受控编号：AG2.508.002S

组合导航安装及配置步骤

INS Installation and Configuration Instructions

适用INS570D、INS570L系列产品

For INS570D 、INS570L series products

1. 惯导安装说明

INS Installation Instructions

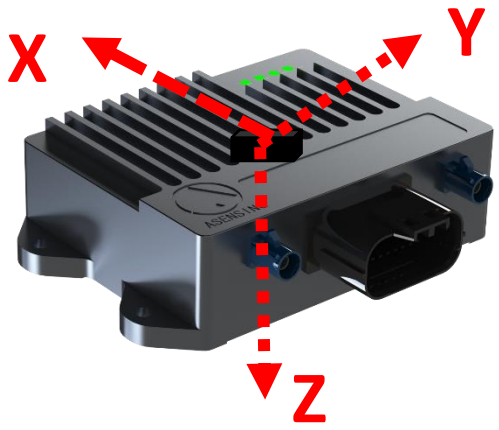
X：指向 车头 为正
Y：指向 车身右方 为正
Z：指向 地心 为正

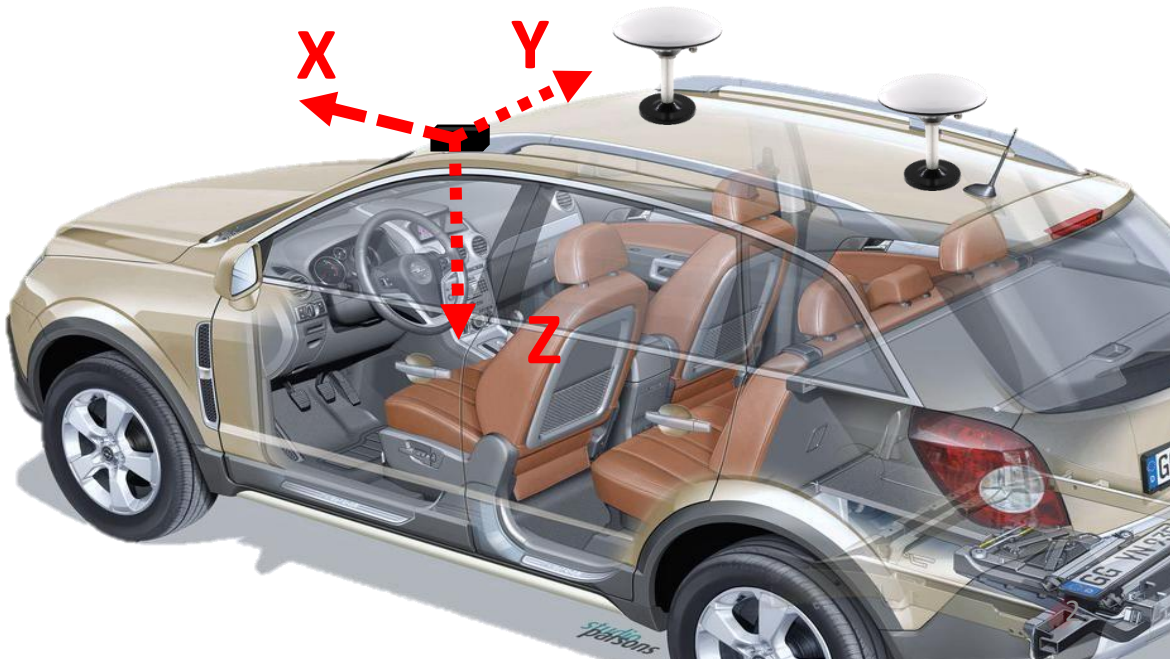
X: positive forward;
Y: positive right;
Z: positive down to the ground.

1.1 设备安装注意事项

Installation Precautions

- **产品安装的设备表面应平整并具有良好的刚度，安装面平面度不大于0.87mm，与设备水平基准面平行度不大于0.5°。**
- The surface of the equipment installed on the product shall be flat and have good rigidity. The flatness of the installation surface shall not be greater than 0.87mm, and the parallelism with the horizontal datum plane of the equipment shall not be greater than 0.5 °.





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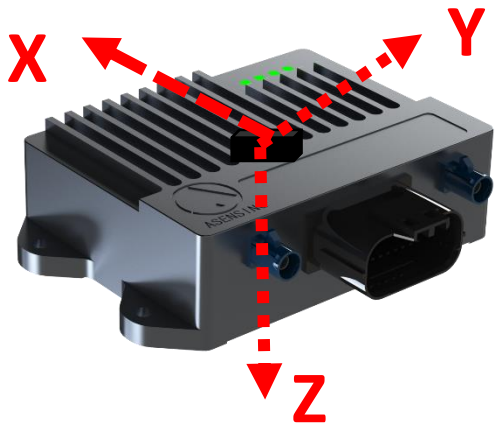
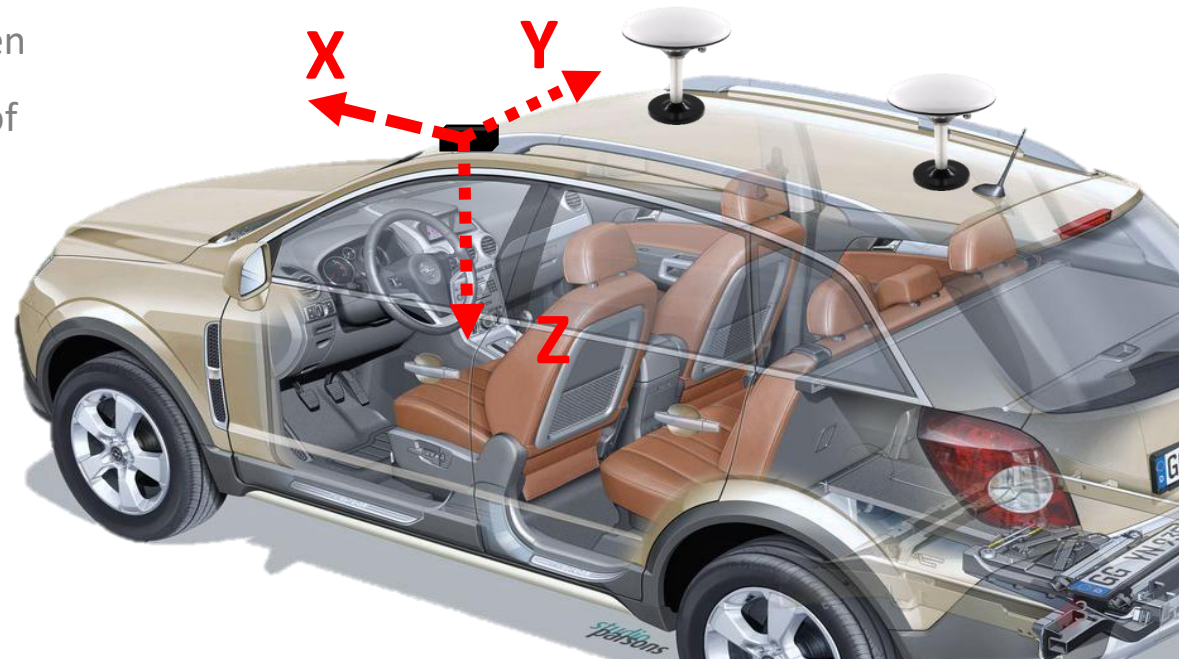
1.1 设备安装注意事项

Installation Precautions

- **产品安装时以基准面A为定位面，设备应提供与此面相接触的定位边，或者在安装过程中通过工具保证此面与设备轴向垂直度不大于0.5°。**
- When the product is installed, the datum plane A shall be taken as the positioning surface, and the positioning edge contacting with this surface shall be provided for the equipment, or the axial perpendicularity between this surface and the equipment shall not be greater than 0.5 ° by means of tools during installation.





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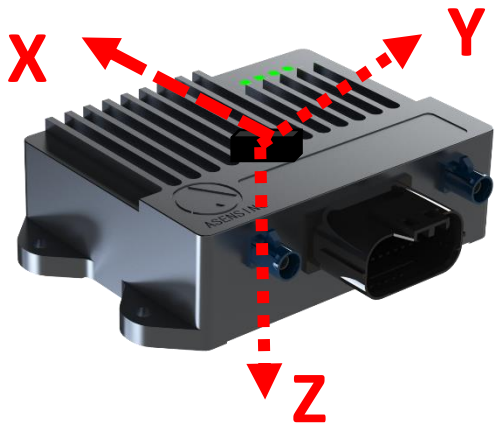
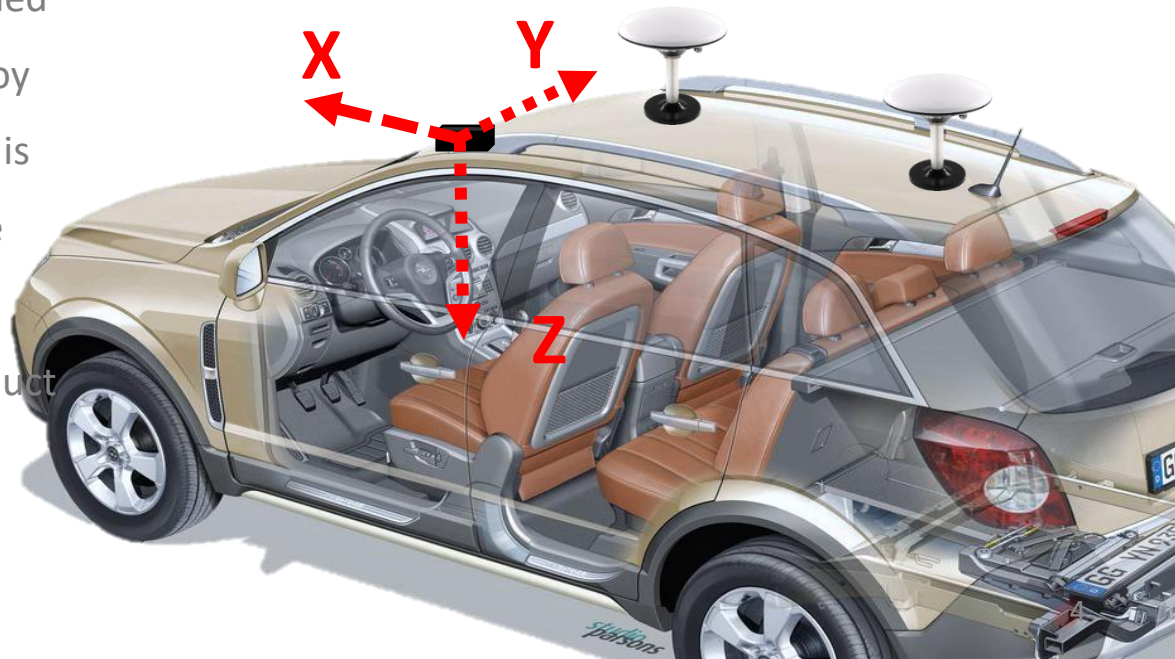


- **产品安装采用M4不锈钢螺钉，设备上加工M4螺纹孔。铝合金螺纹孔旋合长度6-10mm。不锈钢螺纹孔旋合长度3.5-5.5mm。当安装基面为薄板结构时，可以使用螺栓螺母组合件。用户应采用合 适的防松措施，保证产品工作时螺钉不会松动或者脱落。**
- M4 stainless steel screws are used for product installation, and M4 threaded holes are processed on the equipment. The screw length of aluminum alloy threaded hole is 6-10 mm. The screw length of stainless steel thread hole is 3.5-5.5mm.Bolt and nut assembly can be used, when the installation base plane is a thin plate structure. Users should take appropriate anti loosing measures to ensure that the screw will not loose or fall off when the product is working.



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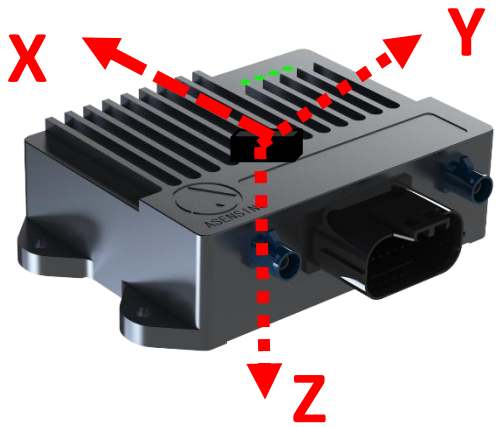
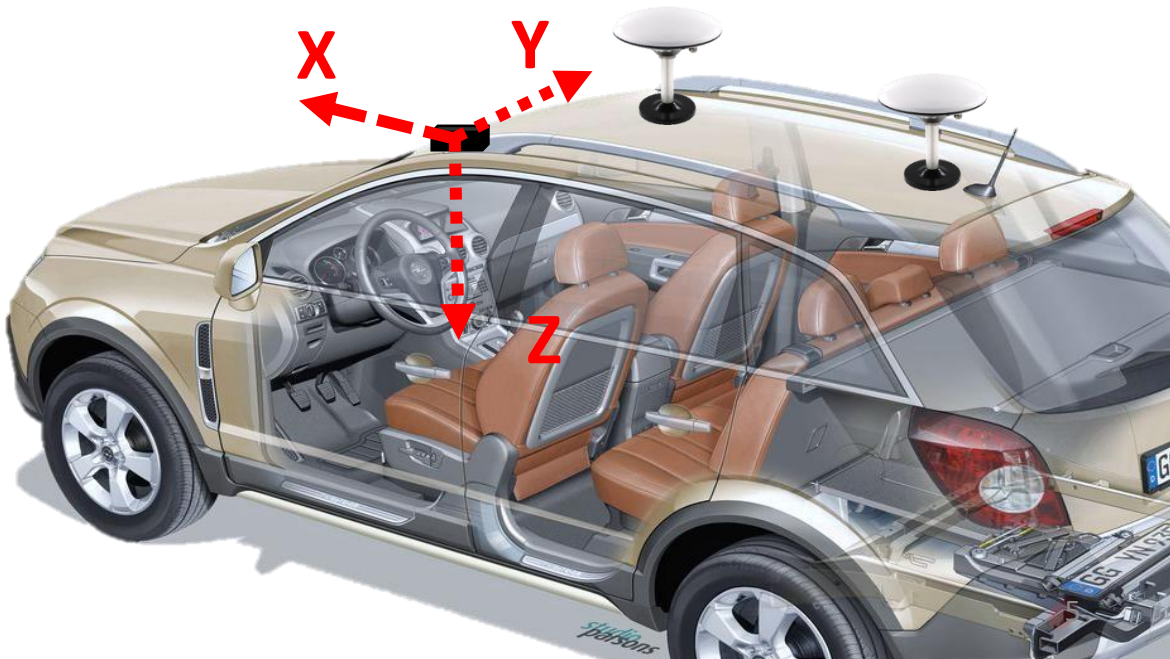


- **产品固定过程中，应使用带有扭力显示或者扭力控制的安装工具。螺钉紧固力矩建议10-12kgf·cm。**
- Installation tools with torque display or torque control should be used during product fixation. The screw tightening torque is recommended to be 10-12kgf · cm.
- **产品应当安装在不会直接淋水的位置，例如驾驶舱内。**
- The product should be installed in a position that will not directly contact with water, such as in the cockpit.
- **尽可能远离振动源，如发动机/音响/空调压缩机等位置。**
- As far as possible away from vibration source, such as engine/audio/air conditioning compressor location.



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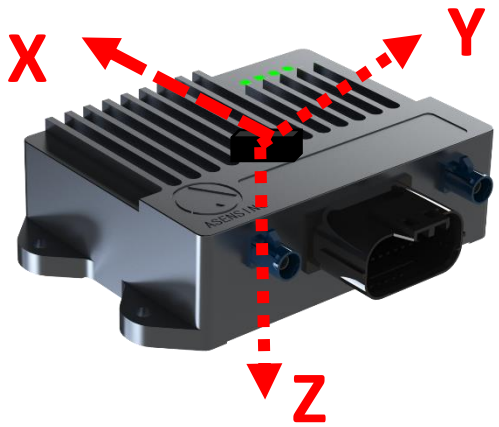
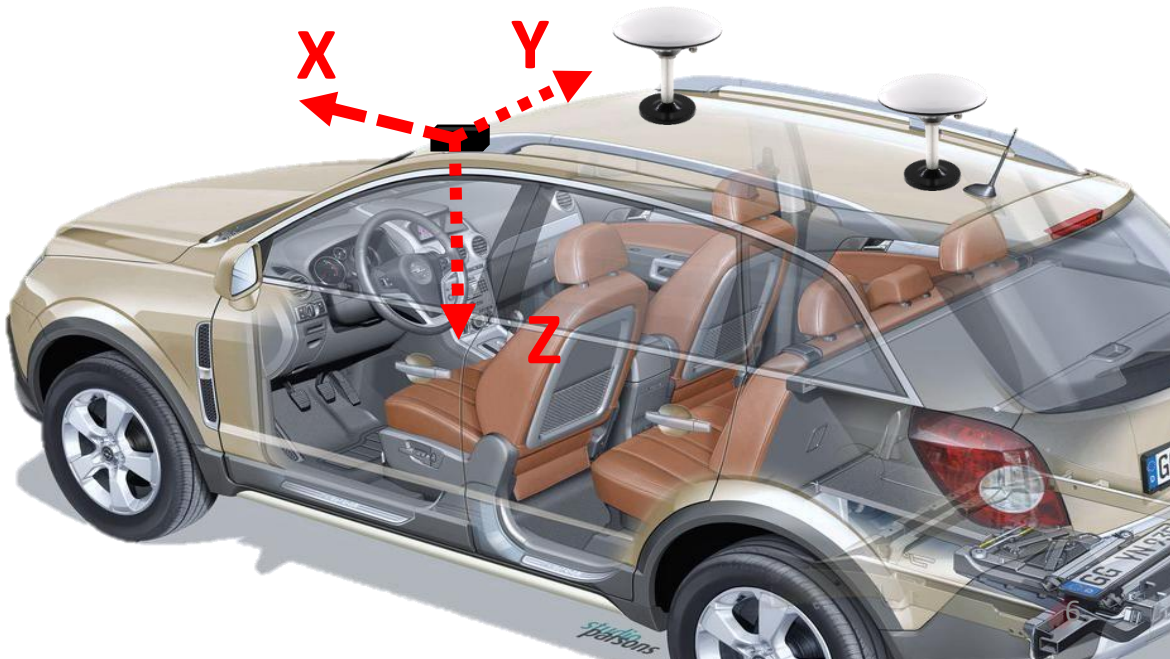
Installation Precautions



- **尽可能靠近车身中轴线，建议距离车身中轴线100mm以内，例如扶手箱下方。**
- As close as possible to the central axis of the car body, it is recommended to be within 100mm of the central axis of the car body, such as under the handrail box.

- **产品在车上的安装方向，一个产品型号的连接器统一朝向车头或者车尾。**
- In the installation direction of the product on the vehicle, the connector of a product model is uniformly facing the front or rear of the vehicle.



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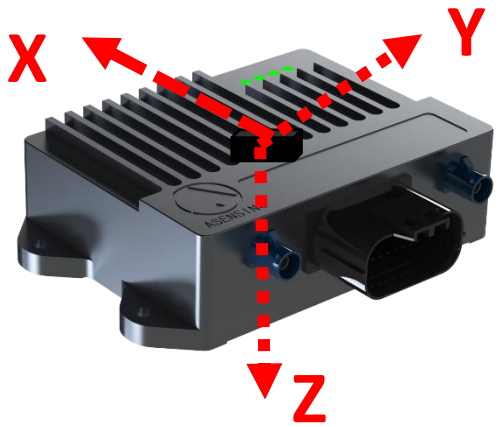
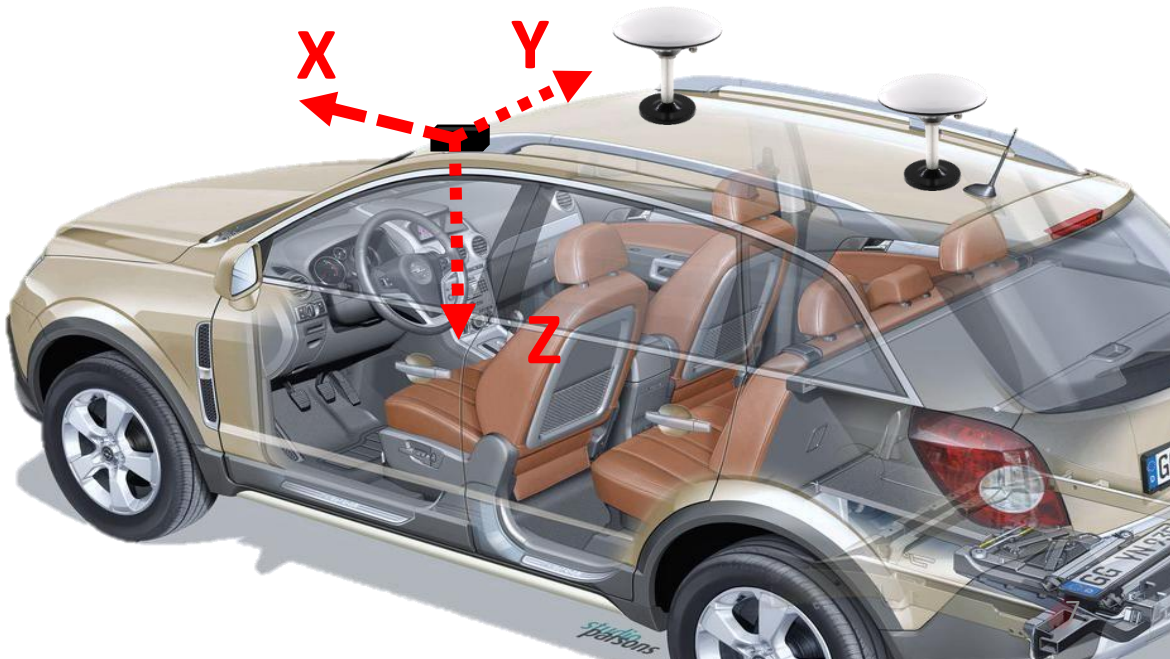
1.1 设备安装注意事项

Installation Precautions

- **产品应安装于金属基板上，产品总散热功率约为15W，若产品通过基板散热，产品壳体表面温升应不超过20℃；若通过产品自身壳体散热，需要保证产品壳体处于通风良好状态。**
- The product should be installed on the metal substrate, and the total heat dissipation power of the product is about 15W. If the product dissipates heat through the base plate, the surface temperature rise of the product shell should not exceed 20 ℃; if the heat is dissipated through the shell of the product itself, it is necessary to ensure that the product shell is in a good ventilation state





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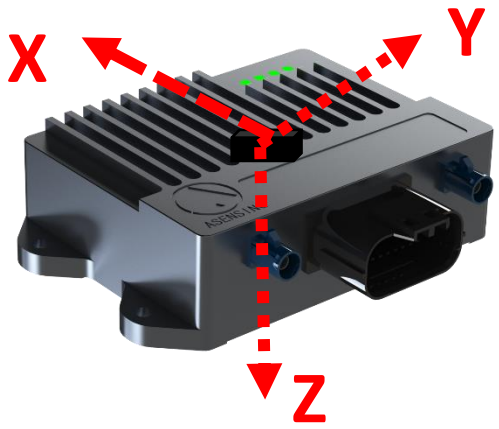
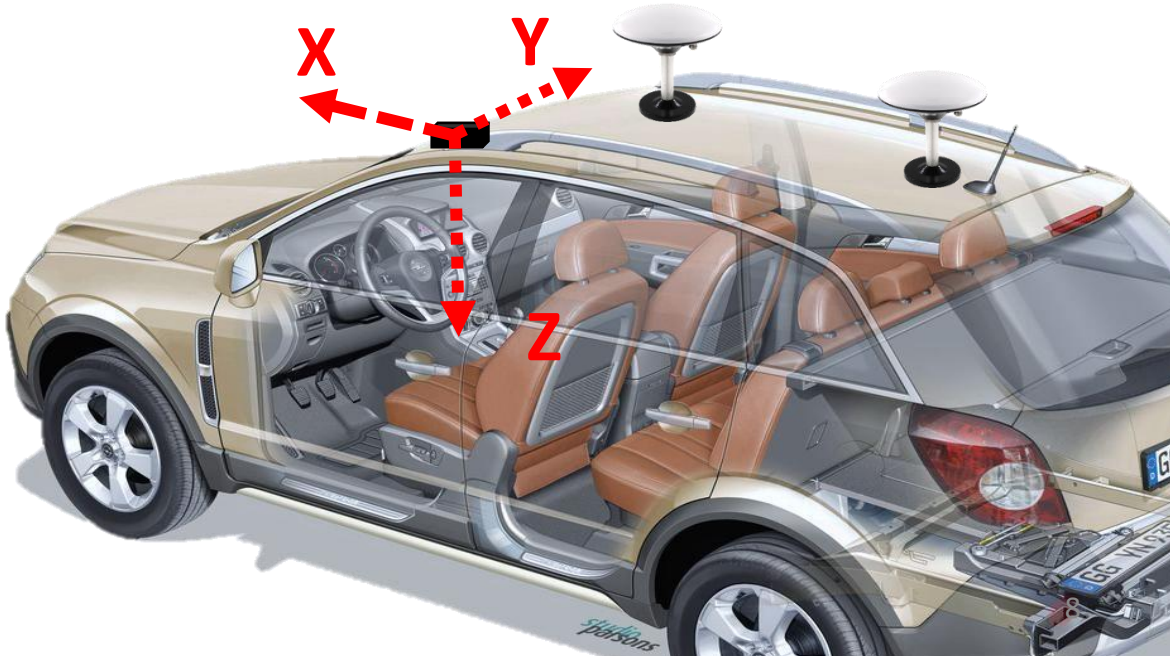
1.1 设备安装注意事项

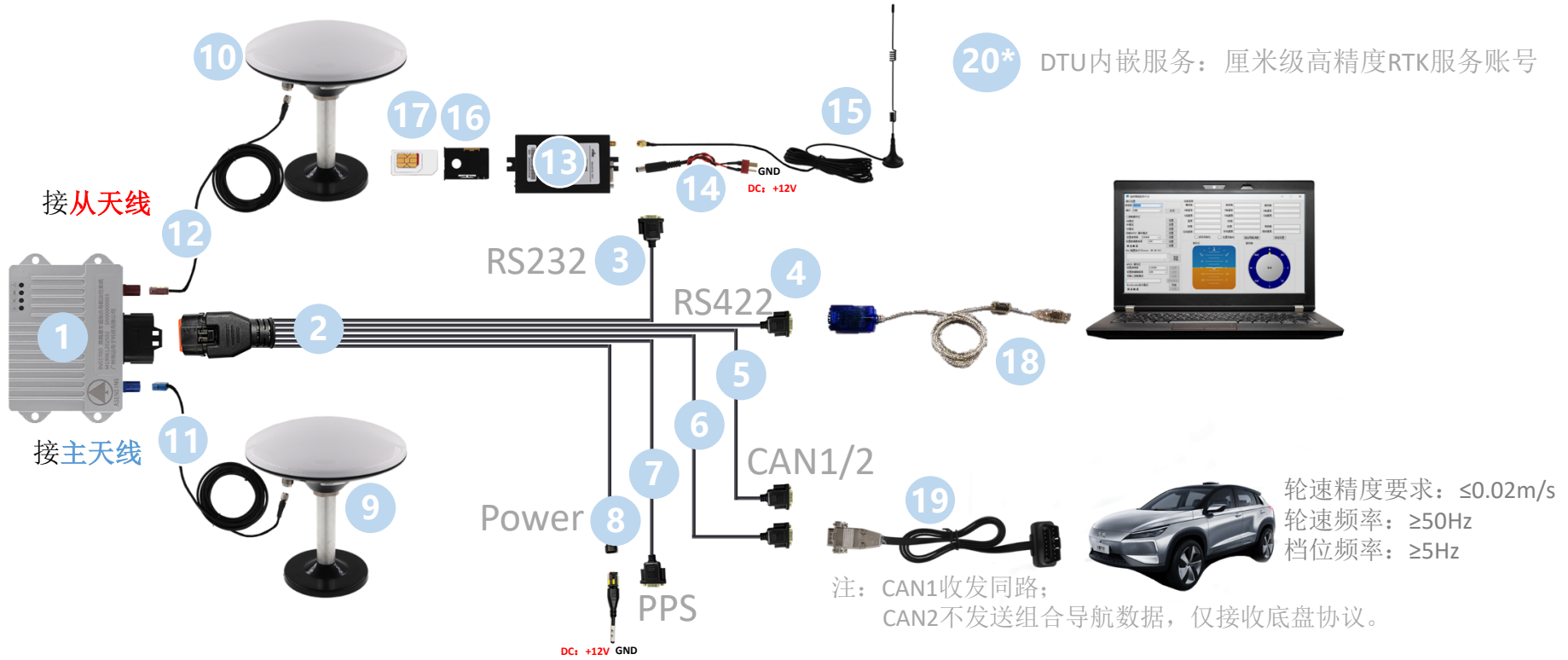
Installation Precautions

- **产品与周边结构的间隙应不小于10mm，以方便放置产品和散热。在安装孔上方应留有螺钉安装工具的空间。**
- The gap between the product and the surrounding structure should not be less than 10 mm to facilitate the placement of the product and heat dissipation. There should be space for screw installation tools above the mounting holes.





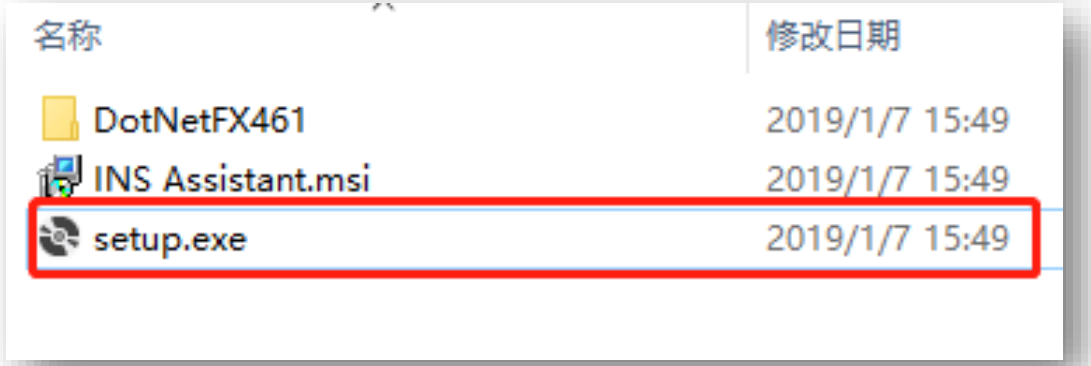
1.2 硬件接线图
Hardware Setup



序号	型号名称	备注
1	主机	标配
2	主线缆	标配
3	主线缆_RS232接口	标配
4	主线缆_RS422接口	标配
5	主线缆_CAN1接口	标配
6	主线缆_CAN2接口	标配
7	主线缆_PPS接口	标配
8	主线缆_Power接口	标配
9	主天线（定位测量天线）	选配
10	从天线（定向测量天线）	选配

序号	型号名称	备注
11	主天线连接线/馈线 （FAKRA_C转TNC）	选配
12	从天线连接线/馈线 （FAKRA_D转TNC）	选配
13	DTU_主机	选配
14	DTU_电源线	选配
15	DTU_天线	选配
16	DTU_卡托	选配
17	DTU_SIM卡（4G流量卡 大卡）	自行采购
18	RS422-USB串口线	自行采购
19	DB9-OBD转换线	自行采购
20*	虚拟设备：厘米级高精度RTK服务账号	自行采购

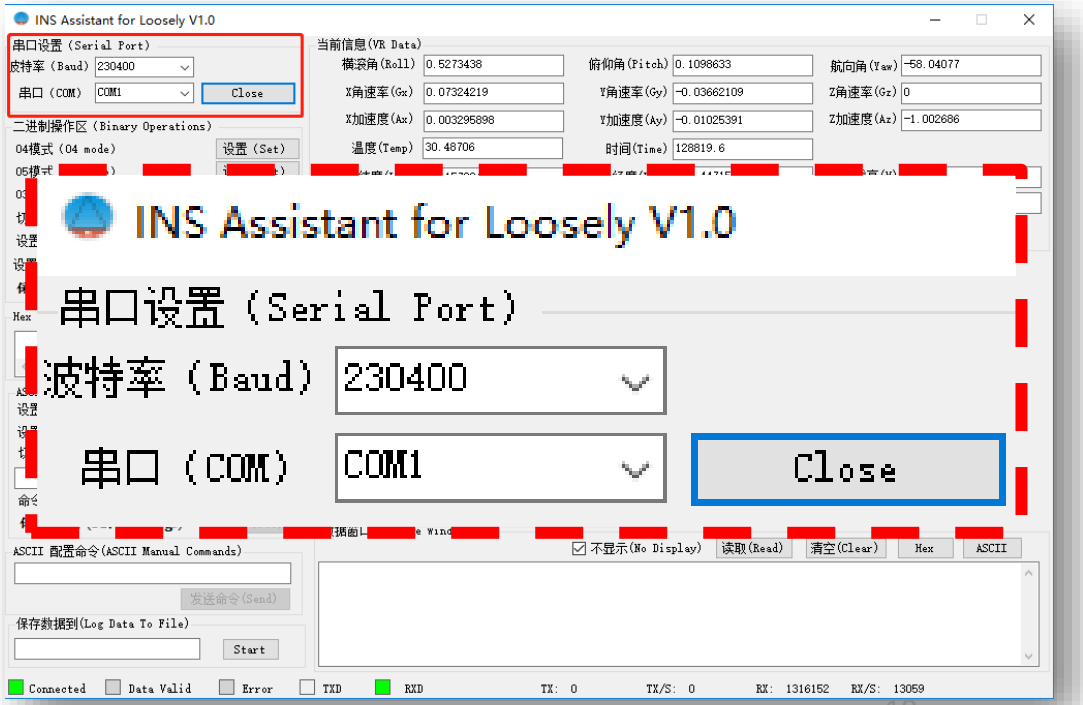
1.3 软件（上位机）安装说明
Software Installation Instructions



- 点击**setup.exe**进行安装。
- Run setup.exe to start installation.

- 安装完成后，在上位机选择波特率（默认**230400**）和 对应的**COM**口，然后打开串口。
- After the installation, select the baud rate (default 230400) and the corresponding COM port on the host computer, then open the serial port.

- 查看上位机主界面“当前信息”信息框，若显示数据在更新，即表示硬件连接成功。
- Check the main interface of the host computer. The hardware should be successfully connected if the data shown in message-box "VR Data“ is updated automatically.



2. 惯导配置步骤
INS Configuration Steps

2.1 恢复出厂设置（归零）
Restore Factory Settings

- 点击软件主界面“**标定设置**”按钮，自动弹出“标定设置”对话框，各数据**保持默认值**，进行以下操作：
- Click the “Calibration Setting” button on the main interface, and in the pop up “Calibration Setting” dialog box. Keep the default data values and do the following:

❶ 点击“**加载出厂参数**”按钮。

1. Click the "Load Factory Parameters“ button.

❷ 点击“**写入出厂参数**”按钮。

2. Click the "Write Factory Parameters“ button.

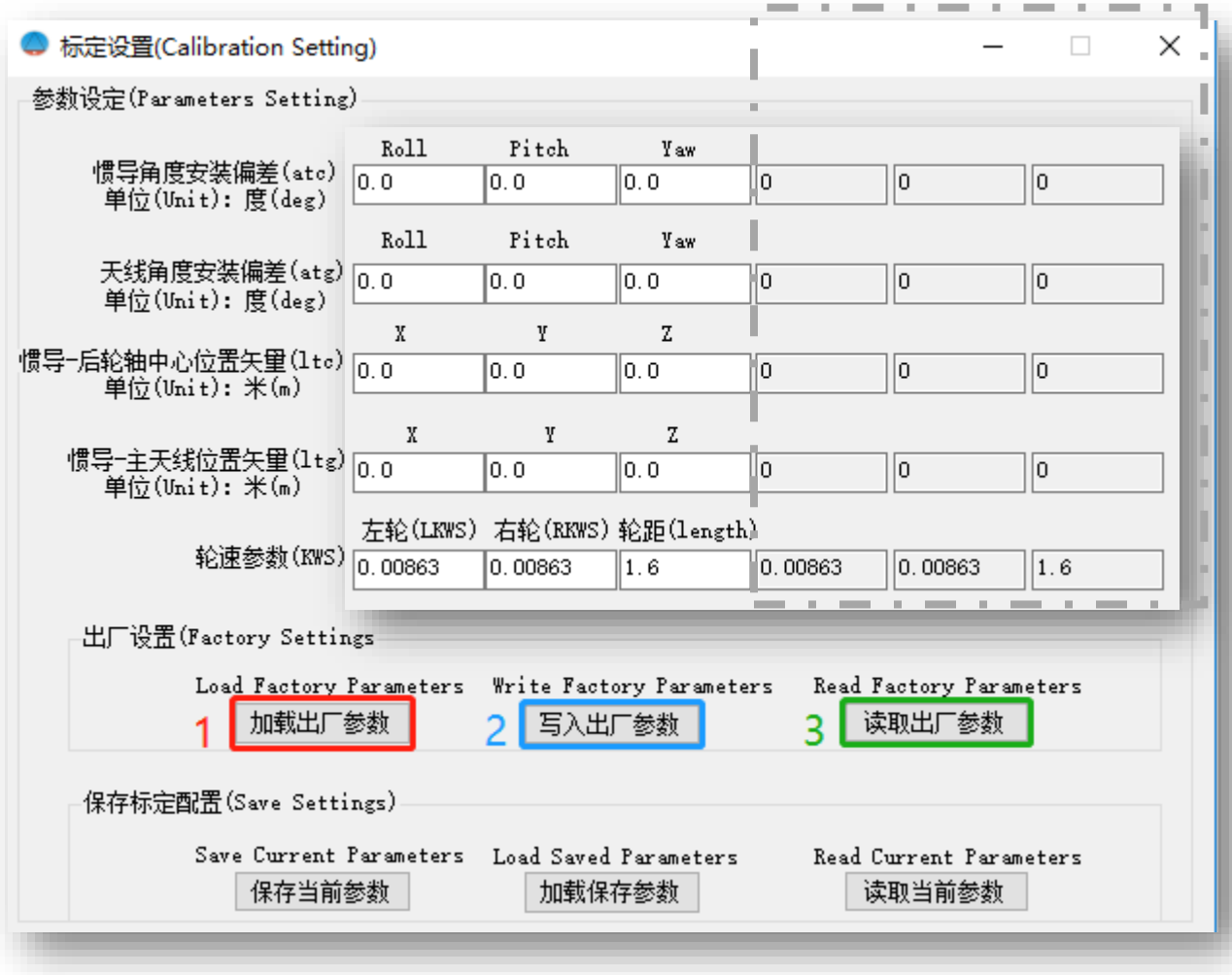
❸ 点击“**读取出厂参数**”按钮，对比各参数如图**虚线方框**所示，即成功归零

3. Click the "Read Factory Parameters“ button. Compare the parameters as shown in the dotted line box, i.e. restore settings successfully.

❹ 最后**重启设备**（惯导设备重新上电）。

4. Finally restart the device (re-power the INS device).

成功加载出厂数据
Load factory parameters successfully



2.2 标定参数设置
Calibration Parameters Settings

2.2.1惯导角度安装偏差设置
INS Angle Installation Deviation Settings

将车辆停放在水平路面上，观察软件主界面“当前信息”中数据，如图1，

若“**横滚角**”、“**俯仰角**”数值绝对值**≥1**，则在“标定设置”将对应数值**取反**，如图2所示。

Park the vehicle on the flat road and observe the data in the “VR Data” frame, as shown in Figure 1.

If the absolute value of “Roll” or “Pitch“ is greater or equal to 1, invert the corresponding value in “Calibration Setting” as shown in the Figure 2.

图1 Figure 1

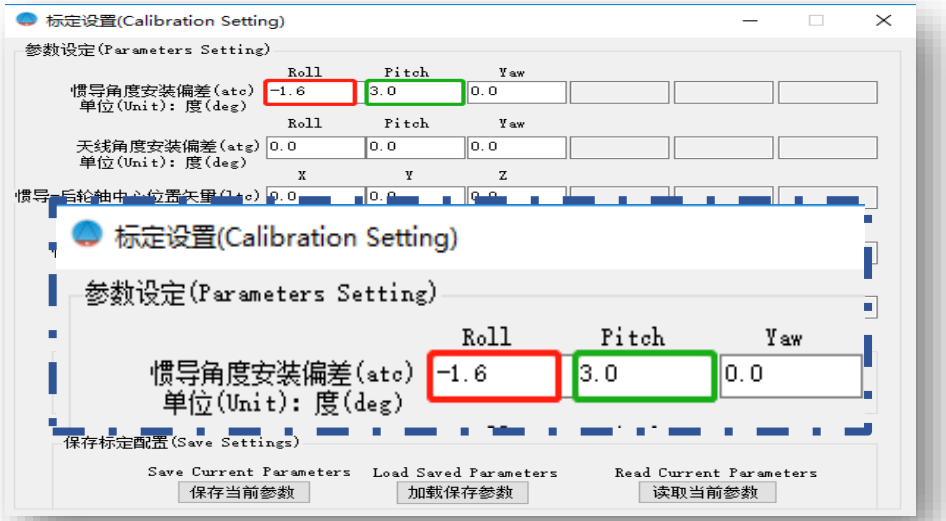


图2 Figure 2

2.2.2 惯导-后轮轴/主天线设置

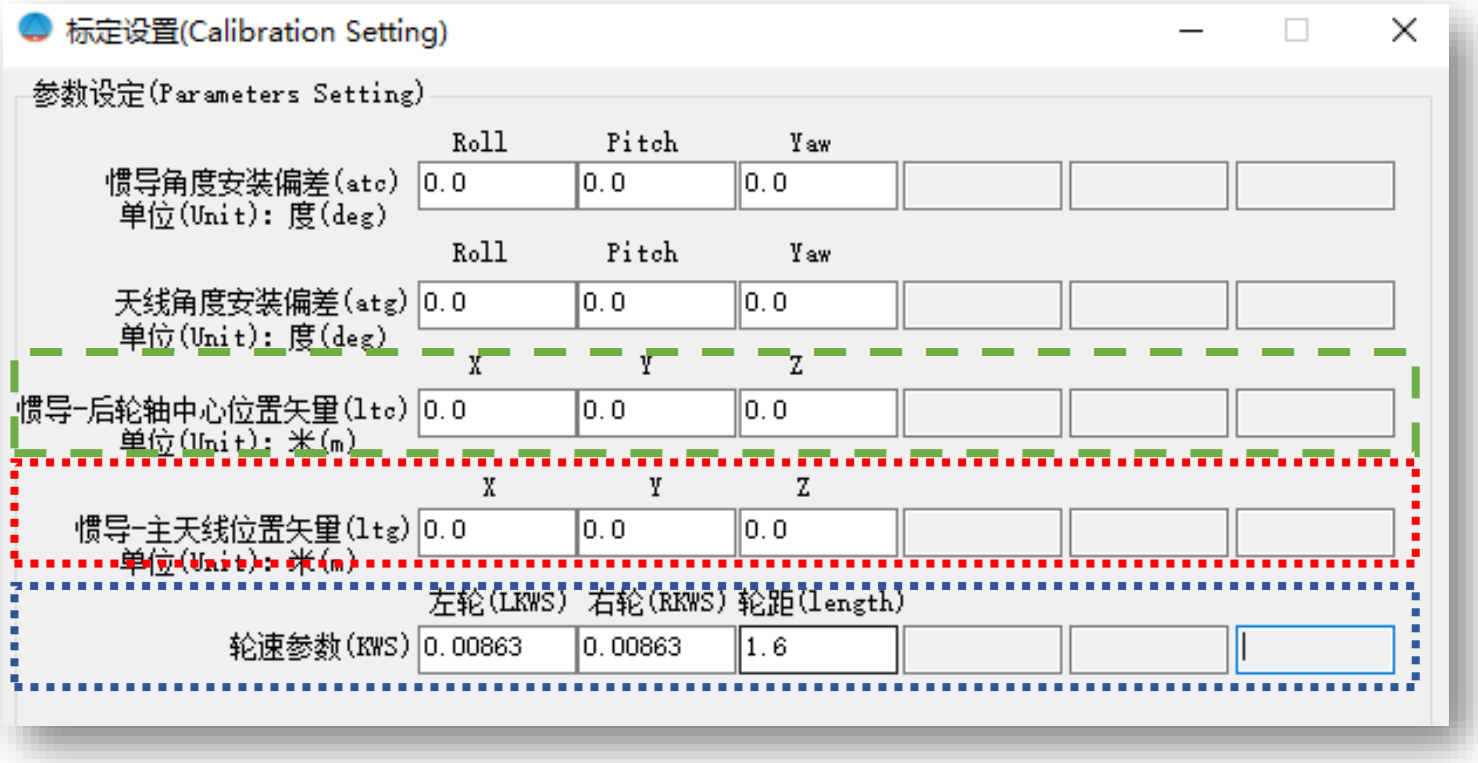
INS - rear Axle / Main Antenna Settings

◆ 以 惯导 为原点，
写出 惯导 到 **车后轮轴中心** 的距离矢量

Set the INS as the origin, measure the distance vector from the center of the rear axle to the INS.

◆ 以 惯导 为原点，
写出 惯导 到 **主天线**（如：蘑菇头天线）的距离矢量

Set the INS as the origin, measure the distance vector from the Main Antenna to the INS.



注：使用尺子进行测量，精度≤5cm。

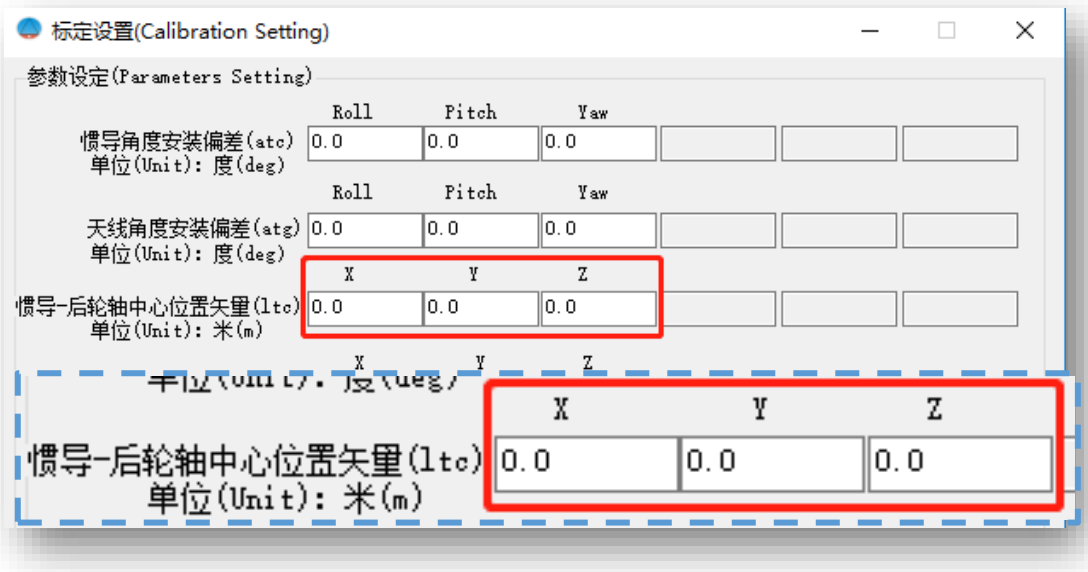
Note: Use a ruler for the measurement. Accuracy requirement: less than 5cm.

具体可翻看下一页“场景示例”

For details, please refer to the next page "Scenario Example"

e.g. 车辆模型测量方法
Vehicle Model Measurements

场景示例



惯导-天线位置矢量：

即：以**惯导**为原点，写出**惯导**到车辆**后轮轴中心**的距离矢量。

Set the INS as the origin, measure the distance vector from the center of the rear axle to the INS.

e.g. 场景

惯导安装在仪表盘上方，中间偏左0.1米；如图所示，假如测量结果为

X： 以**惯导为原点**，惯导到后轮轴中心的 **前后** 距离为**1.8**米；

Y： 以**惯导为原点**，惯导到后轮轴中心的 **左右** 距离为**0.1**米；

Z： 以**惯导为原点**，惯导到后轮轴中心的 **上下** 距离为**0.7**米；

依据 ***X：指向 车头 为正； Y：指向 车身右方 为正； Z：指向 地心 为正。***

最终填入的数值为：X= -1.8（负）； Y=0.1（正）； Z=0.7（正）

The INS is installed above the instrument panel, 0.1 m left to the middle, as shown in the figure. The measurement result is:

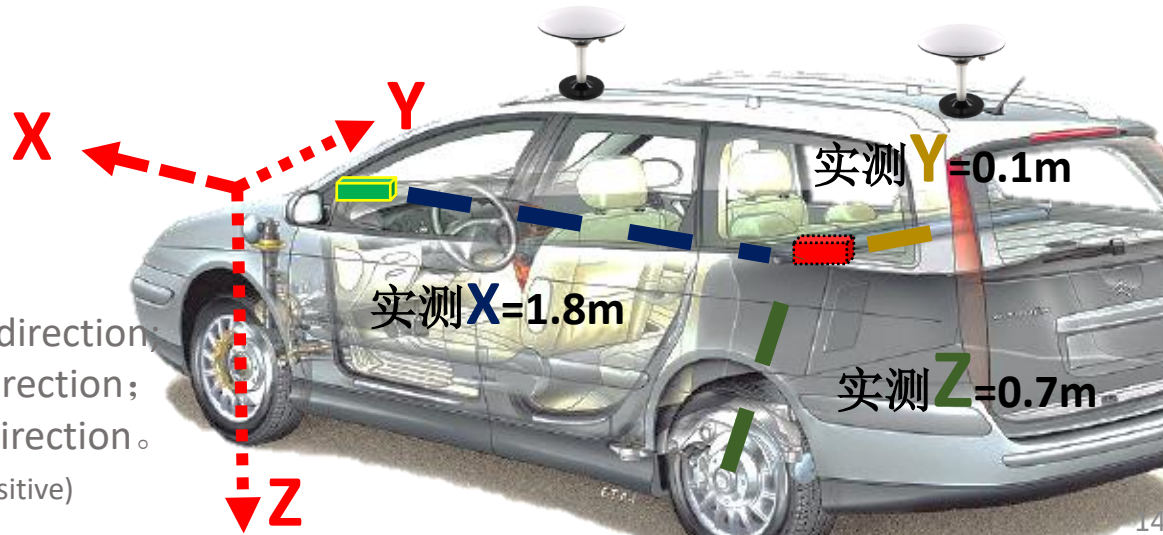
e.g.

X: Distance from the center of the rear axle to the INS is 1.8 m in the negative x direction;

Y: Distance from the center of the rear axle to the INS is 0.1m in the positive y direction;

Z: Distance from the center of the read axle to the INS is 0.7m in the positive z direction。

■ The final values to be filled in are: X = -1.8 (negative); Y = 0.1 (positive); Z = 0.7 (positive)

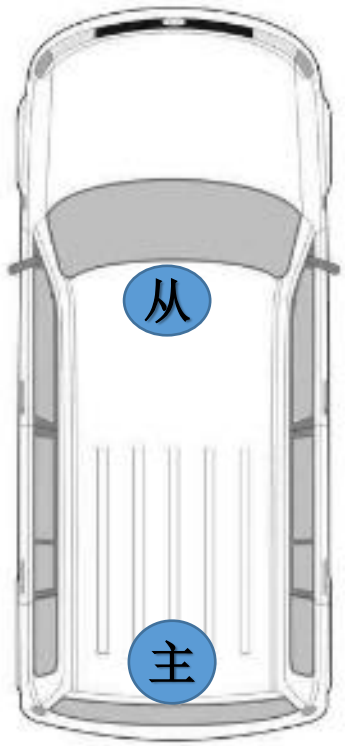


场景示例

e.g. 天线常用布局

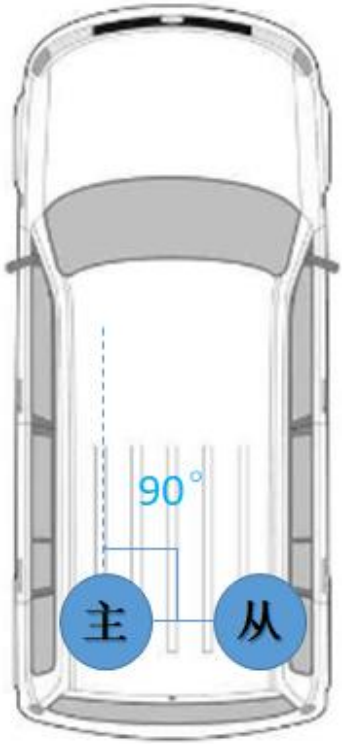
天线一前一后对准放置。
后为主天线

天线角度安装偏差
（x, x ,0 ）



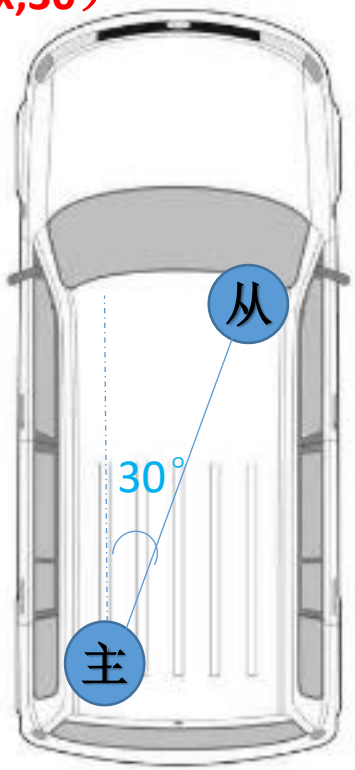
天线左右水平对准放置。
左为主天线

天线角度安装偏差
（ x, x, 90 ）



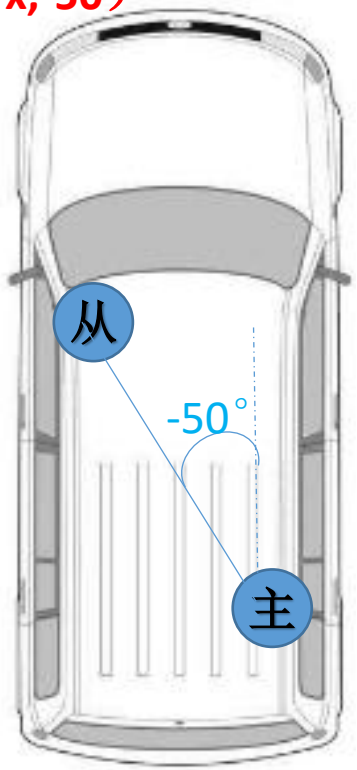
天线斜对角水平对准放置。
（例如顺时针30°）左下为主天线

天线角度安装偏差
（ x, x,30）



天线斜对角水平对准放置。
（例如逆时针50°）右下为主天线

天线角度安装偏差
（ x, x,-50）



2.2.3 写入车辆坐标参数
Set Calibration Parameters

- 将车辆停放在**水平路面**上，在上位机“**标定设置**”对话框进行标定参数写入，如图灰色方框所示。

Park the vehicle on the flat road and set the calibration parameters in the “Calibration Settings” window of the host computer, as shown in the gray box.

- 写入出厂参数后，依次进行以下操作
- After setting the factory parameters, do the following steps:

❶ 点击“**加载出厂参数**”按钮。

1. Click the "Load Factory Parameters“ button.

❷ 点击“**写入出厂参数**”按钮。

2. Click the “Write Factory Parameters” button.

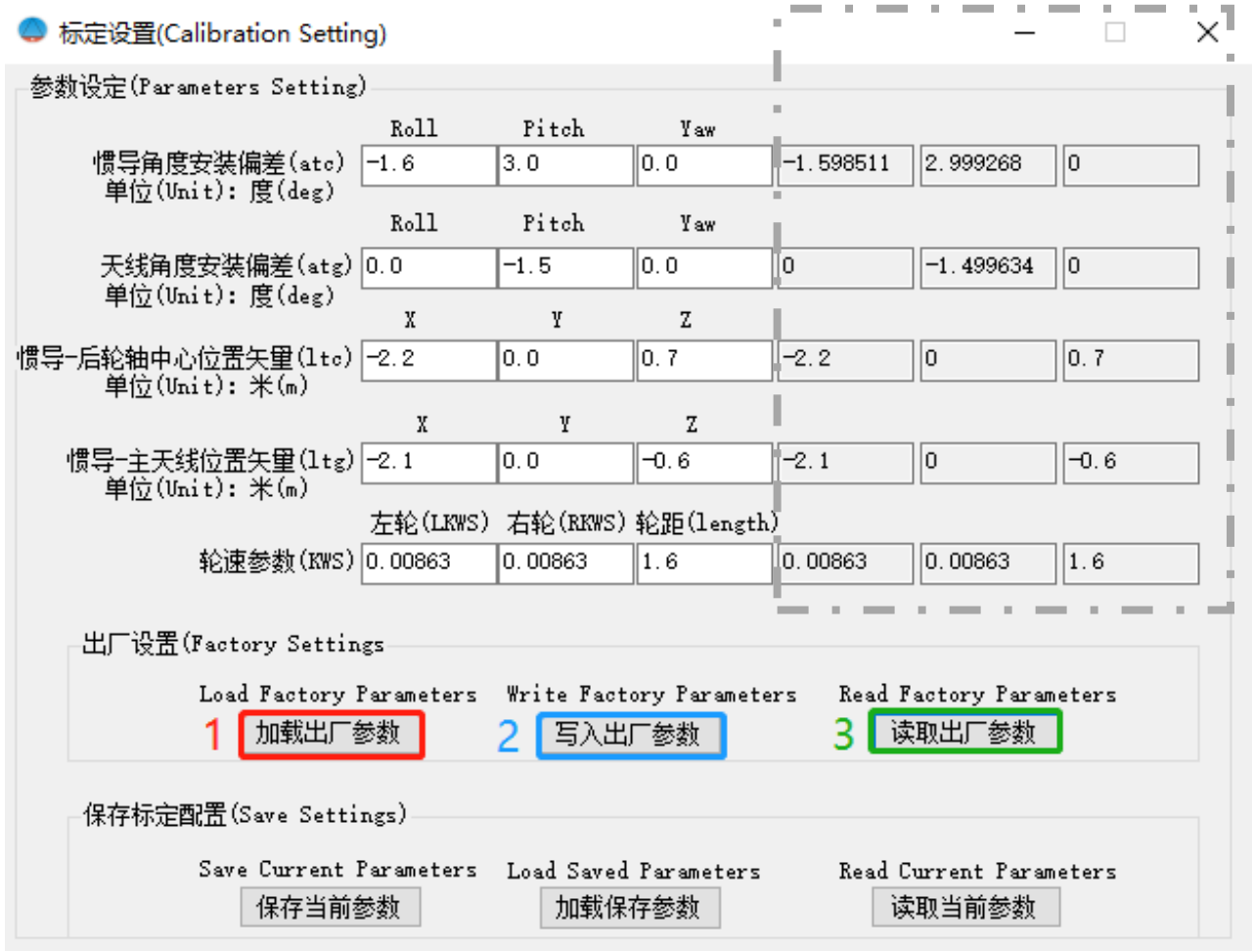
❸ 点击“**读取出厂参数**”按钮，
对比参数应与写入参数一致，即标定参数写入成功。

3. Click the "Read Factory Parameters” button,
the parameters should be consistent with the written parameters,
i.e. the calibration parameters are written successfully.

❹ 最后**重启设备**（惯导设备重新上电）。

4. Finally restart the device (re-power the INS device).

成功加载车辆坐标数据
Load vehicle coordinate data successfully



2.3 惯导初始化
INS Initialization

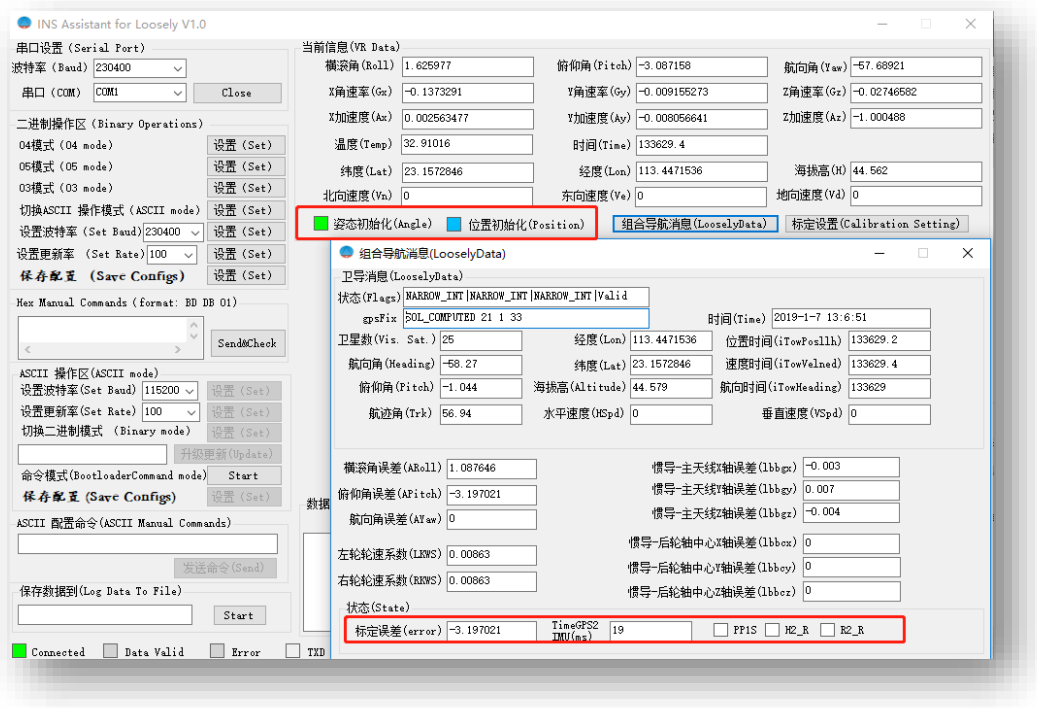
- **在卫星信号良好（收星数>17颗）情况下，**
- When satellite signals are strong enough (Vis. Sat. is greater than 17).

（1）软件主界面“**姿态初始化**”、“**位置初始化**”指示灯应点亮（绿灯 与 蓝灯 ）。

(1) The indicators of “Angle” and “Position” in the main interface should remain green and blue.

（2）点击主界面“**组合导航消息**”，弹出“组合导航消息”框。

(2) Click the “INS Data” button. A message box of “INS Data” should be popped out automatically.



- “**卫星消息**”状态信息栏应为三个“**NARROW_INT**”状态。
- The “Flags” information bar should display three "NARROW_INT".

- “**状态**”信息栏中PP1S、H2_R指示灯应均匀闪烁 ；
- The PP1S and H2_R indicators in the “State” information bar should flash evenly ;

- TimeGPS2 IMU(ms)数值不为0。
- TimeGPS2 IMU (ms) value should NOT be 0.

- 车辆行驶时，R2_R指示灯（CAN版）应正常闪烁 ；
- When the vehicle is running, the R2_R indicator (CAN version) should flash normally;

建议：*惯导初始化完成后，准备跑车标定前，请开始保存跑车的数据，方便日后问题溯源。*

Suggestion: When INS initialization is done, to facilitate error traceability please save the calibration data before starting the road test.

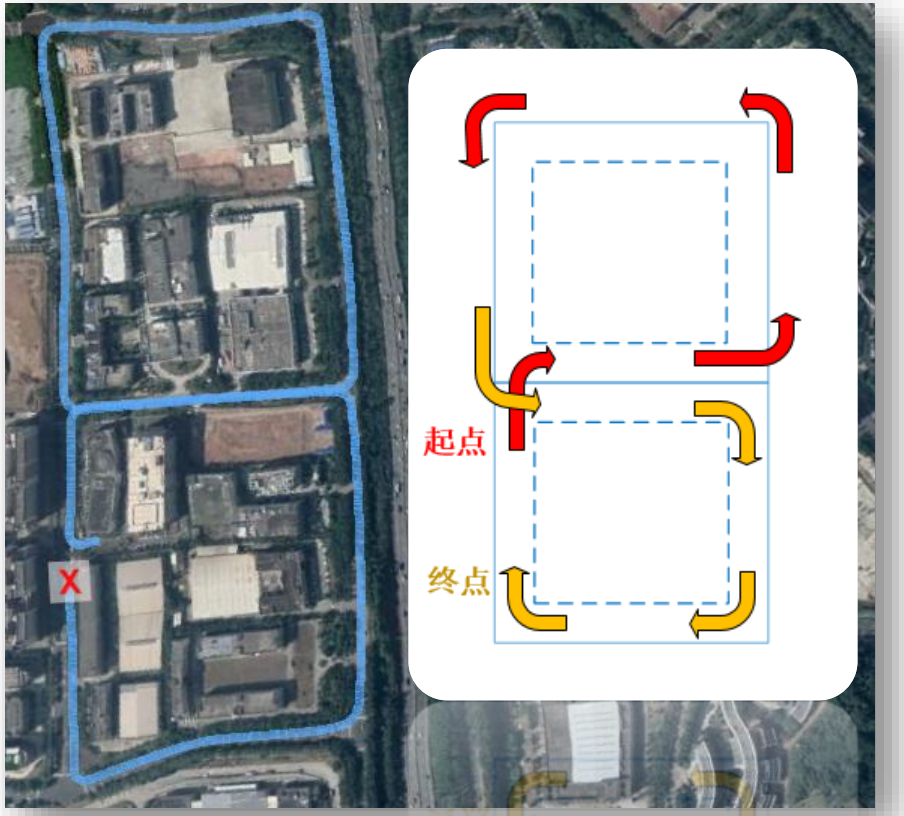
2.4 跑车标定
Road Test and Calibration

➢ **跑车标定要求**

road test requirements

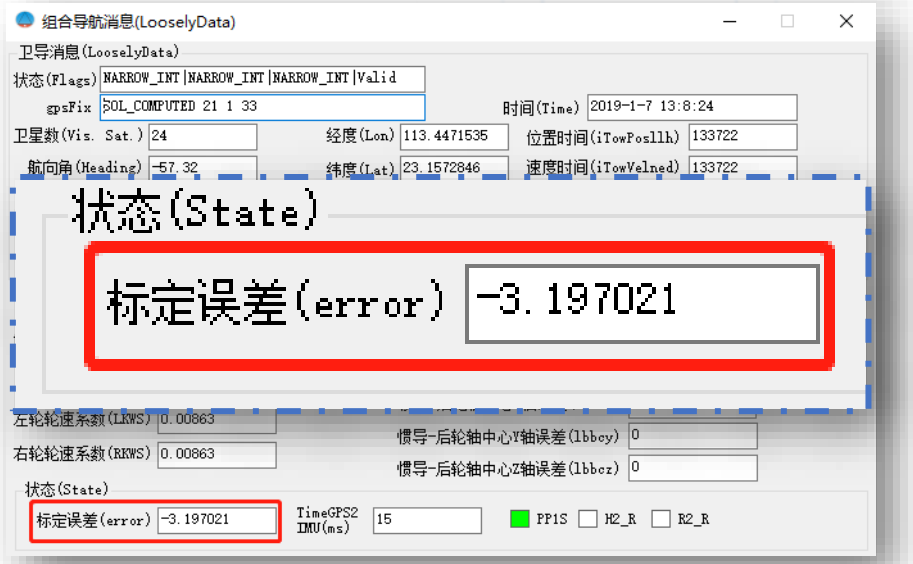
（1）惯导初始化状态检查无误后，开始跑车标定。尽量跑“**日**”字（包含**左、右转弯** 和 **拐弯后需直行**），如图。

(1) After the INS initialization, start the road test. Try to run as the word “日” (including left and right turns and keep straight after turning), as shown in the figure.



（2）跑车时间尽量在**5-10min**，待“**组合导航消息_状态**”信息栏中“**标定误差**”数值稳定，波动小于0.1°，认为标定完成。

(2) The time of the road test should be 5-10min. Observe the “INS Data” message box, when the “error” value in the “State” information bar is stable， Fluctuation＜0.1°,the calibration is considered to be completed.



- 若无理想路线，必须包含**左转、右转、拐弯后需直行**状态。
- If there is no ideal route, the route must include left turns, right turns, and keep straight after turning.

注：完成跑车标定后，继续进行标定数据写入，期间设备不能断电。

Note: After the road test, to finish writing calibration data, uninterrupted power supply is required.

2.5 写入跑车标定数据
Set Road Test and Calibration Data

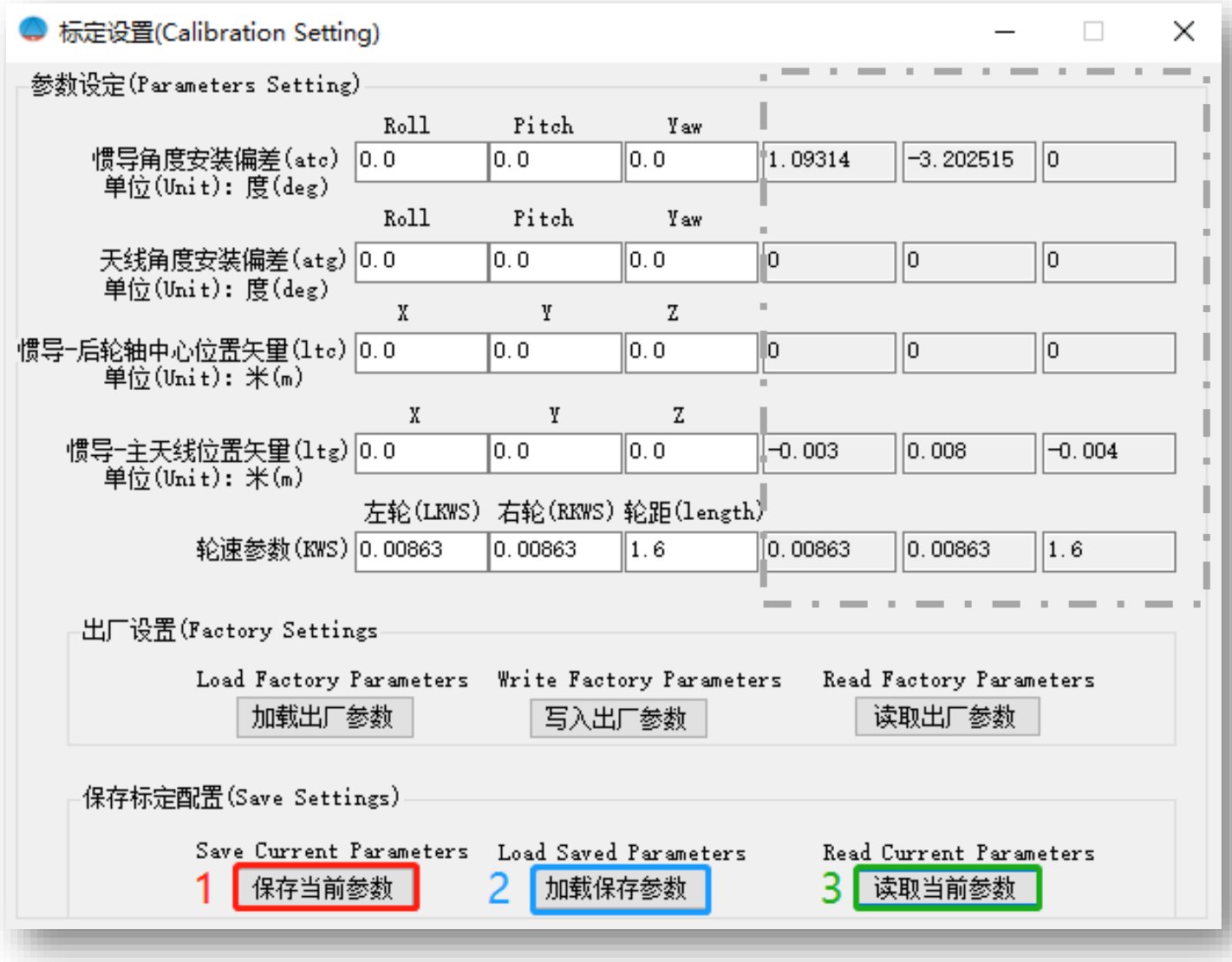
❶ 点击“保存当前参数”按钮。
1. Click the “Saved Current Parameters“ button.

❷ 点击“加载保存参数”按钮。
2. Click the “Load Saved Parameters“ button.

❸ 点击“读取当前参数”按钮，
对比是否写入参数。
3. Click the “Read Current Parameters“ button. Compare the parameters to check whether they are set correctly.

❹ 最后重启设备（惯导设备重新上电），
即完成惯导标定。
4. Finally, restart the device (re-power the INS device) to complete the INS calibration.

成功加载标定数据
Set the calibration data successfully



注：若单次标定效果不佳，可重复2.3- 2.5节步骤重复写入标定数据。
Note: If single calibration is not very effective, repeat the steps 2.3-2.5 to reset the calibration data.

3. 安装标定 结束
Installation and Calibration Completed

安装标定工作已完成，
可将标定数据发给对应工程师进行数据分析。

Installation and calibration work is complete,
Send calibration data to corresponding engineer for further data analysis.