

# **L26-DR** EVB User Guide

## **GNSS Module Series**

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# About the document

## History

Revision	Date	Author	Description
1.0	2019-07-04	Brooke WANG	Initial
1.1	2019-11-09	Brooke WANG	<ol style="list-style-type: none"><li>1. Updated Figure 2, 9 and 15;</li><li>2. Updated the description in Chapter 5.2;</li><li>3. Updated the calibration procedure in Chapter 7;</li><li>4. Updated accessory information in Table 2.</li></ol>
1.2	2019-12-25	Shua SHI/ Brooke WANG	<ol style="list-style-type: none"><li>1. Updated the description about calibration result monitoring in Chapter 6.2.2;</li><li>2. Moved description about EVB and accessories assembly into Chapter 2.</li></ol>

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# 1 Introduction

This user guide describes detailed information about the usage of Quectel L26-DR EVB (Evaluation Board), the auxiliary for engineers to develop and test Quectel L26-DR module.

## 1.1. Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any terminal incorporating Quectel L26-DR module. Manufacturers of the terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals supplied with the product. If not so, Quectel assumes no liability for any failure to comply with these precautions.



Be assure the use of the product conforms to the national safety and environmental regulations, and is allowed in the country and in the environment required.



Keep away from explosive and flammable materials. The use of electronic products in extreme power supply conditions and locations with potentially explosive atmospheres may cause fire and explosion hazards.



The product has to be powered by a stabilized voltage source, and the wiring shall conform to security and fire prevention regulations.



Proper ESD handling procedures must be applied throughout the mounting, handling and operation of any application that incorporates the module to avoid ESD damages.

## 2 General Overview

### 2.1. Top and Side Views of L26-DR EVB

The following figure illustrates the top and side views of L26-DR EVB.

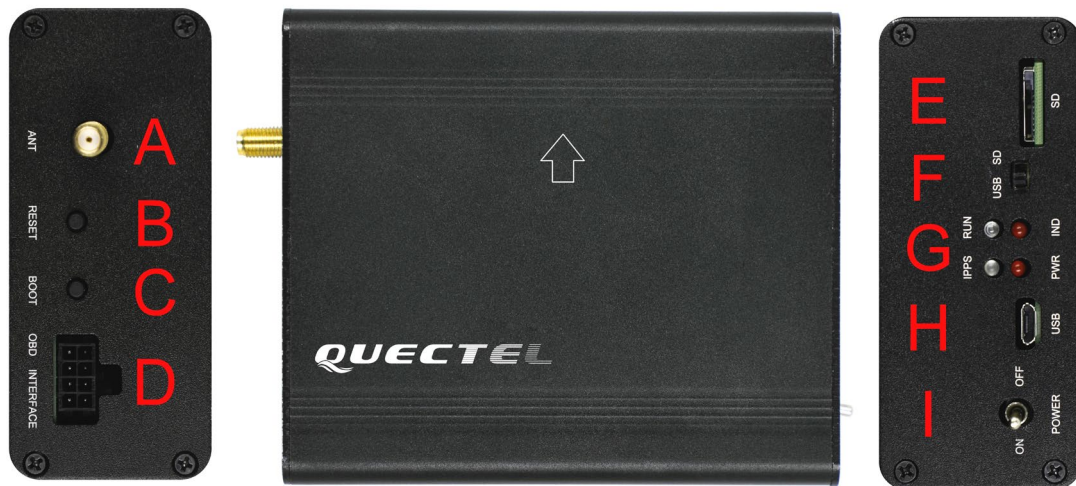


Figure 1: Top and Side Views of L26-DR EVB

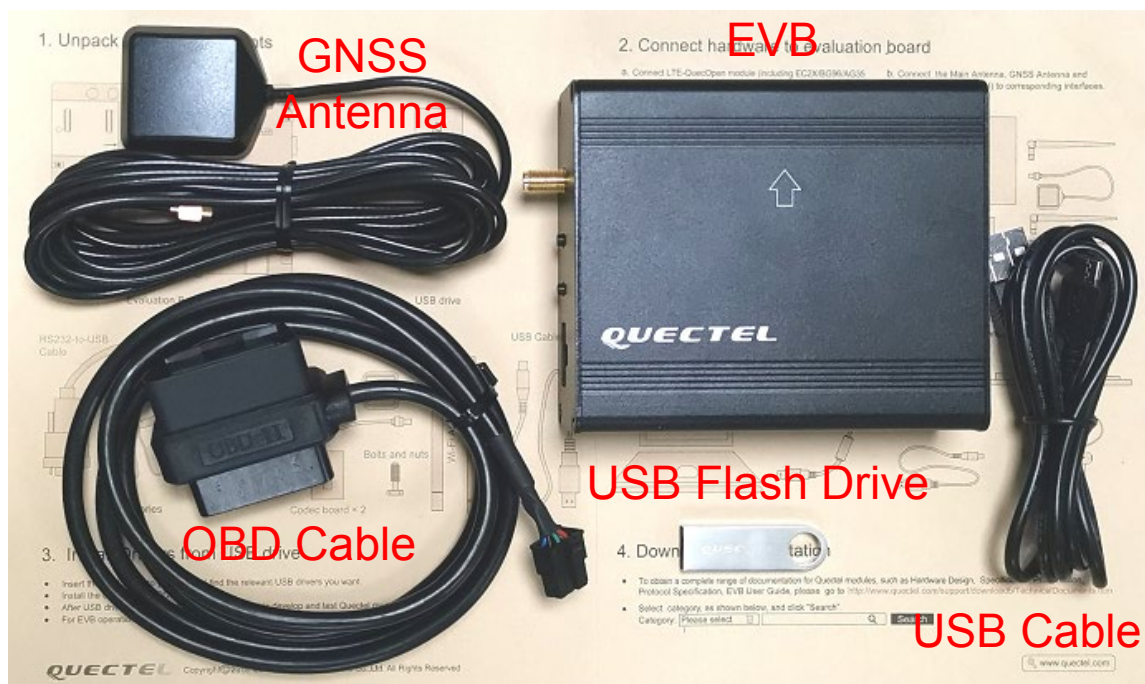
Table 1: Interfaces of L26-DR EVB

SN.	Name	Description
A	ANT	Antenna Interface
B	RESET	Reset Button
C	BOOT	Boot Button
D	OBD INTERFACE	OBD Interface
E	SD	SD card Interface



F	USB/SD	USB/SD Switch
G	1PPS/RUN/PWR/IND	Indication LEDs
H	USB	Micro-USB Interface
I	POWER	Power Switch

## 2.2. L26-DR EVB and Accessories



**Figure 2: L26-DR EVB & Accessories**

**Table 2: List of Accessories**

Items	Description	Quantity
EVB	The evaluation board of L26-DR	1
USB Cable	USB Cable	1
OBD Cable <sup>1)</sup>	OBD Cable	1

Antenna	GNSS Antenna (Active)	1
USB Flash Drive	USB Flash Drive (including L26-DR related documents, tools, drivers, etc.)	1
Instruction	One-sheet-instruction giving instructions for EVB connection, details of EVB accessories, etc.	1

**NOTE**

<sup>1)</sup> L26-DR (UDR) EVB Kit does not contain the OBD Cable.

## 2.3. EVB and Accessories Assembly

The following figure shows the assembly of L26-DR EVB and its accessories.



**Figure 3: L26-DR EVB and Accessories Assembly**

## 3 Interface Applications

### 3.1. Micro-USB Interface

Main power is supplied via the Micro-USB interface. Data can be transmitted via both Micro-USB and SD card interfaces, which is switched between the two interfaces with the USB/SD switch.



Figure 4: Micro-USB Interface

### 3.2. SD Card Interface

The SD interface supports to save the output data of L26-DR module in SD card. The storage capacity of supported SD card should be no more than 32GB.



Figure 5: SD Card Interface

### 3.3. Antenna Interface

The antenna interface is used to connect the GNSS antenna.



Figure 6: Antenna Interface



### 3.4. Switches and Buttons

The following figure illustrates the switches and buttons of the EVB.

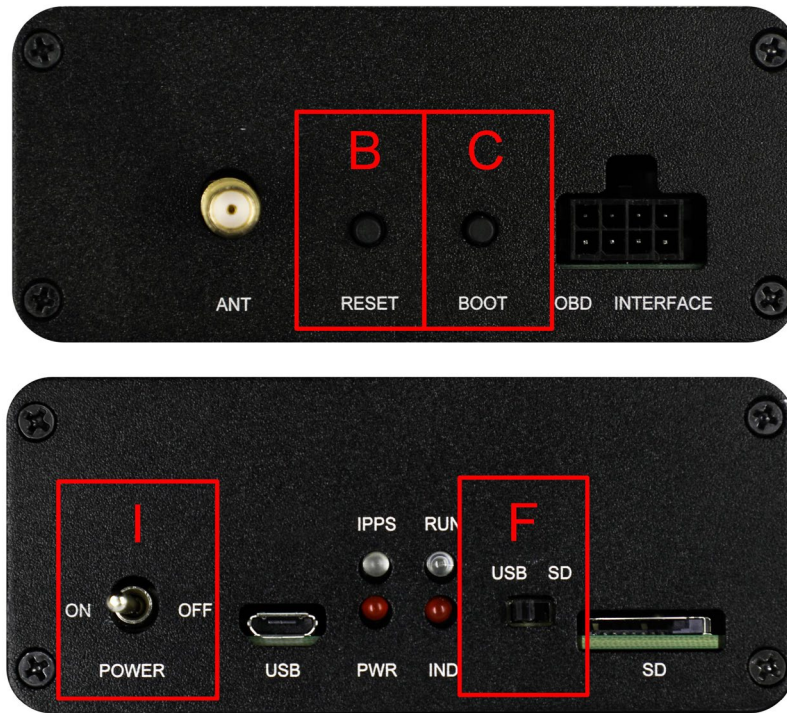


Figure 7: Switches and Buttons

Table 3: Switches and Buttons

Part No.	Name	I/O	Description
B	RESET	DI	The module will be reset through pressing and then releasing the button.
C	BOOT	DI	Please refer to <b>Chapter 4.2.2</b> for details.
I	POWER	PI	Power switch
F	USB/SD	IO	USB/SD switch L26-DR EVB supports data output via both Micro-USB and SD card interfaces, which is switched by the USB/SD switch.

### 3.5. Operation Status Indication LEDs



Figure 8: Operation Status Indication LEDs

Table 4: Operation Status Indication LEDs

Name	I/O	Description
1PPS	DO	Flash: 1PPS signal indicator. The frequency is 1Hz (configurable).
RUN	DO	Flash: SD card function is supported.
PWR	DO	Power indicator
IND	DO	Flash: Data is output through SD card interface. Extinct: Data is output through USB card interface.

### 3.6. OBD Interface

The following figure illustrates the OBD interface of the EVB.

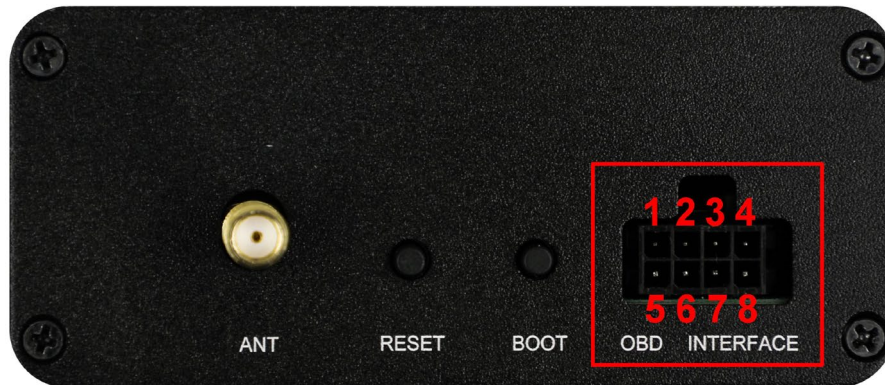


Figure 9: OBD Interface

Table 5: Pin Description

Pin No.	Signal	I/O	Description
1	GND	-	Ground
2	CAN_L	IO	Low level CAN bus line
3	CAN_H	IO	High level CAN bus line
4	SGND	-	Signal ground
5	-	-	Reserved
6	WHEELTICK	DI	Odometer wheel-tick input
7	FWD	DI	Forward/backward status signal input
8	GND	-	Ground

#### NOTE

L26-DR (UDR) EVB does not support WHEELTICK, FWD, CAN features.

# 4 EVB Operation Procedures

This chapter mainly illustrates the operation procedures of L26-DR EVB.

## 4.1. Communication via Micro-USB Interface

**Step 1:** Connect the EVB and the PC with a Micro-USB cable through Micro-USB interface, and then switch POWER to ON state to power on the EVB.

**Step 2:** Run the USB flash drive on PC to install the USB driver. The USB port numbers will be viewed in Device Manager of the PC after the USB driver is installed, as shown below.

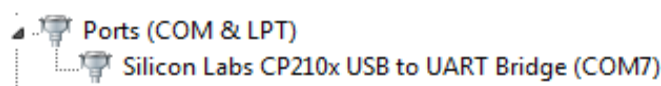


Figure 10: USB Ports

**Step 3:** Install and then use the QCOM tool provided by Quectel to realize the communication between L26-DR module and the PC.

The following figure shows the COM Port Setting of QCOM: select the correct “**COM Port**” (USB Port shown in the above figure) and set the correct “**Baudrate**” (the default value: 115200bps). For more details about the usage of QCOM, please refer to **document [4]**.

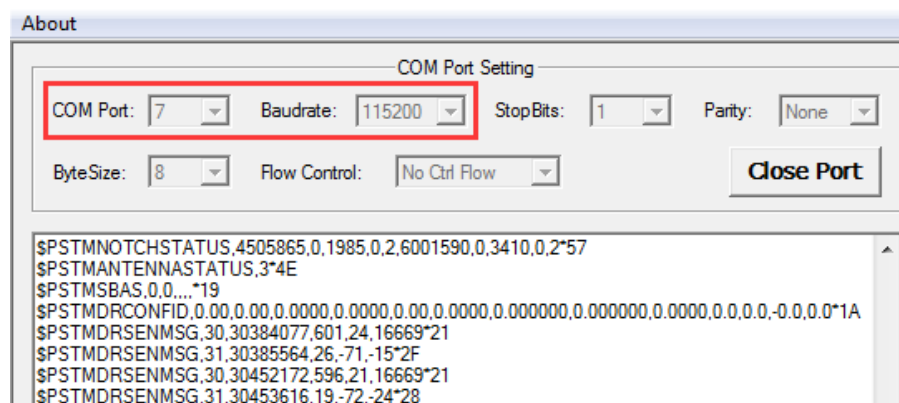


Figure 11: COM Port Setting of QCOM



## 4.2. Download Firmware

There are two methods to download the firmware: firmware upgrade and boot download.

### 4.2.1. Firmware Upgrade

Firmware Upgrade should be operated as the following steps:

**Step 1:** Connect the EVB to a PC through the USB cable.

**Step 2:** Switch POWER to ON state to power on the EVB.

**Step 3:** Run the tool STA808x/9x Firmware Upgrade and configure the tool as shown below.

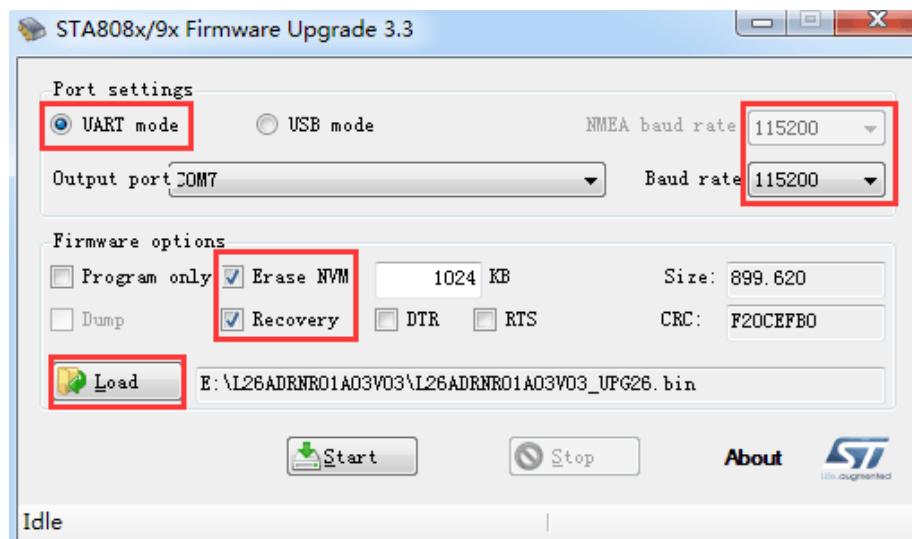



Figure 12: STA808x/9x Firmware Upgrade Tool Configurations

**Step 4:** Click  button and then reset the module to upgrade the firmware.

### 4.2.2. Boot Download

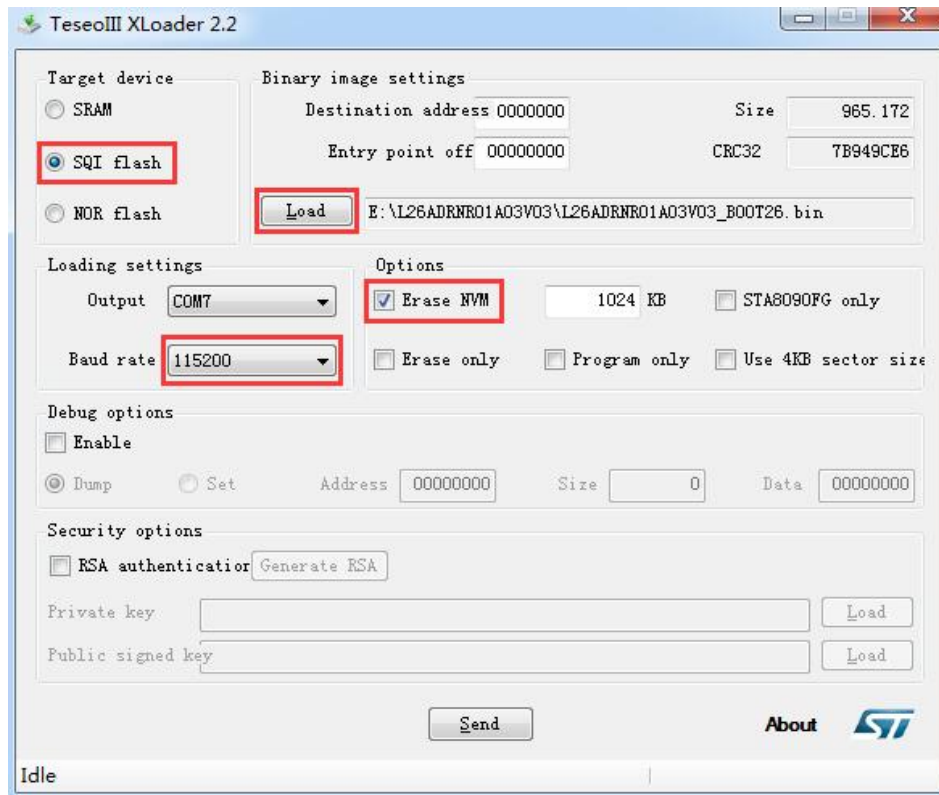
Boot download should be performed as the following steps:

**Step 1:** Connect the EVB to a PC through the USB cable.

**Step 2:** Long press BOOT button (the BOOT pin of L26-DR will be pulled up to VCC with a 10kΩ resistor), and switch POWER to ON state to power on the EVB. Once the high voltage level of BOOT pin has been detected during the power-up, the module will enter boot download.

**Step 3:** Release BOOT button to make BOOT pin of L26-DR return to normal floating.

**Step 4:** Run the tool TeseoIII XLoader and configure the tool as shown below.



**Figure 13: TeseoIII XLoader Tool Configurations**

**Step 5:** Click  button to download the firmware.

# 5 Usage of Teseo-Suite Pro

After the EVB accessories are assembled, please turn on the module and start the tool Teseo-Suite Pro. The tool helps users to view the status of GNSS receiver. The following chapters only briefly describes the use of Teseo-Suite Pro. For more details about the tool, please click **“Help”** and select **“User Manual”** in the tool.

## 5.1. View GNSS Receiver Status

### 5.1.1. COM Port and Baud Rate Setting

After the tool is opened, the following interface will be shown:

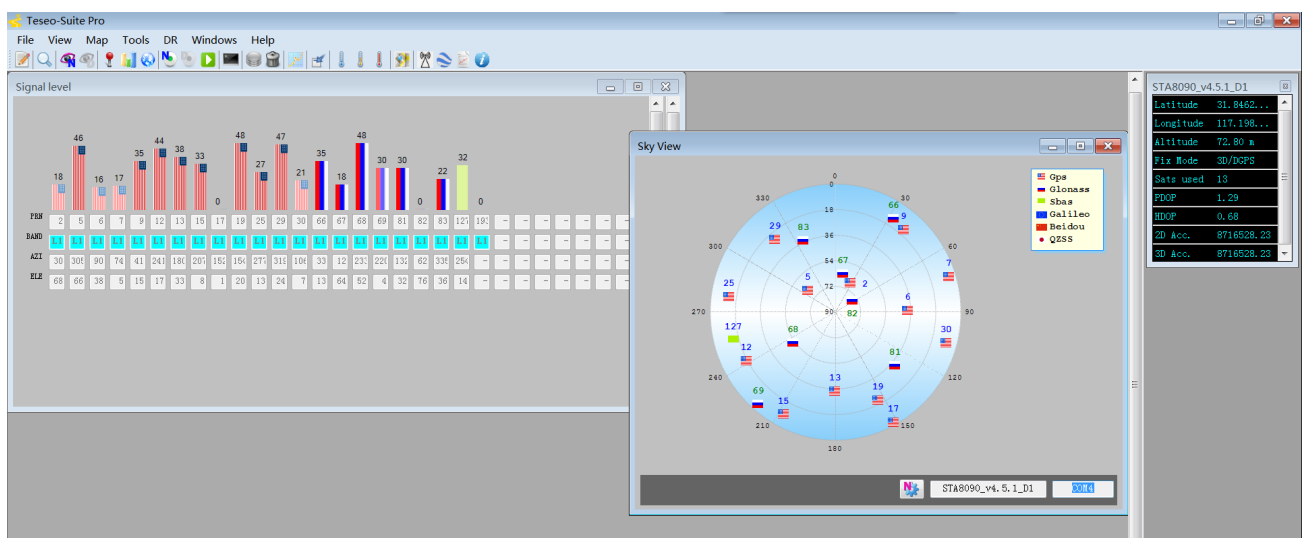
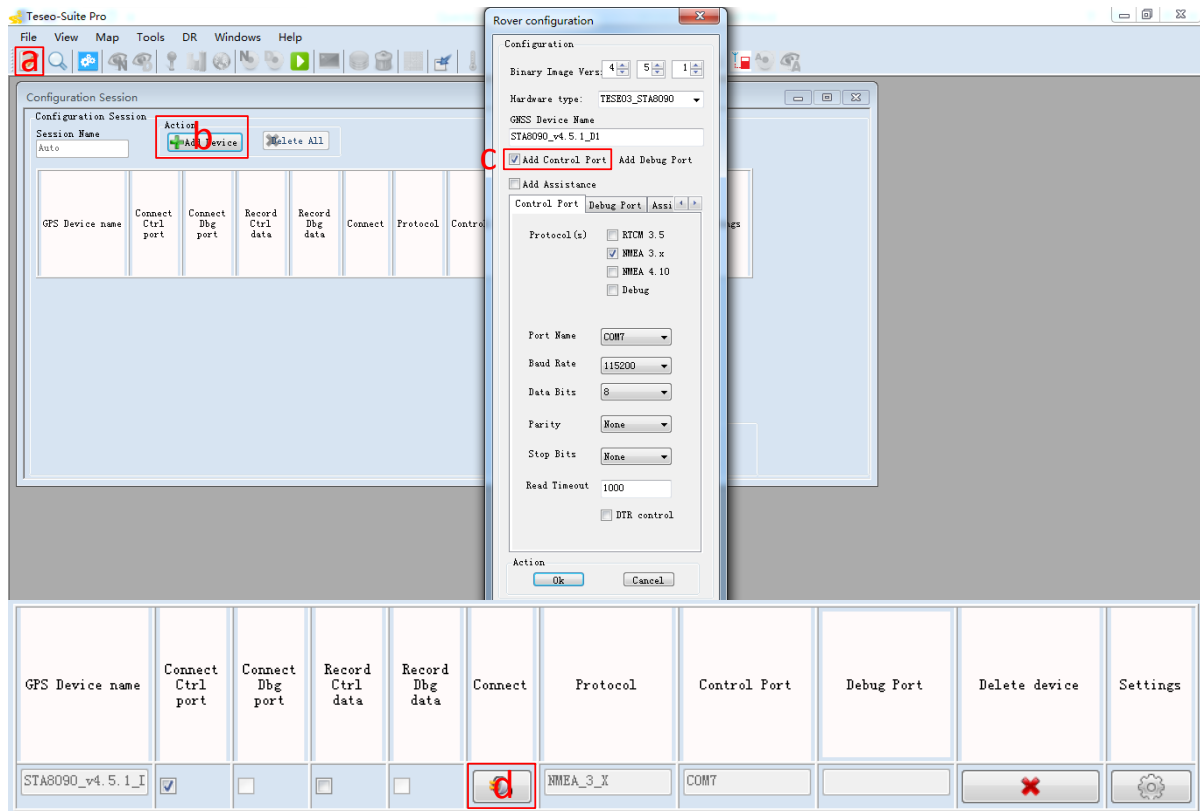


Figure 14: Teseo-Suite Pro Interface


UART port can be automatically identified by Teseo-Suite Pro when the it is opened. If not, the steps from “a” to “d” illustrated in the following figure should be performed.

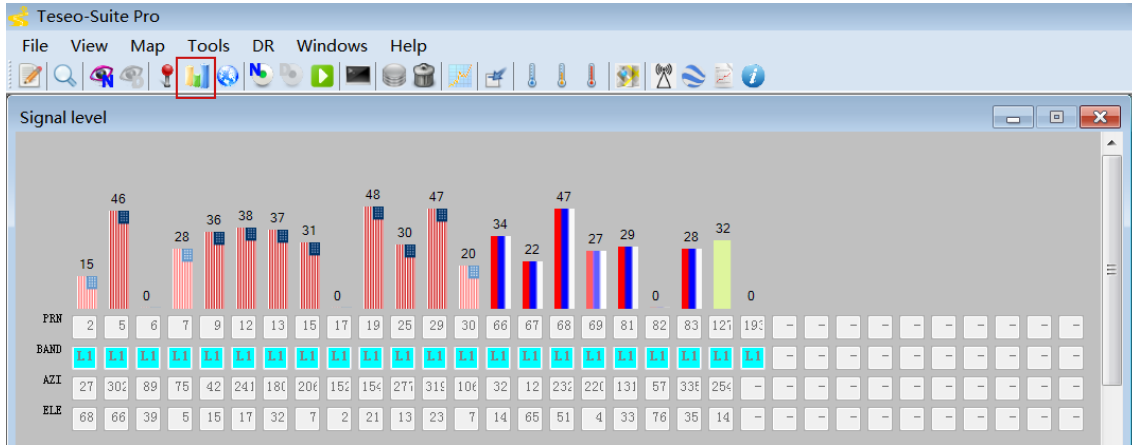
Please click the corresponding buttons. After **+Add Device** button is clicked, the “Rover Configuration” box will be popped up, then please check the **“Add Control Port”** box.




**Figure 15: Manual Configuration for the COM Port**

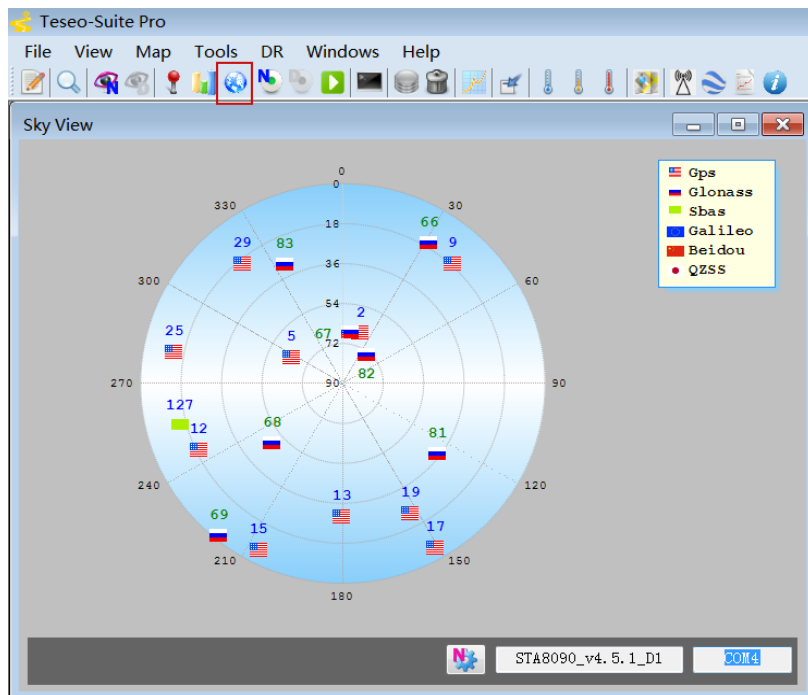
### 5.1.2. Explanations of Views and Windows

The following interface will be shown by clicking  button. The digit shown above each flag is the CN value. Below are displayed information such as the PRN, the frequency band used by the satellite ("BAND"), the azimuth ("AZI") and the elevation of the satellite ("ELE"). Clear flag means the navigation data of this satellite are in use, while faded flag means not used.



**Figure 16: Signal Level**

After  button is clicked, "Sky View" will be opened, which shows the current azimuth and elevation of satellites used for the fix.



**Figure 17: Sky View**



# 6 Calibration Procedure

In order to utilize Dead Reckoning (DR) capabilities of L26-DR, a valid module calibration is essential. Please mount the module tightly on the vehicle during use. No movement or shaking should occur to ensure the performance of the module. This chapter introduces the detailed calibration procedure.

## 6.1. Calibration for L26-DR (ADR)/L26-DR (ADRA) EVB

L26-DR (ADR) and L26-DR (ADRA) EVB allow for flexible installation without constraint on angle and direction. The module automatically recognizes the mounting angle deviation and compensates by algorithmic calculations.

The calibration for L26-DR (ADR) and L26-DR (ADRA) comprises 7 steps, as describe in the following chapters.

### NOTES

1. This calibration process in this chapter is based on the precondition that users have fixed the EVB. And no displacement or rotation of the EVB should happen after the calibration.
2. The calibration process needs to be repeated only when:
  - The EVB has been moved and reinstalled.
  - During a DR cold start and when the NVM is blank or invalid.
3. Please follow the steps in **Chapter 6.1.1** to finish the angle determination process as any improper operation may affect the calibration.

### 6.1.1. Determination Process of EVB Installation Angle

Before the 6-axis accelerometer sensor is available, EVB installation angle needs to be determined by the following steps:

**Step 1:** Install the EVB on a vehicle and connect the antenna.

**Step 2:** Start the vehicle and power on the EVB.

**Step 3:** Keep the vehicle unmoved for at least 20 seconds on a flat road ( $1^{\circ}\sim 2^{\circ}$  tolerance in gravity

direction).

**Step 4:** Drive the vehicle for 1 minute.

**Step 5:** Stop the vehicle and keep it unmoved for at least 5 seconds. The software will save the calculated installation angle to the flash memory.

### 6.1.2. Main Calibration Procedure

Once installation angle is determined, the following steps should be executed to fine tune the calibration accurately:

**Step 6:** After **Step 5**, the yaw rate offset is automatically initialized with a reliable value. Then, drive in a straight road (with speed > 30 km/h) for at least 5 minutes.

**Step 7:** Drive in areas rich of curves (with speed > 30 km/h). This process is needed to calibrate the yaw rate gain. It is important that tight turns (with narrow radius of curvature) are required. Typical scenes that allow this step to be performed properly are roundabouts, tight turns, and road curves with direction changed in 90 degrees or more. Large turns (e.g. smooth turns on highway, lane changes, etc.) will not work.

Please note that the success of this operation does not depend on its duration, but the number of valid turns. In order to have a fine-tuned yaw rate gain, it is suggested that the first-boot calibration route should include at least 10 tight turns described above. During this procedure, the same turn can be repeated for many times.

It is of the utmost importance that all these operations should be performed under adequate GNSS signal conditions, which means that the antenna must have maximum sky visibility. Thus, the calibration should be performed in an open area, i.e. the area away from high-rise buildings, forests, tunnels and any other element that may cause signal blocking or reflection.

#### NOTE

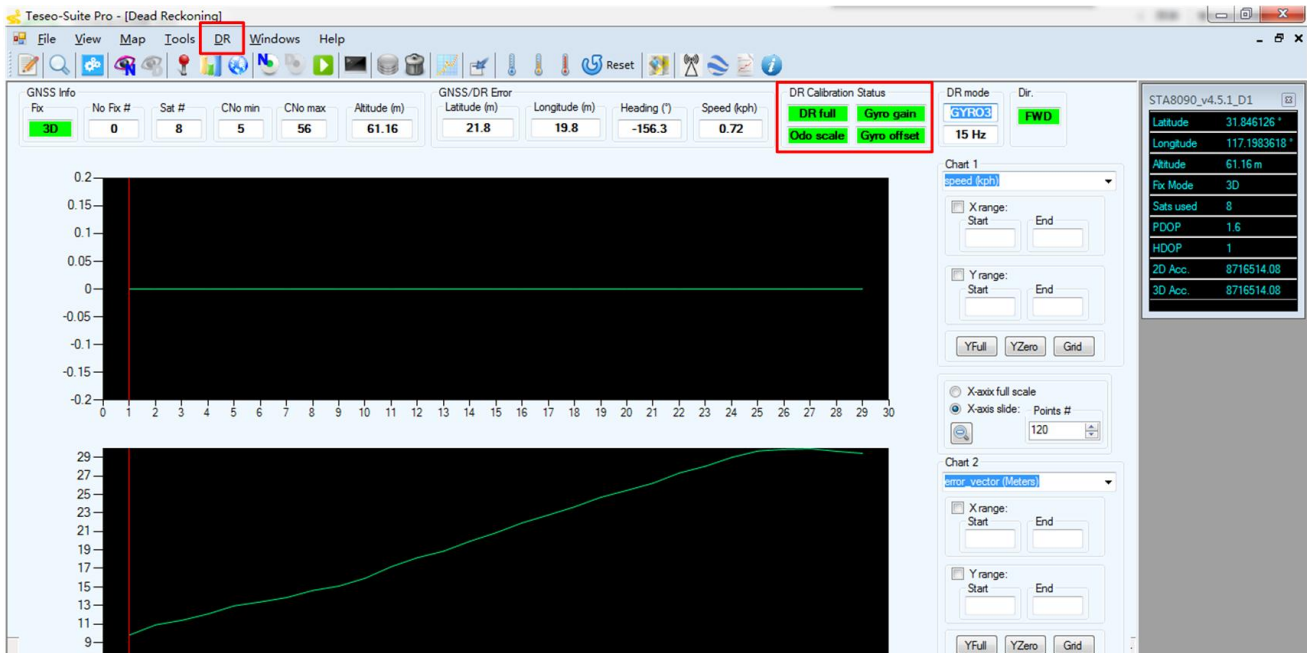
Please notify that the hybrid GNSS/DR navigation mode will not be available until a valid calibration is done. Without a valid calibration, only single GNSS navigation is available.



### 6.1.3. Calibration Result Monitoring

The calibration result can be monitored through Teseo-Suite Pro tool. After the tool is started, please click “DR” in the menu. The “Dead Reckoning” window will be popped up, as shown by the figure below.

If the “DR Calibration Status” shown below turns green, the calibration is successful. After that, the test can be started. If the “DR Calibration Status” turns red, please repeat the calibration procedure.

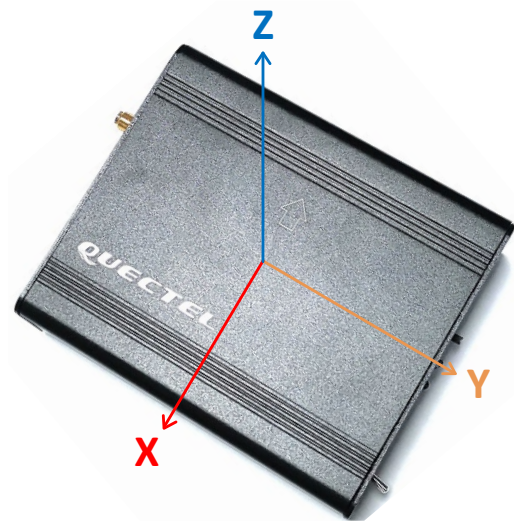


**Figure 20: ADR Calibration Status**

## 6.2. L26-DR (UDR) EVB

The installation of L26-DR (UDR) EVB is relatively more demanding, one of the X, Y and Z axis, shown in the following figure, should be perpendicular to the horizontal plane, and the deviation should be less than 20°. In this case, there is no limit to the placement direction on the plane formed by the other two axes.

For instance, if axis Z is perpendicular to the horizontal plane, there is no limit to the mounting direction of the EVB on the plane formed by axes X and Y.



**Figure 21: Axis of L26-DR (UDR) EVB**

### 6.2.1. Calibration Procedure

**Step 1:** Install the EVB on a vehicle and connect the antenna.

**Step 2:** Power on the EVB.

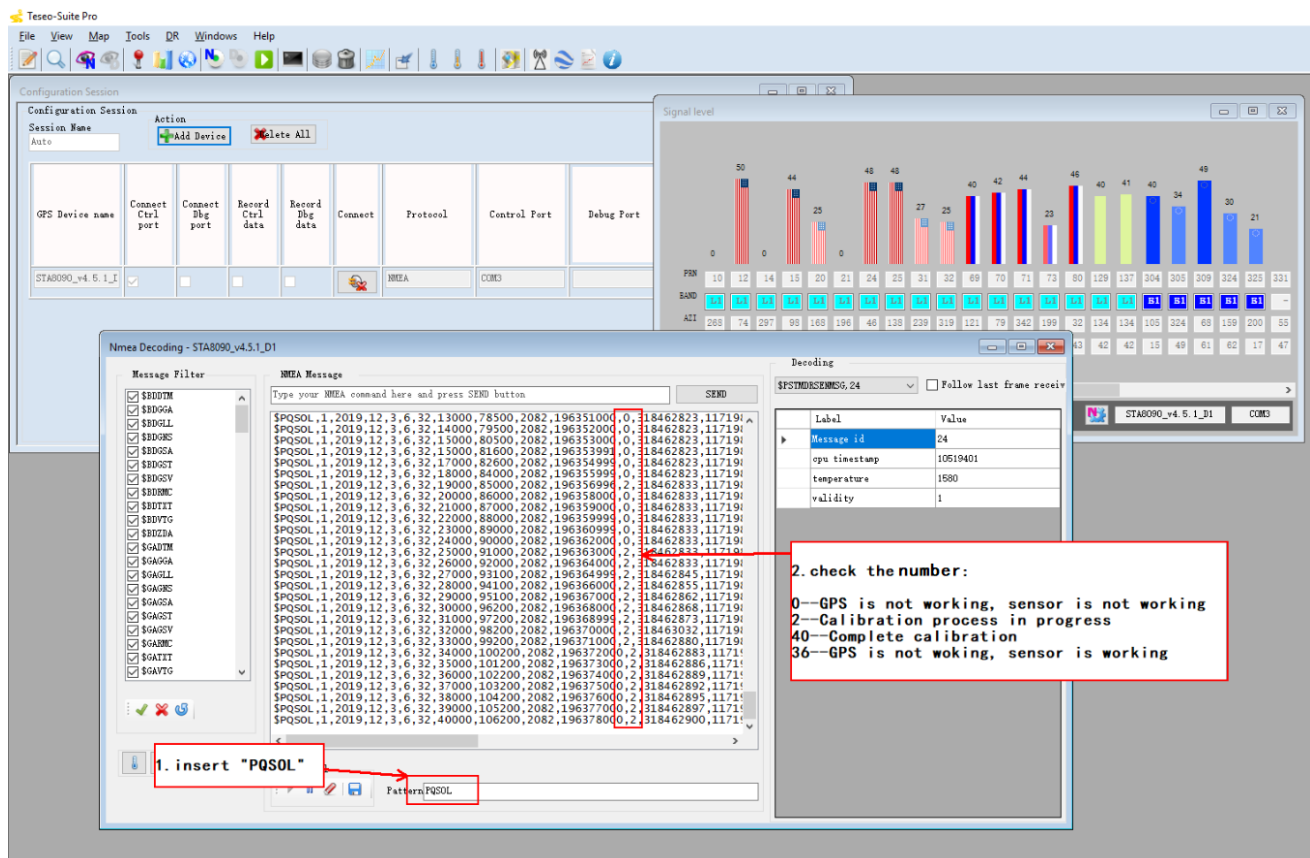
**Step 3:** Keep the vehicle unmoved for 30s~60s.

**Step 4:** Then start the vehicle and drive under strong GNSS signals, with speed changed for 2 times.

## 6.2.2. Calibration Result Monitoring

The calibration result will be reported in an NMEA (\$PQSOL) message. For more details about this message, please refer to **document [2]**.

A method to check the UDR state message is shown by the following figure.



# 7 Appendix A Reference

**Table 6: Related Documents**

SN	Document name	Remark
[1]	Quectel_L26-DR_Hardware_Design	L26-DR Hardware Design
[2]	Quectel_L26-DR_GNSS_Protocol_Specification	L26-DR GNSS Protocol Specification
[3]	Quectel_L26-DR_Reference_Design	L26-DR Reference Design
[4]	Quectel_QCOM_User_Guide	QCOM User Guide

**Table 7: Terms and Abbreviations**

Abbreviation	Description
API	Application Programming Interface
CAN	Controller Area Network
CNR	Carrier-to-Noise Ratio
DI	Digital Input
DO	Digital Output
EVB	Evaluation Board
GNSS	Global Navigation Satellite System
IO	Bidirectional
LED	Light Emitting Diode
NVM	Non-volatile Memory
OBD	On Board Diagnostics

---

PI	Power Input
PPS	Pulse Per Second
PRN	Pseudorandom Noise
SV	Satellite Vehicle
UART	Universal Asynchronous Receiver & Transmitter
UTC	Coordinated Universal Time

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