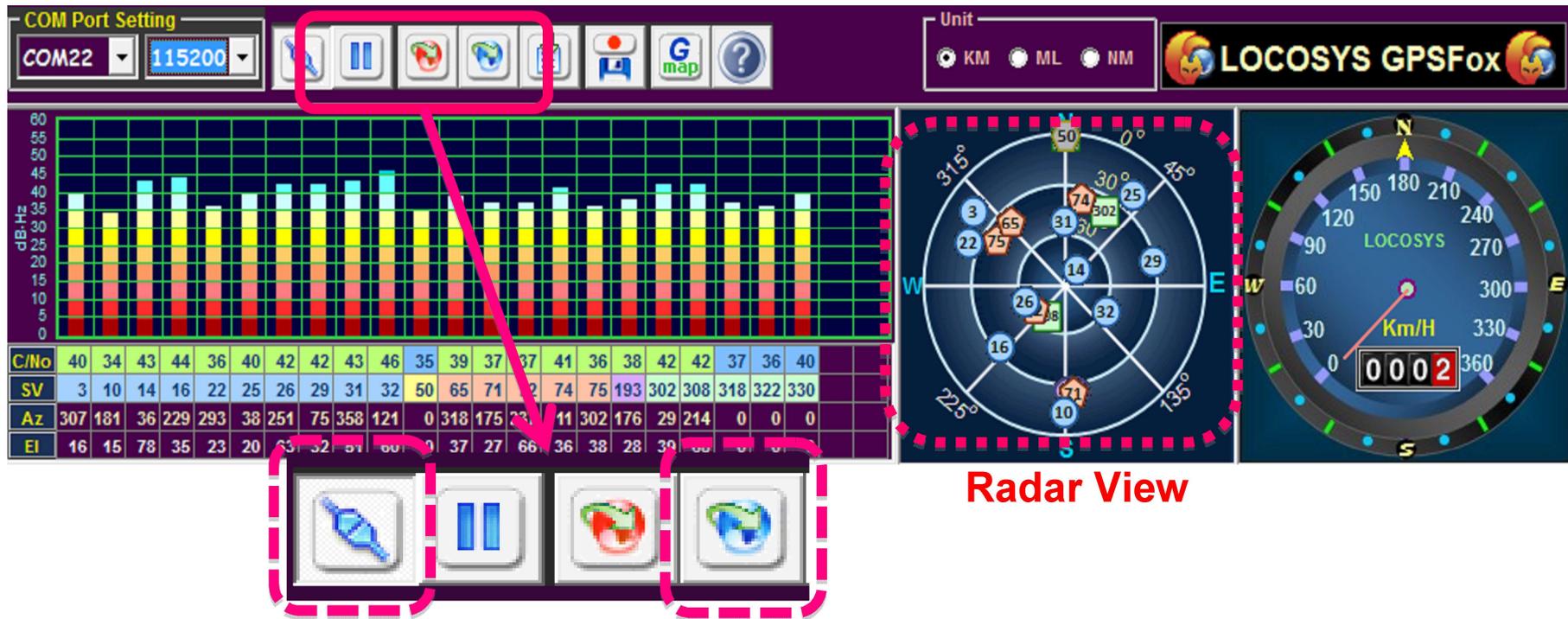
- Icon description



- **Step 1. Check USB Comport**
check USB COM Port if it is auto-detected.
- **Step 2. Select Baud Rate**
select 115200 bps for Baud Rate setting.

The screenshot shows the LOCOSYS GPSFox software interface. A callout box highlights the 'COM Port Setting' section, which has 'COM39' selected for the port and '115200' for the baud rate. The main interface includes a signal strength bar chart, a data table, a compass rose, and a speedometer.

CNo	40	37	32	41	44	41	43	43	37	35	34	34	32	35	41
SV	10	12	13	15	18	20	21	24	25	32	42	70	71	73	193
Az	321	137	63	51	334	115	238	35	173	280	0	357	316	188	124
EI	25	27	6	34	57	53	49	66	13	15	0	42	8	37	73



Radar View

➤ **Step 3. Connect to GPS**

Click  (connect to GPS) to  start connection.

When the **Radar View** appear, click  (Cold Start) to cold start, and then wait for position fixed to start calibration.

➤ Step 4. Start the Calibration

Click **Start calibration** to initiate Calibration Mode, shown as below

The screenshot displays the LOCOSYS GPSFox software interface. The window title is "LOCOSYS GPSFox". The interface includes a "COM Port Setting" section with "COM9" and "115200" selected. A "Unit" section shows "KM", "ML", and "NM" options. The main display area is divided into several sections: a signal strength bar chart (dB-Hz), a compass rose with a callout bubble saying "Click here!" pointing to the "Start calibration" button, a speedometer showing "0002" Km/H, and a data table. The data table is as follows:

C/No	39	48	42	40	40	44	38	39	44	41	47	36	42	43
SV	4	10	12	14	15	18	21	24	25	31	32	50	193	309
Az	0	272	56	312	103	174	192	47	121	258	334	134	166	1
EI	0	76	40	26	8	62	8	16	65	33	44	51	56	71

Below the table is a list of NMEA sentences. The "Start calibration" button is highlighted with a yellow callout bubble. The bottom status bar shows "GPS Baud Rate :115200", "Open (COM9,115200 bps)", "NMEA", "Rx(Bps):756", "Fix (C):+00:00:41.7", and "00:12:16".

➤ Step 5. Confirm to do Calibration

After click **Start calibration**, you will see a message to have a calibration.

If you confirm to do it, please click **OK** If don't, click **Cancel**

The screenshot displays the LOCOSYS GPSFox software interface. At the top, there is a 'COM Port Setting' section with 'COM9' and '115200' selected. Below this is a bar chart showing signal strength in dB-Hz. To the right of the bar chart is a table of satellite data:

C/No	38	46	42	44	39	37	46	39	39	45	43	33	38	0	0	37	41
SV	3	4	14	16	22	25	26	27	29	31	32	42	74	83	84	193	314
Az	296	0	111	243	278	42	287	192	60	18	138	134	321	72	131	176	0
Ei	19	0	77	45	24	9	69	11	29	51	49	51	38	24	22	24	0

Below the table is a 'DR Calibration Info...' dialog box with the following text:

Start Calibration will clear all calibrated data !

Are you sure to continue ?

At the bottom of the dialog box are 'Cancel' and 'OK' buttons. To the right of the dialog box is a 'Start calibration' button and a list of satellite systems: 'OSP120S', 'DS30KM', and 'L3+R3'. Below these are 'Eng' and 'GB5' radio buttons. On the far right, there is a panel with various GPS data fields:

- Latitude: N 25.0619115°
- Longitude: E 121.6457628°
- Altitude: 117.9 m
- Fix Mode: 3D
- Speed (SOG): 0.0 Km/H
- Course (COG): 0.0°
- Number of SVs Used: 12
- UTC Time: 2017/02/06 08:24:43.000
- Local Time: 2017/02/06 16:24:43.000
- PDOP: 1.30 HDOP: 0.70 VDOP: 1.10

After confirm the calibration, GPSFox software will automatically tell if the OBD-II Cable is from CAN Bus (ISO 15765-4 11-bit 500kbps) protocol.
 (Note: If the protocol is not supported by the vehicle, the DR testing will not be available.)

The screenshot displays the LOCOSYS GPSFox software interface. A prominent error dialog box titled "DR Calibration Info..." is shown in the foreground, indicating a failure to receive CAN-bus data and that the DR test function is aborted. The background interface features several data visualization and control elements:

- COM Port Setting:** COM9, 115200
- Unit:** KM, ML, NM
- Signal Strength:** A bar graph showing signal strength in dBmHz for various satellites.
- Satellite Constellation:** A circular diagram showing the positions of satellites in the sky.
- Speedometer:** A circular gauge showing speed in Km/H, currently at 0002.
- Accelerometer:** A graph showing acceleration data for X, Y, and Z axes.
- Gyro:** A graph showing gyroscope data for X, Y, and Z axes.
- Data Tables:**

C/No	41	42	35	43	38	41	39	44	42	34	0	0	39	0	0	0	19	36	38	34	37	33	36
SV	8	9	14	16	21	23	26	27	31	50	65	72	74	75	84	85	86	193	302	308	311	312	324
Az	216	313	161	4	63	281	40	199	109	0	264	217	58	349	37	115	186	164	312	301	84	42	76
Ei	41	19	10	50	15	48	36	82	31	0	20	11	37	37	32	68	27	13	25	12	54	17	28
- DR Calibration Info... Dialog:**

Can not receive CAN-bus data !
 DR test function is aborted !
- Location and Sensor Data:**
 - Latitude: N 25.0619025°
 - Longitude: E 121.6457400°
 - Altitude: 121.3 m
 - Fix Mode: 3D
 - Speed (SOG): 0.2 Km/H
 - Course (COG): 0.0°
 - Number of SVs Used: 16
 - UTC Time: 2017/02/06 10:50:35.000
 - Local Time: 2017/02/06 18:50:35.000
 - PDOP: 1.20 | HDOP: 0.60 | VDOP: 1.10

➤ Step 6. Accelerometer and Gyro output data

Click **Start calibration**, there will be the information of X, Y, and Z axial information of Accelerometer and Gyro by the GPSFox
 (Note: The information is Raw data 10Hz output)

The screenshot shows the LOCOSYS GPSFox software interface. The main window displays various data including a signal strength bar chart, a satellite constellation diagram, a speedometer, and a data table. A calibration window is open, showing a 'Start calibration' button and a list of sensors: OSP120S, DS30KM, and L3+R3. The calibration window also displays real-time data for Latitude, Longitude, Altitude, Fix Mode, Speed (SOG), Course (COG), Number of SVs Used, UTC Time, Local Time, PDOP, HDOP, and VDOP.

COM Port Setting: COM9, 115200

Unit: KM, ML, NM

Signal Strength Bar Chart: Shows signal strength in dBm for various satellites.

Satellite Constellation Diagram: Shows the positions of satellites in the sky.

Speedometer: Shows speed in Km/H, currently at 0002.

Data Table:

C/No	48	44	43	44	35	40	46	37	38	39	48	36	44	37	45	43
SV	10	12	14	18	21	24	25	26	29	31	32	42	193	301	309	324
Az	248	50	316	173	188	50	106	206	140	264	340	141	168	38	8	236
EI	75	36	29	56	5	12	67	6	7	36	47	54	54	8	75	63

Calibration Window:

Start calibration

OSP120S
DS30KM
L3+R3

Eng **GB5**

Latitude: N 25.0619045°
Longitude: E 121.6457437°
Altitude: 113.9 m
Fix Mode: 3D
Speed (SOG): 0.2 Km/H
Course (COG): 0.0°
Number of SVs Used: 16
UTC Time: 2017/02/06 05:33:26.000
Local Time: 2017/02/06 13:33:26.000
PDOP: 1.10 **HDOP:** 0.70 **VDOP:** 0.80

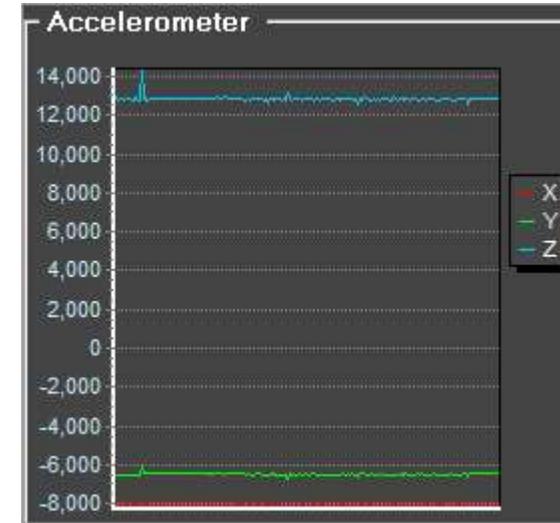
Accelerometer: Shows raw data for X, Y, and Z axes. The Y-axis ranges from -8,000 to 14,000.

Gyro: Shows raw data for X, Y, and Z axes. The Y-axis ranges from -2,000 to 5,000.

\$PSTMDRSENMSG,30 → for Accelerometer

```

$PSTMDRSENMSG,30,69385819,-8067,-6441,12857*14
$PSTMDRSENMSG,31,69387215,1048,839,-1430*1F
$PSTMDRSENMSG,30,69488099,-8061,-6417,12823*18
$PSTMDRSENMSG,31,69489533,1052,-835,-1436*14
$PSTMDRSENMSG,30,69590506,-8037,-6435,12869*18
$PSTMDRSENMSG,31,69592007,1085,-824,-1417*14
$PSTMDRCAL,0,0,0,1,3f,1,1,N*58
$GNRMC,053326.000,A,2503.71429,N,12138.74469,E,0.0,0.0,060217,,A*7F
$GNGGA,053326.000,2503.71429,N,12138.74469,E,1,16,0.7,114.10,M,15.3,M,,*7D
$GNVTG,0.0,T,,M,0.0,N,0.1,K,A*12
$GNGSA,A,3,10,25,18,32,12,31,14,24,29,26,15,21,1.1,0.7,0.8*27
$GNGSA,A,3,,,,,,,,,,,,,1.1,0.7,0.8*23
$GNGSA,A,3,193,,,,,,,,,,,,,1.1,0.7,0.8*18
$GNGSA,A,3,324,301,309,,,,,,,,,,,,,1.1,0.7,0.8*1E
$GNGSA,A,3,,,,,,,,,,,,,1.1,0.7,0.8*23
    
```



\$PSTMDRSENMSG,31 → for Gyro

```

$PSTMDRSENMSG,30,69385819,-8067,-6441,12857*14
$PSTMDRSENMSG,31,69387215,1048,839,-1430*1F
$PSTMDRSENMSG,30,69488099,-8061,-6417,12823*18
$PSTMDRSENMSG,31,69489533,1052,-835,-1436*14
$PSTMDRSENMSG,30,69590506,-8037,-6435,12869*18
$PSTMDRSENMSG,31,69592007,1085,-824,-1417*14
$PSTMDRCAL,0,0,0,1,3f,1,1,N*58
$GNRMC,053326.000,A,2503.71429,N,12138.74469,E,0.0,0.0,060217,,A*7F
$GNGGA,053326.000,2503.71429,N,12138.74469,E,1,16,0.7,114.10,M,15.3,M,,*7D
$GNVTG,0.0,T,,M,0.0,N,0.1,K,A*12
$GNGSA,A,3,10,25,18,32,12,31,14,24,29,26,15,21,1.1,0.7,0.8*27
$GNGSA,A,3,,,,,,,,,,,,,1.1,0.7,0.8*23
$GNGSA,A,3,193,,,,,,,,,,,,,1.1,0.7,0.8*18
$GNGSA,A,3,324,301,309,,,,,,,,,,,,,1.1,0.7,0.8*1E
$GNGSA,A,3,,,,,,,,,,,,,1.1,0.7,0.8*23
    
```



➤ Step 7. DR Calibration Info

When the cursor move to **OSP120S** , **DS30KM** , **L3+R3** the pop-up **DR calibration info** will provide you the instructions.

(Note: The information only show in 10 seconds. To read it again, please move the cursor to the calibration item.)

The screenshot displays the LOCOSYS GPSFox software interface. A dialog box titled "DR Calibration Info..." is open, providing instructions for calibration. The instructions are:

1. Stop the car
2. Assure the GNSS is in fix status
3. Wait for 2 minutes

The dialog box also features a "Start calibration" button and a "9" icon. The background interface shows various GPS data, including a signal strength bar graph, a compass rose, a speedometer, and accelerometer and gyro graphs.

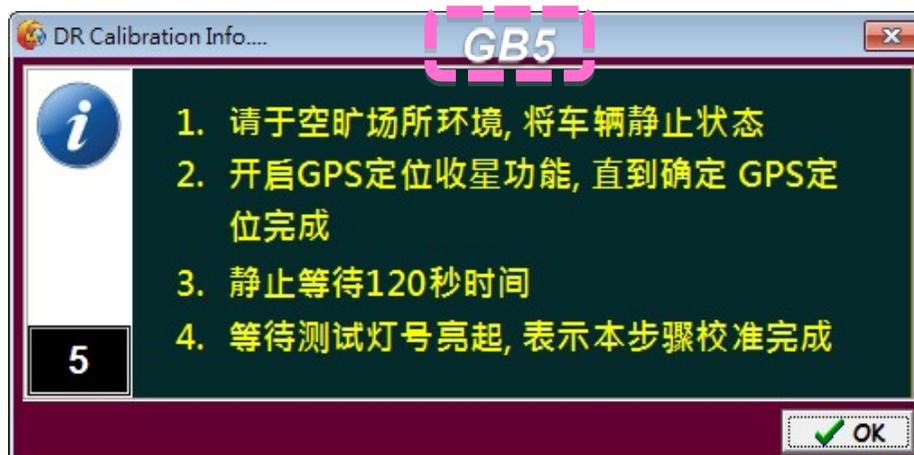
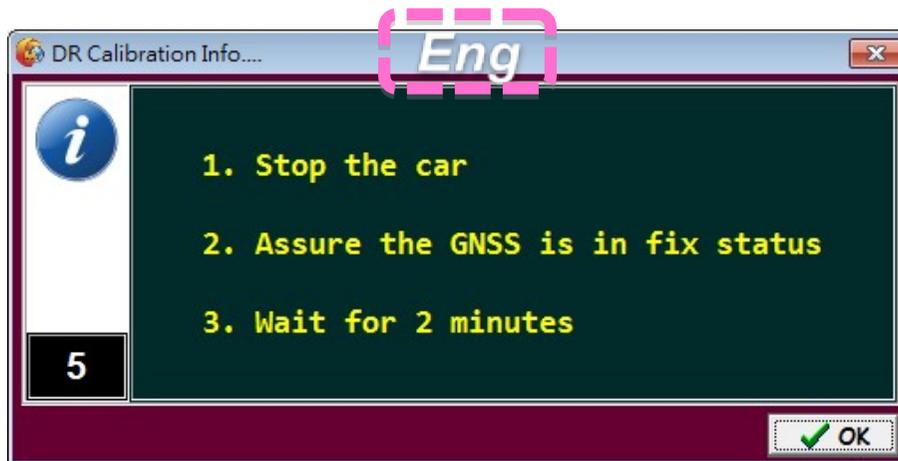
C/No	48	43	45	48	38	46	37	42	43	48	38	45	46	38	43
SV	10	12	14	18	24	25	26	29	31	32	50	193	309	314	324
Az	224	45	322	173	54	87	206	135	272	347	134	171	23	0	248
EI	71	31	2	6	6	6	6	6	6	6	6	6	6	6	6

Additional data shown in the interface includes:

- Latitude: N 25.0618920°
- Longitude: E 121.6457558°
- Altitude: 112.0 m
- Fix Mode: 3D
- Speed (SOG): 0.0 Km/H
- Course (COG): 0.0°
- Number of SVs Used: 13
- UTC Time: 2017/02/06 05:47:56.000
- Local Time: 2017/02/06 13:47:56.000
- PDOP: 1.30 HDOP: 0.80 VDOP: 1.00

➤ Step 8. Choose Language of DR Calibration info

In DR Info., there are two languages for users to choose, **English (Eng)** and **Simplified Chinese (GB5)**.



➤ Step 9. Timer and Status of DR Info.

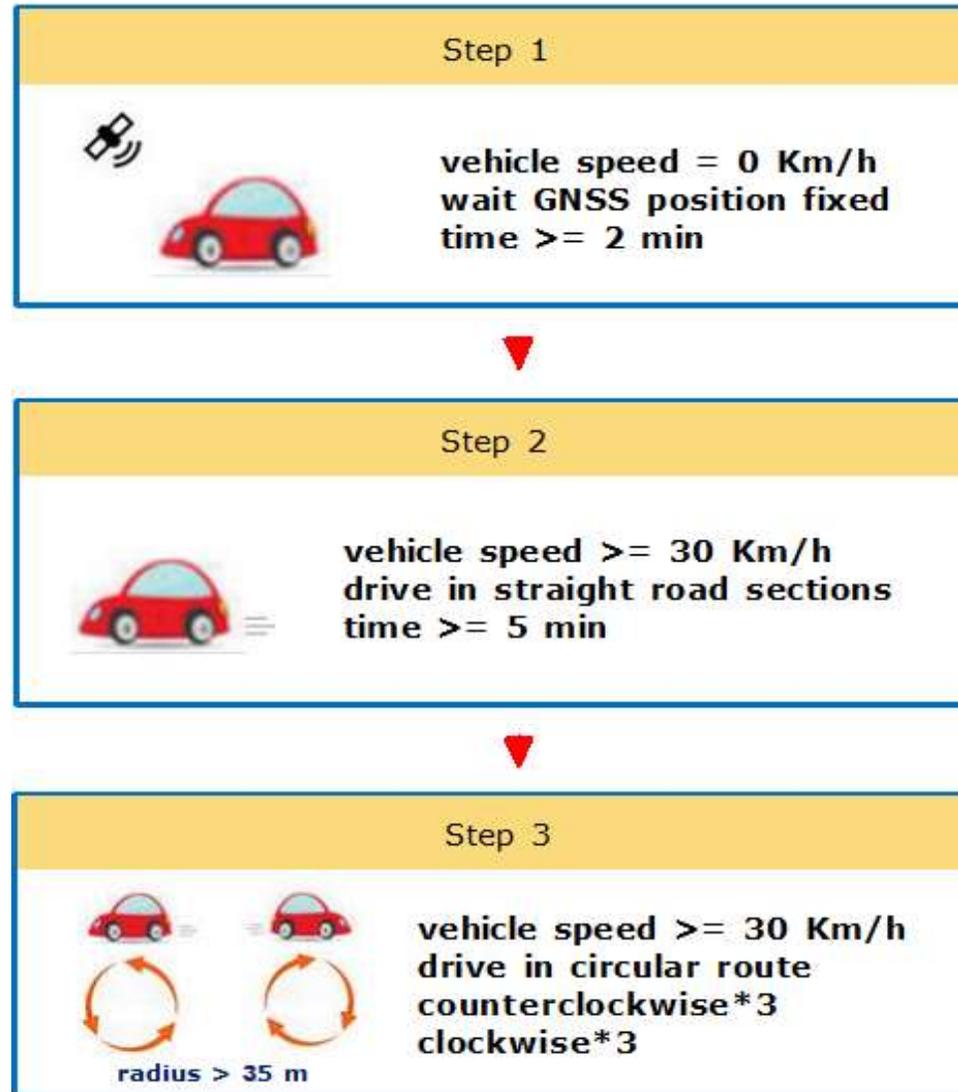
In DR info., you will see the timer and status while doing each calibration item.



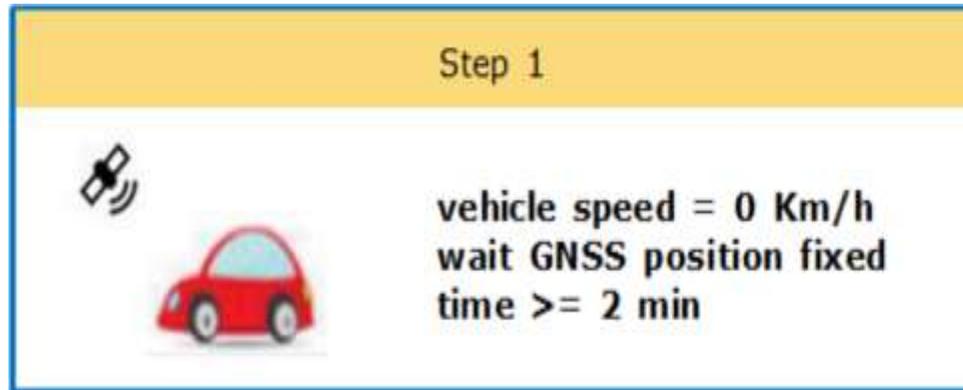
Item	Description
OSP120S	Doing calibration
DS30KM	Calibration not done
OSP120S	Calibration done
120 300 OK	<ul style="list-style-type: none"> • 120, 300: Countdown on 120, 300 seconds. • OK: Calibration is done
DR Ready !	All calibrations are completed.

Part V. Calibration Manoeuvres

Calibration Flow Chart



➤ Step 1. Calibration for OSP120S



Turn vehicle on and stay stopped in a flat section of road with good sky view, wait GNSS position fixed for 2 minutes at least.

You will see in DR Info.



- Stop the vehicle and wait for the GNSS position being done.
- The timer will start to countdown from 120 seconds to 0 seconds.

(Note: In this process, if the vehicle is moved or the GNSS position is failed, the countdown process will start over again.)



- As OSP120S is done, it will show in green, and "OK" in the status.
- The instruction of DS30KM will pop-up to guide you.

➤ Step 2. Calibration for DS30KM

Step 2



vehicle speed \geq 30 Km/h
drive in straight road sections
time \geq 5 min

Drive in straight road sections with vehicle speed 30 km/h for 5 minutes at least .

You will see in DR Info.

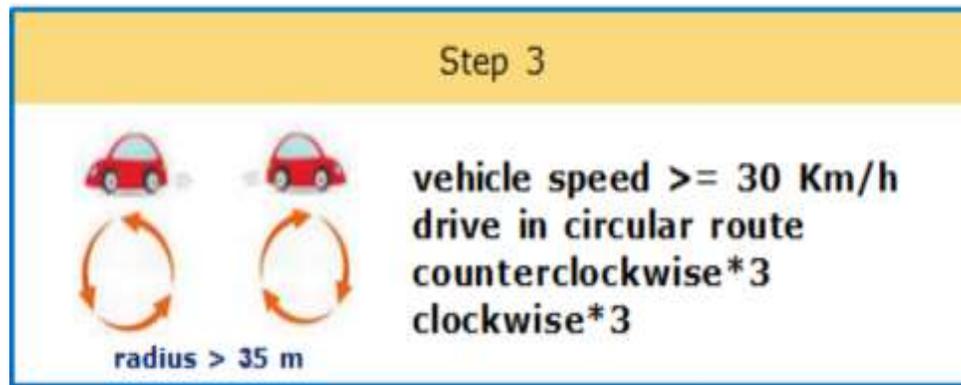


- When driving speed is over 30 Km/h, the timer will start countdown from 300 seconds to 0 seconds.

(Note: In the process, if the driving speed is lower than 30 Km/h, the countdown will stop or pause.)

- As DS30KM is done, it will show in green, and “OK” in the status.
- The instruction of L3+R3 will pop-up to guide you.

➤ Step 3. Calibration for L3+R3



Drive in circular route with its radius over 35 m, take counterclockwise and clockwise circles for three or more times with driving speed over 30 Km/h

Note:

- You may have the condition that “L3+R3” calibration to be processed for many times and still fail to complete. If this happened, please do the Step 2 again, drive straightly for 5 to 10 minutes. And then do the Step 3.
- Driving in circular routes (counterclockwise and clockwise) for more times will benefit the DR precision.

You will see in DR Info.



- When driving speed is over 30 Km/h and making 3 or more circular routes, the calibration of L3+R3 will be completed, and you will see “OK” in the status.

(Note: If the speed is lower than 30 Km/h, the calibration will be failed.)



- Good job! All the calibrations are completed.
- You will see “DR Ready!” in the status.
- Now it is ready to do the DR function test.

➤ Step 4. Turn Off DR Info. and Start DR Function Test

When completing all the calibrations, GPSFox will turn to NMEA mode. Now you can start to do the DR function test.

The screenshot displays the LOCOSYS GPSFox software interface. At the top, the 'COM Port Setting' is configured to COM37 and 115200. The unit is set to KM. The interface is divided into several sections:

- Signal Strength Graph:** A bar chart showing signal strength in dB-Hz across multiple channels.
- SV Data Table:** A table listing satellite IDs (SV) and their corresponding Azimuth (Az) and Elevation (El) angles.
- Compass:** A circular compass showing heading and satellite positions.
- Speedometer:** A speedometer showing speed in Km/H, currently at 056.1.
- NMEA Data Stream:** A text area displaying raw NMEA data, including coordinates and satellite information.
- Calibration and Status Panel:** A panel with buttons for 'Start calibration', 'OSP120S', 'DS30KM', 'L3+R3', and 'DR Ready!'. It also shows 'Eng' and 'GB5' options.
- Position and Time Data:** Fields for Latitude (N 52°31'15.844"), Longitude (E 14°09'18.733"), Altitude (-70.4 m), Fix Mode (3D), Speed (SOG) (56.1 Km/H), Course (COG) (90.6°), Number of SVs Used (9), UTC Time (2033/08/10 09:28:59.000), and Local Time (2033/08/10 17:28:59.000).
- Bottom Status Bar:** Shows GPS Baud Rate (115200), Open (COM37,115200 bps), NMEA, Rx(Bps):672, Fix (C):+00:00:41.0, and 00:15:08.

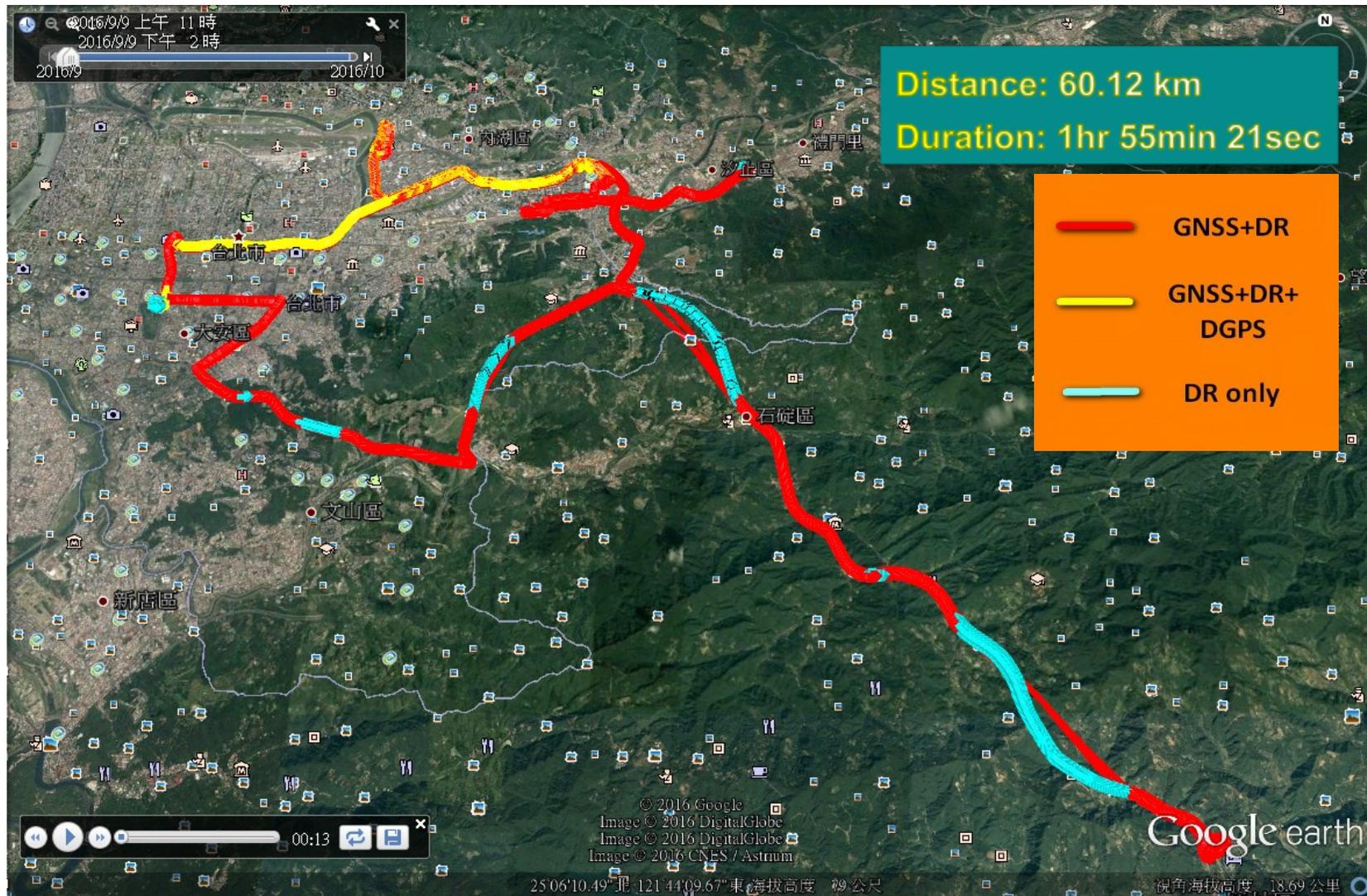
C.No	40	40	40	40	40	40	40	40	40
SV	5	11	12	16	18	19	21	22	32
Az	244	314	294	99	226	156	96	46	325
El	17	20	49	52	45	82	44	25	14

```

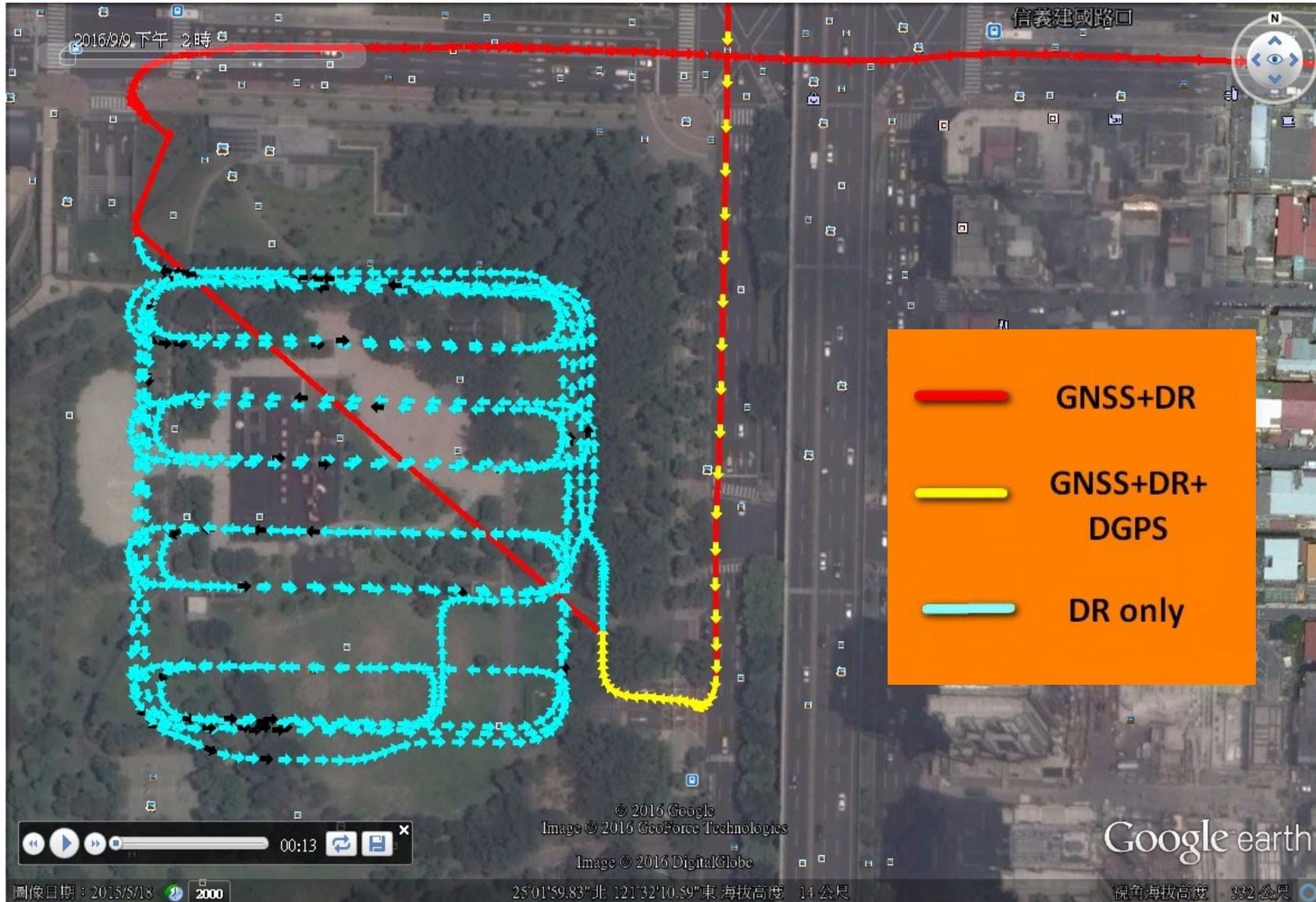
$GNGLL,5231.26407,N,01409.31222,E,092859.000,A,A*47
$GNZDA,092859.00,10,08,2033,00,00*7D
$GPRMC,092859.000,A,5231.26398,N,01409.32605,E,30.3,90.6,1.00833,,A*74
$GNCCX,092859.000,5231.26398,N,01409.32605,E,1.09,1.1,-70.36,M,43.8,N,,*69
$GNVTG,90.6,T,M,30.3,M,56.1,K,A*2E
$GNCSA,A,3,16,12,18,19,22,11,05,21,32,,,,2.1,1.1,1.8*24
$GNCSA,A,3,,,,,,,,,,,,,2.1,1.1,1.8*26
$GNCSA,A,3,,,,,,,,,,,,,2.1,1.1,1.8*26
$GNCSA,A,3,,,,,,,,,,,,,2.1,1.1,1.8*26
$GNCSA,A,3,,,,,,,,,,,,,2.1,1.1,1.8*26
$GNCSV,3,1,09,19,82,156,40,16,52,099,40,12,49,294,40,18,45,226,40*63
$GNCSV,3,2,09,21,44,096,40,22,25,046,40,11,20,314,40,05,17,244,40*63
$GNCSV,3,3,09,32,14,325,40,,,,,,,,,,,,,*5A
$GNGLL,5231.26398,N,01409.32605,E,092859.000,A,A*45
$GNZDA,092859.00,10,08,2033,00,00*7C
  
```

Part VI. Result

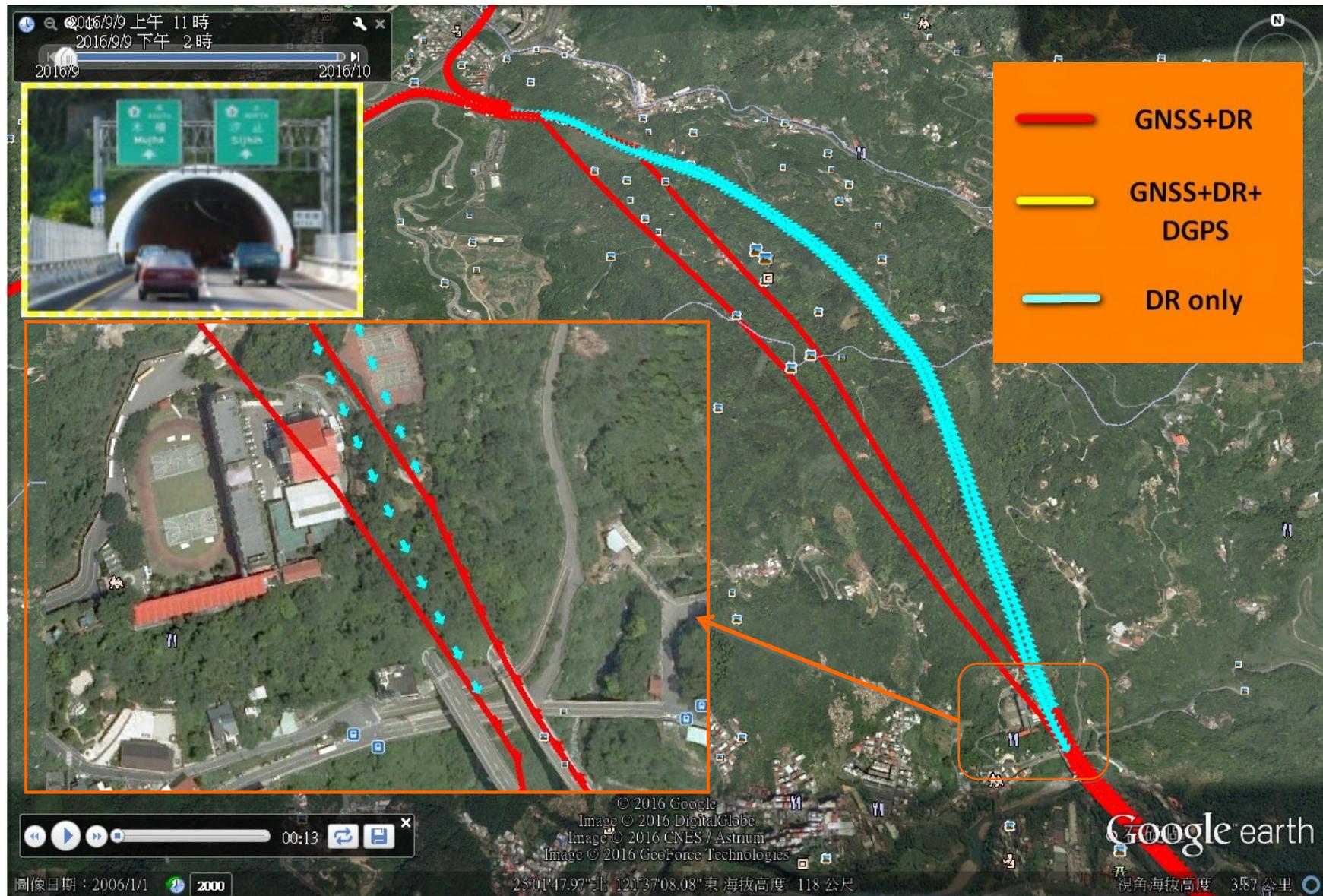
➤ LOCOSYS Demonstration: Path of Field test



➤ Field Test: Parking Garage (Basement)



➤ **Field Test: Shih-Ting Tunnel (Length: 2,720m)**



WITH ANY QUESTIONS,

LOCOSYS

IS ALWAYS HERE FOR YOU!

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