LC86L EVB User Guide

GNSS Module Series

Rev. LC86L_EVB_User_Guide_V1.0

Date: 2020-04-10

Status: Preliminary

Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our company headquarters:

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Tel: +86 21 5108 6236
Email: info@quectel.com

Or our local office. For more information, please visit:
http://www.quectel.com/support/sales.htm

For technical support, or to report documentation errors, please visit:
http://www.quectel.com/support/technical.htm
Or email to: support@quectel.com

GENERAL NOTES

COPYRIGHT

About the document

History

Revision	Date	Author	Description
1.0	2020-04-10	Andy ZHAO	Initial

Contents

Table Index

Figure Index

1 Introduction

This document specifies the usage of LC86L EVB (Evaluation Board) which is an assistant tool for engineers to develop and test Quectel LC86L 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 LC86L 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 view of LC86L EVB

The following figure illustrates the top view of LC86L EVB.

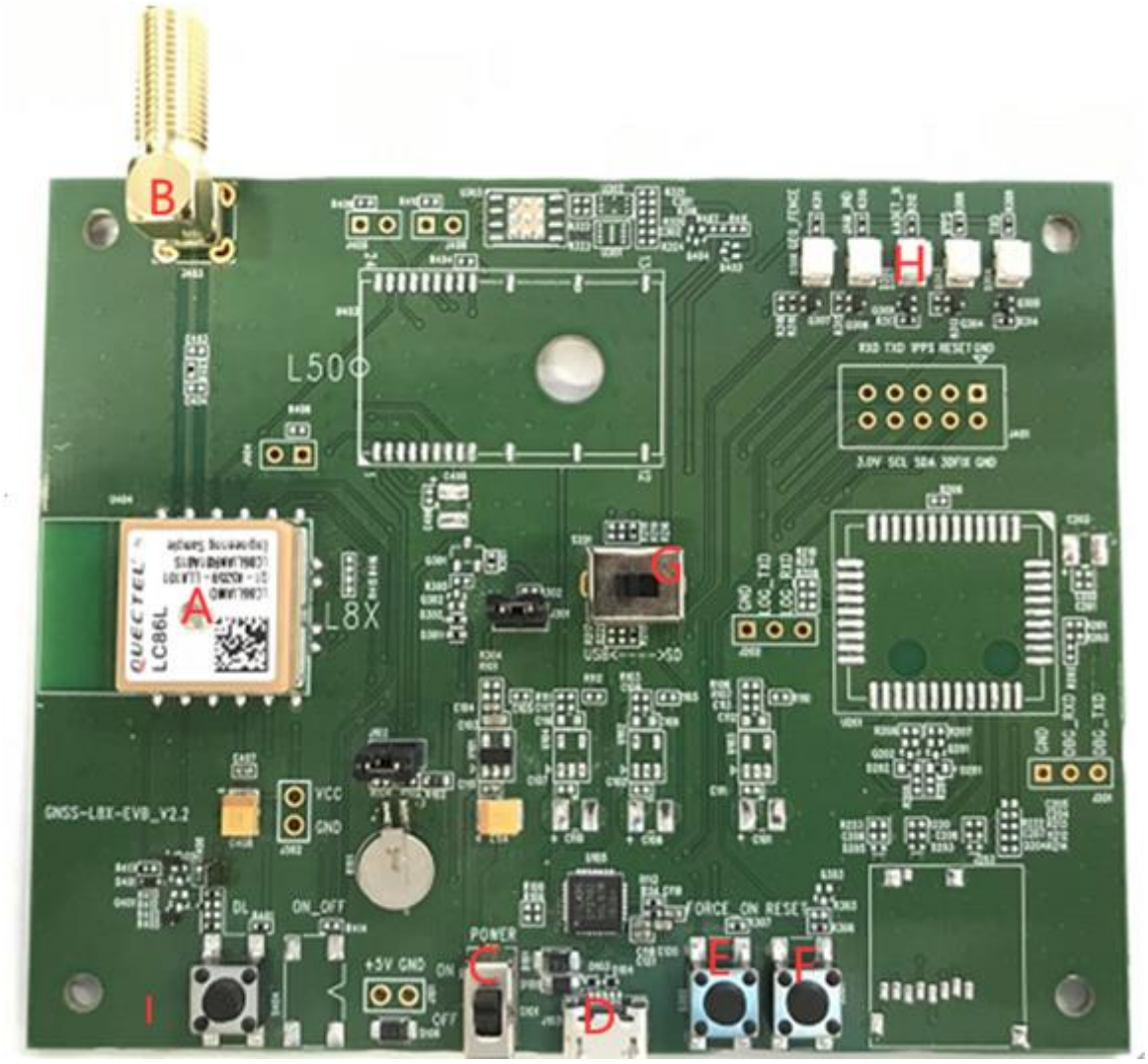


Figure 1: Top View of LC86L EVB

Table 1: Interfaces of LC86L EVB

SN.	Designator	Description
A	Y404	LC86L module
B	J403	Antenna connector
C	S101	Power switch
D	J103	Micro-USB connector
E	S302	Force_on button
F	J301	Reset button
G	U201	USB and SD switch
H	D303,D304,D305,D306,D307	Indication LEDs
I	S401	Boot button

2.2. LC86L EVB & Kit Accessories

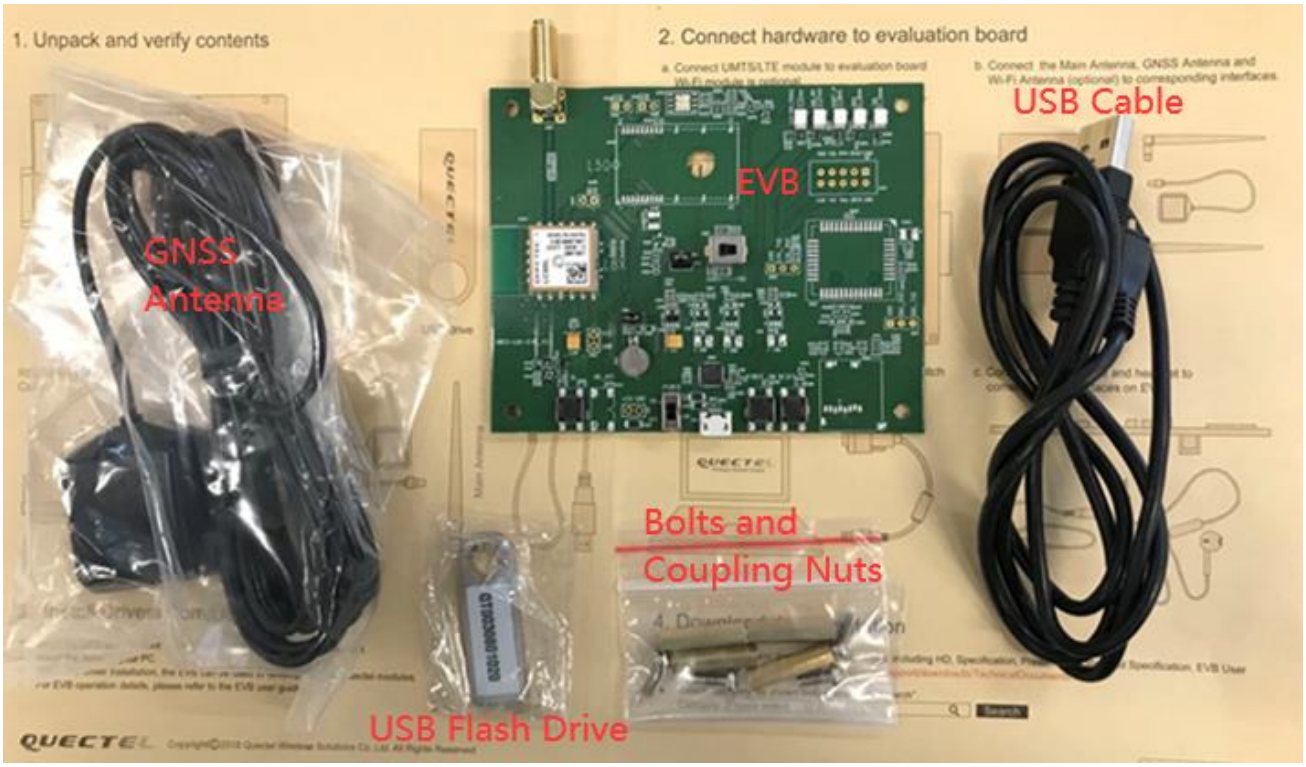


Figure 2: LC86L EVB & Kit Accessories

Table 2: List of Accessories

Items	Description	Quantity
USB Cable	USB cable	1
EVB	Evaluation board	1
Antenna	GNSS antenna (active)	1
USB Flash Drive	USB flash drive (including LC86L related documents, tools, drivers, etc.)	1
Instruction Sheet	A sheet of paper giving instructions for EVB connection, details of EVB accessories, etc.	1
Others	Bolts and coupling nuts	4 pairs

2.3. EVB and Accessories Assembly

The following figure shows the assembly of LC86L EVB and its accessories.

Figure 3: LC86L EVB and Accessories Assembly

3 Interface Applications

3.1. Micro-USB Interface

Micro-USB connector is used for EVB power supply as well as data transmission.

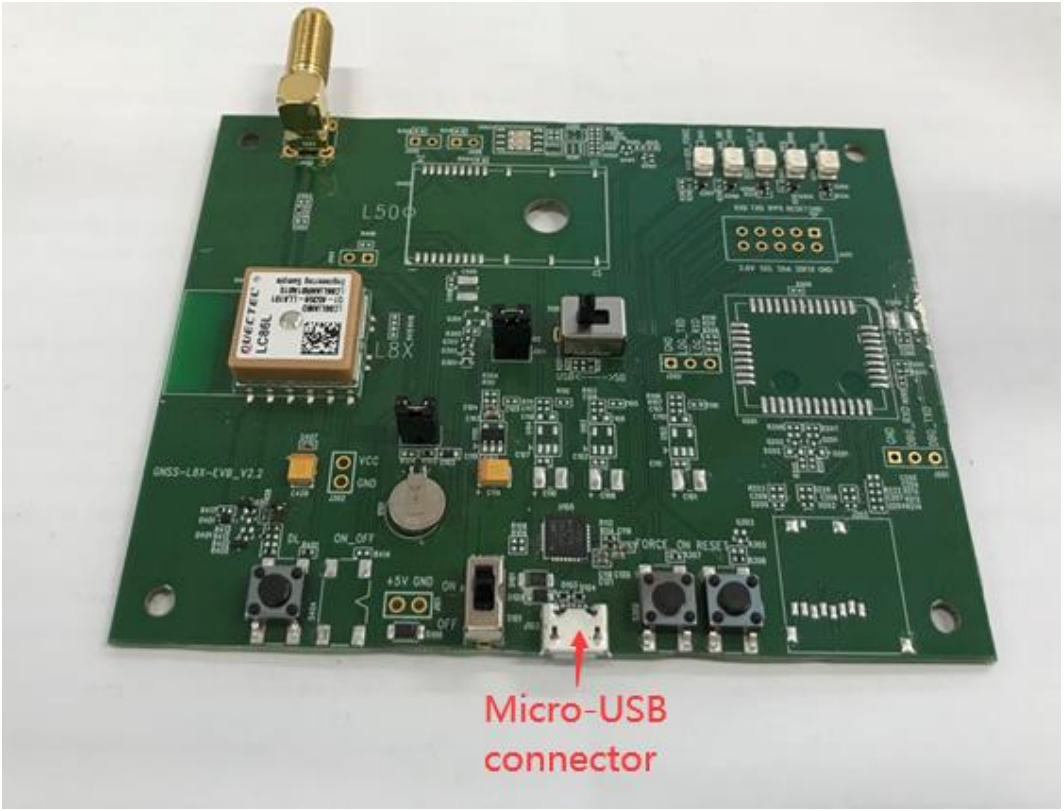


Figure 4: Micro-USB Connector

3.2. Antenna Interface

The antenna connector is used to connect an external passive or active GNSS antenna.

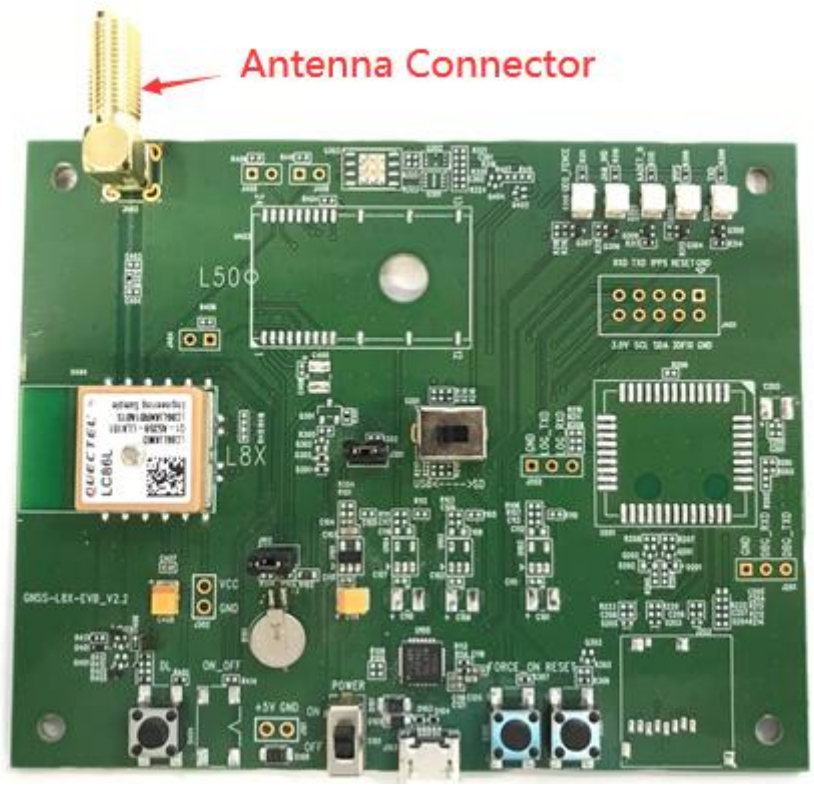


Figure 5: Antenna Connector

3.3. Switches and Buttons

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

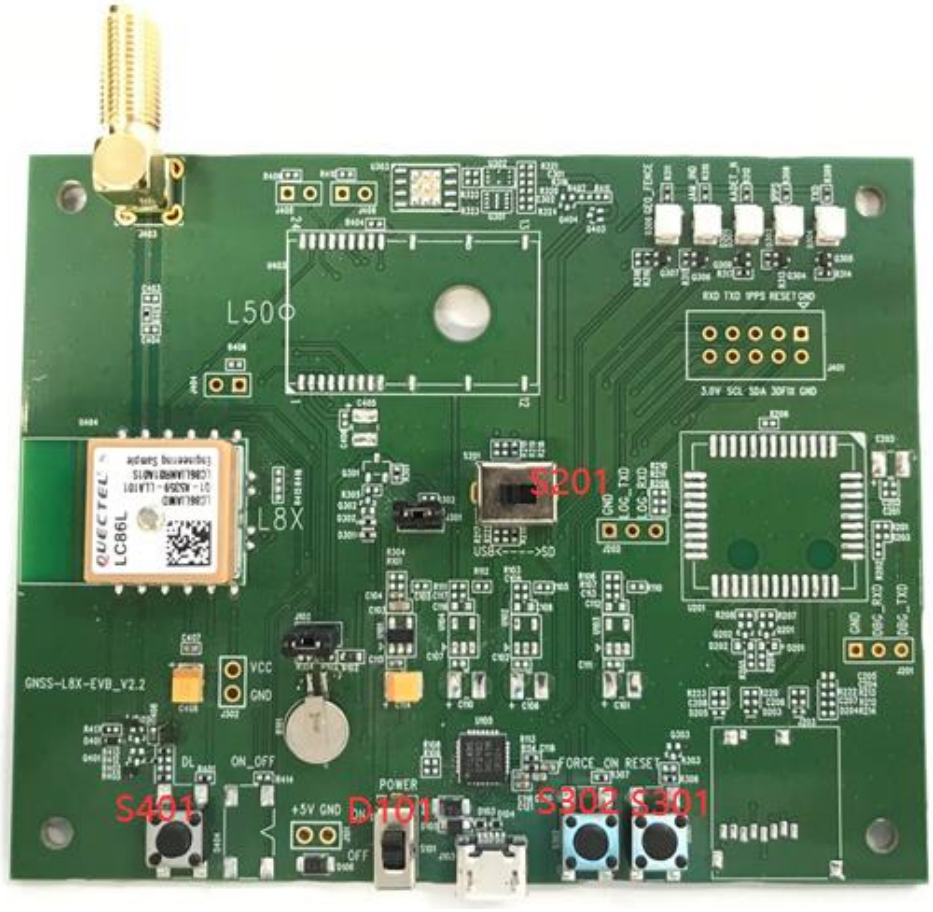


Figure 6: Switches and Buttons

Table 3: Switches and Buttons

Part No.	Name	I/O	Description
D101	POWER	PI	Power switch
S201	USB/SD switch	DI	LC86L for data transmission via USB
S301	RESET	DI	The module will be reset through pressing and then releasing the button.
S302	FORCE_ON	DI	In Backup mode, press this button, the module will be woken up
S401	BOOT	DI	Unused

3.4. Operation Status Indication LEDs

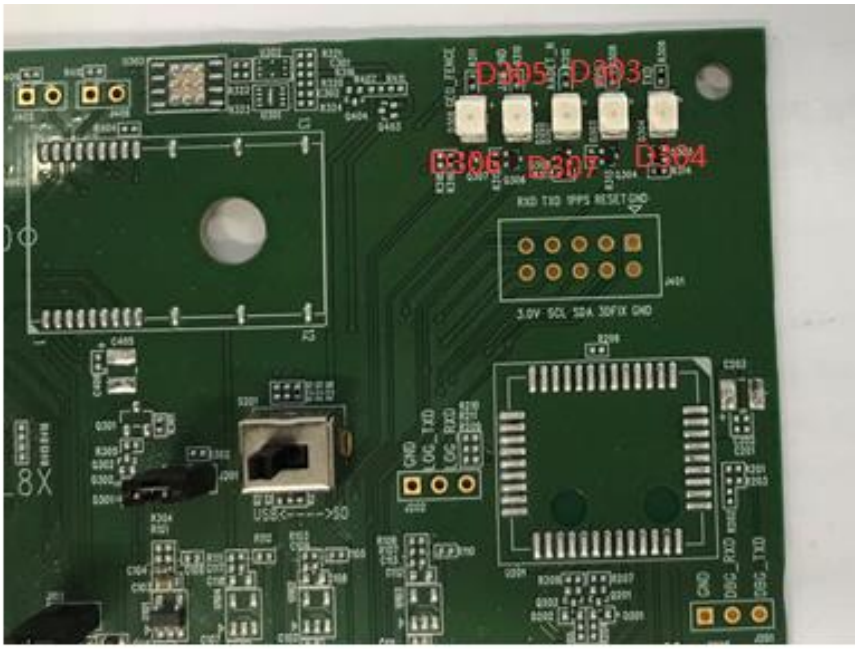


Figure 7: Operation Status Indication LEDs

Table 4: Operation Status Indication LEDs

Part	Name	I/O	Description
D303	1PPS	DO	Light: positioning success, frequency 1Hz Dark: no positioning
D304	TXD	DO	Light: data output Dark: no data output
D305	JAM_IND	DO	Jamming detection indicator, LC86L not used
D306	GEO_FORCE	DO	Geo-fence boundary indicator, LC86L not used
D307	AADET_N	DO	Light: active antenna is connected well Dark: active antenna is not connected to EX_ANT or has poor contact with antenna feeding point

3.5. Test Points

The following figure illustrates the test points of the EVB.

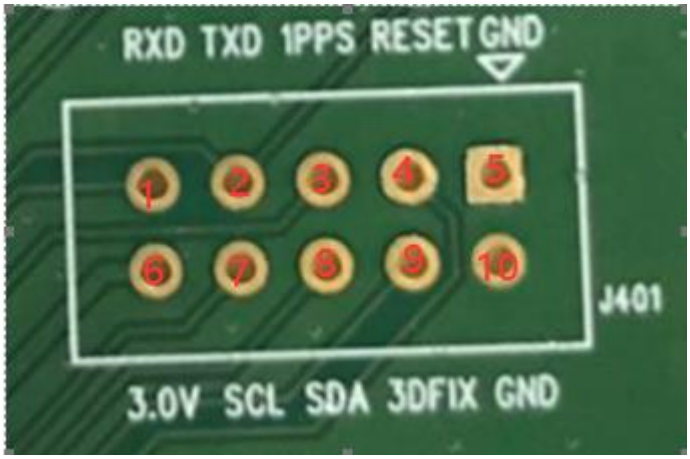


Figure 8: Test Points - J104

Table 5: Pin Description

Pin No.	Signal	I/O	Description
1	RXD	DI	Receive data
2	TXD	DO	Send data
3	1PPS	DO	One pulse per second
4	RESET	DO	Module reset
5	GND	/	Ground
6	3.0V	PI	/
7	SCL	I/O	/
8	SDA	I/O	/
9	3DFIX	DO	/
10	GND	/	Ground

4 EVB Operation Procedures

This chapter mainly illustrates the operation procedures of LC86L 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 can be viewed in Device Manager of the PC after the USB driver is installed, as shown below.

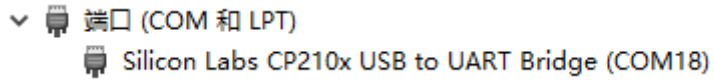


Figure 9: USB Ports

Step 3: Install and then use the tool QCOM provided by Quectel to realize the communication between LC86L 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: 9600bps). For more details about the usage of QCOM, please refer to ***document [4]***.

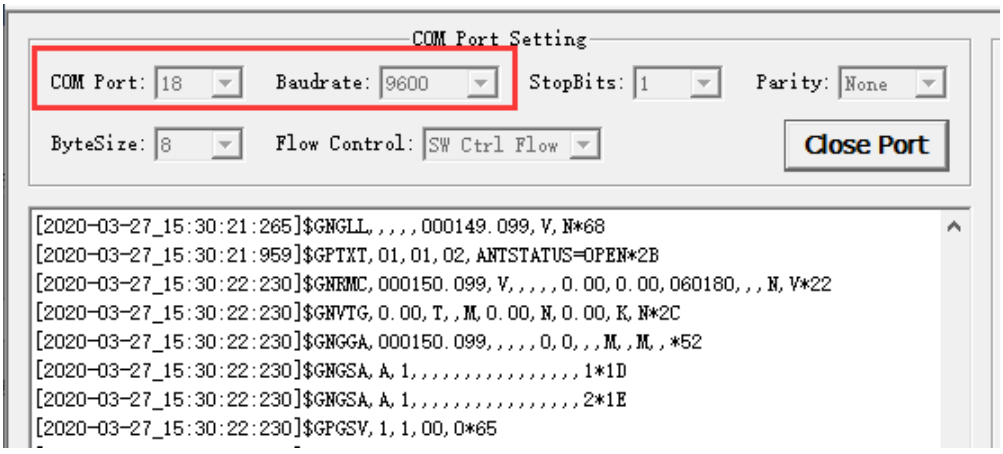


Figure 10: COM Port Setting of QCOM

4.2. Firmware Download

The LC86L module upgrades the firmware through the USB port by default. Please follow the procedure below to upgrade the firmware:

Step 1: Install and open the Flash tool software;

Step 2: Connect the EVB to a PC through the USB cable, and switch POWER to ON state to power on the EVB.

Step 3: Follow these steps to upgrade the firmware:

- Click "Settings"-"Baud rate"-"Auto Detect" to select the baud rate;
- Click "Settings"-"COM Port"-"COM3" to select the communication port;
- Select the download file: Click the two red boxes shown in step c in the figure below to select the corresponding file path: "Reserve" corresponds to the download management file, and "ROM" corresponds to the project firmware;
- Click the "Download", "OK" and "Go" buttons to start the firmware upgrade

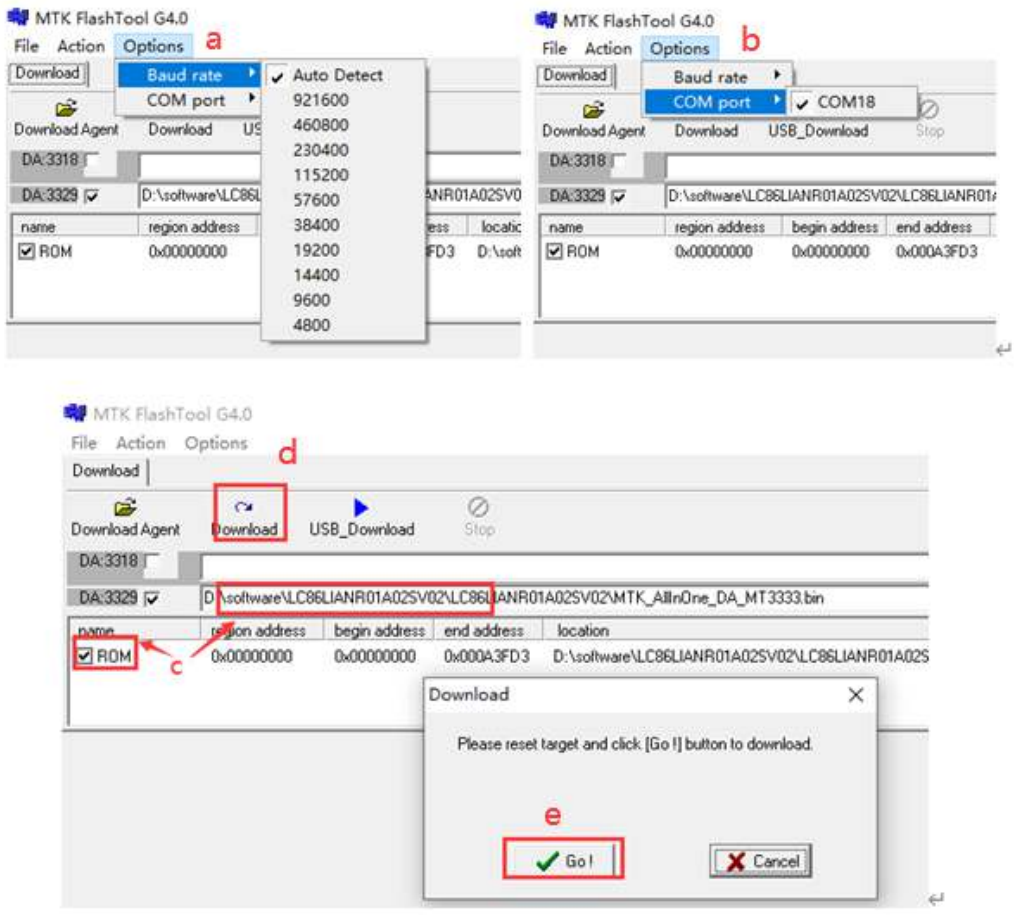


Figure 11: Flash tool configuration and firmware upgrade

5 PowerGPS instructions

The PowerGPS tool can be used to view the status of GPS, GLONASS, BeiDou, and Galileo satellite reception. This chapter will mainly introduce the use of the tool

5.1. COM Port and Baud Rate Setting

Step 1: After the EVB and its accessories are properly connected, power on the EVB and start PowerGPS (this article uses PowerGPS Trial 2.3.5 as an example), and the following main interface is displayed:

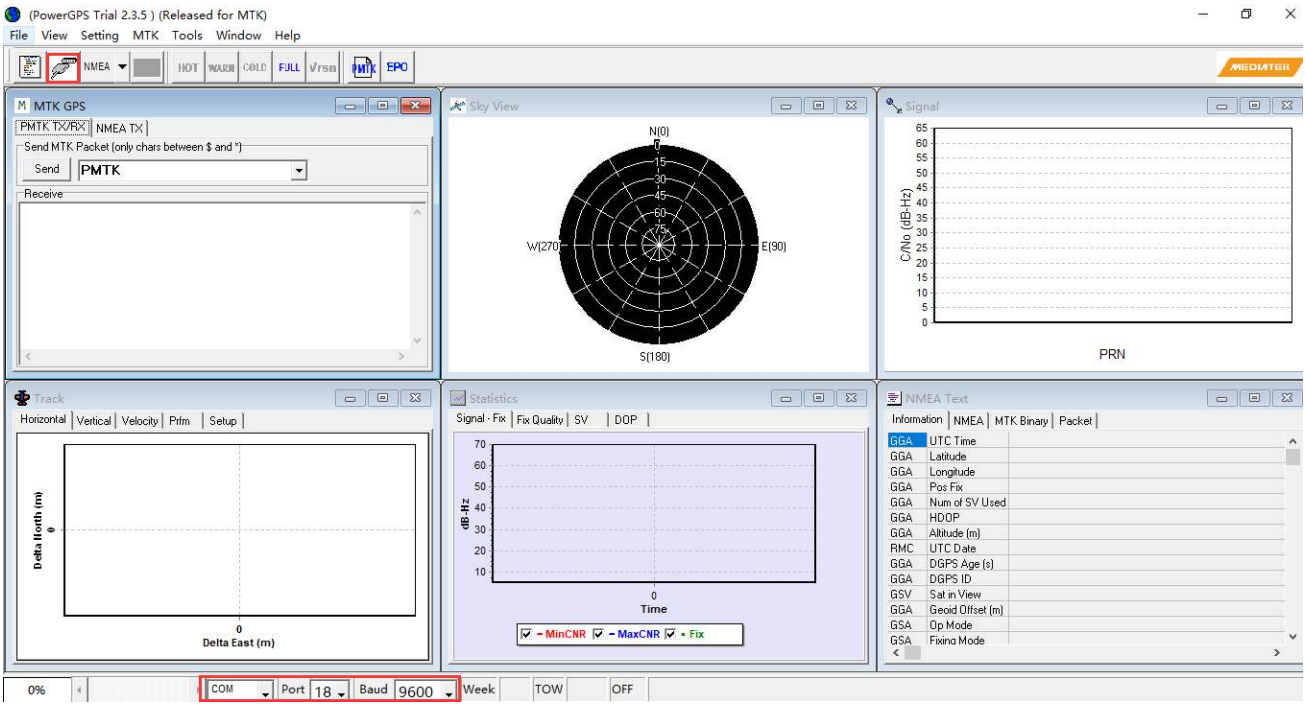


Figure 12: PowerGPS main interface (not connected)

Step 2: At the bottom of the interface, select a correct **COM port** and **baud rate** (LC86L module supports 9600 bps by default), click the button  "**Create Connection**", and then the following interface in default layout will be shown:

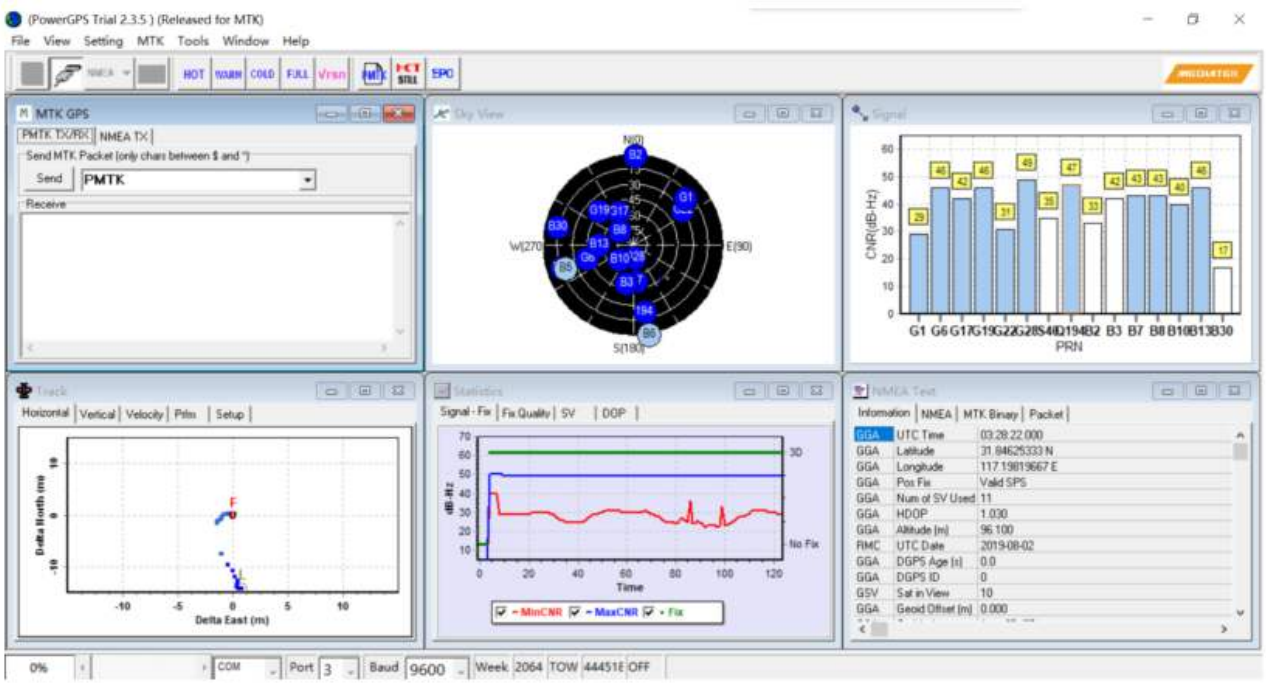


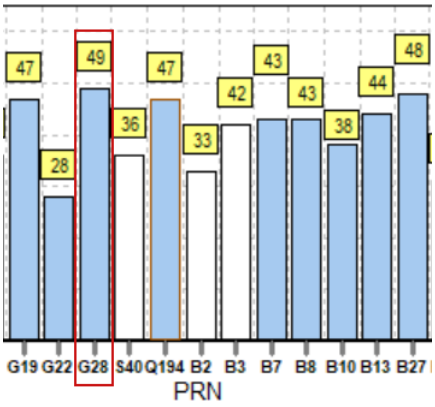
Figure 13: PowerGPS main interface (connected)

5.1.1. PowerGPS interface description

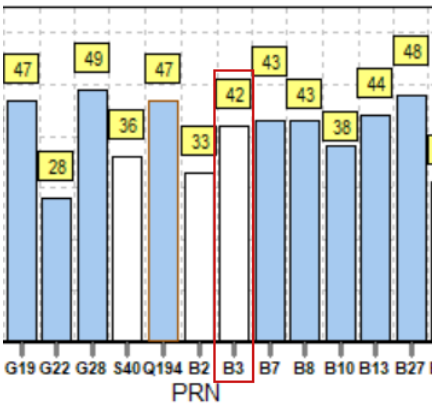
On the PowerGPS interface, GNSS information such as CNR message, time, position, speed and precision can be viewed. Explanations are listed in the table below.

Table 6: Explanations of PowerGPS Interface

Icon	Explanation
	• SV with PRN 65. If the position of SV is near to the centre of the Sky View, the elevation angle of SV is close to 90°. • Blue means this satellite is being tracked.
	• Light blue means this satellite is not being tracked.



- The CNR of PRN 28 is 49 dB/Hz.
- G means it is a GPS satellite, B means it is a BeiDou satellite, and S means it is a SBAS.
- Light blue column means the navigation data of this satellite is in use.



- The CNR of PRN 3 is 42 dB/Hz.
- White column means the navigation data of this satellite is not in use.

UTC Time	08:57:29.000
Latitude	31.84628000 N
Longitude	117.19882833 E
Pos Fix	Valid DGPS
Num of SV Used	13
HDOP	0.810
Altitude (m)	58.500
UTC Date	2017-10-26

- UTC time
- Latitude degree
- Longitude degree
- Position fix
- The number of satellites being used
- Horizontal dilution of precision
- Altitude based on WGS84 datum
- UTC date

Fixing Mode	3D
SV in Used	G24 Q193 G18 G20
PDOP	0.810
VDOP	2.000
Speed (m/s)	0.000

- Fixing mode: No-fix, 3D or 2D SPS
- Satellite being used
- Position dilution of precision
- Vertical dilution of precision
- Speed of receiver

5.2. PMTK Command Sending

PowerGPS supports sending PMTK commands to control the module. The format of PMTK commands to be sent include only characters between '$' and '*', for example: **PMTK869,0**.

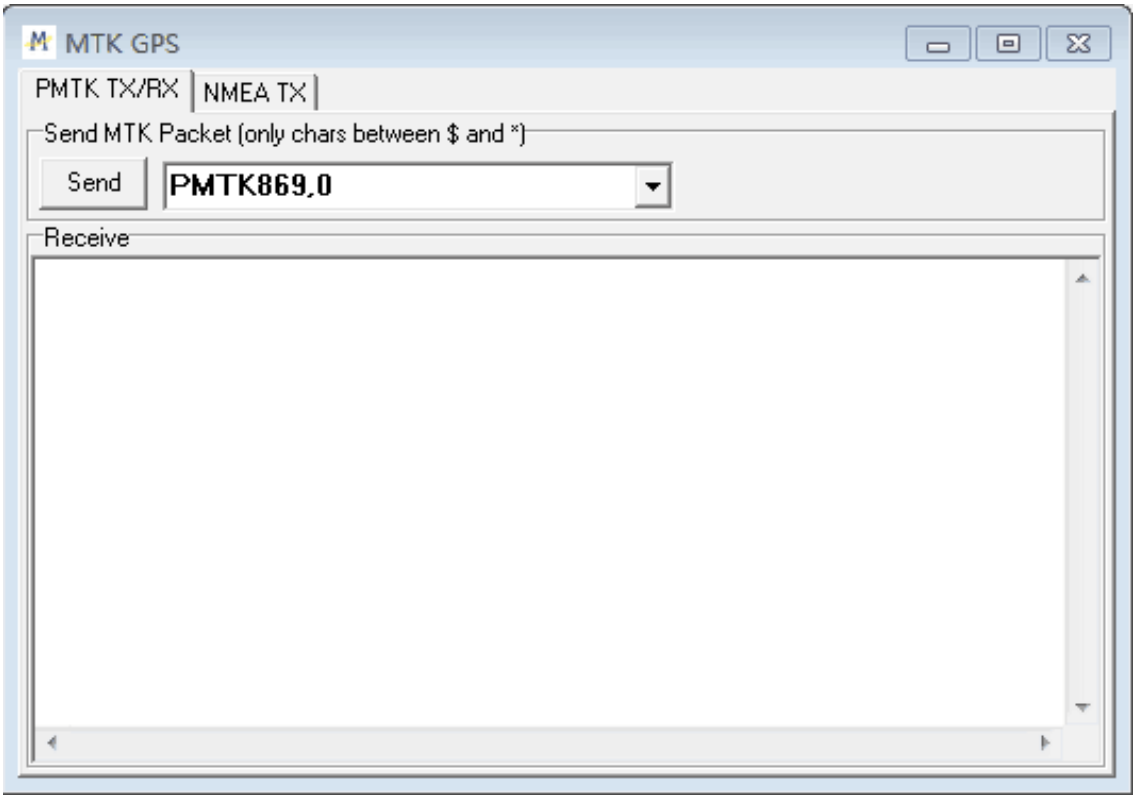


Figure 14: PMTK Command Sending via PowerGPS

5.3. Automatic TTFF Testing

PowerGPS tool allows users to measure the TTFF (Time to First Fix) under different testing conditions. The TTFF can be tested under full cold start, cold start, warm start or hot start conditions, and the number of tests can be selected from 1, 10, 20, 100, 1000 and 10000. Click the "**Run**" button to start the test and it can be stopped by clicking the "**Stop**" button.

The following are the detailed configuration steps during TTFF testing:

Step 1: Start "**MTK**" menu, and then click "**Static TTFF Testing**" to enter Automatic TTFF Testing as shown below:

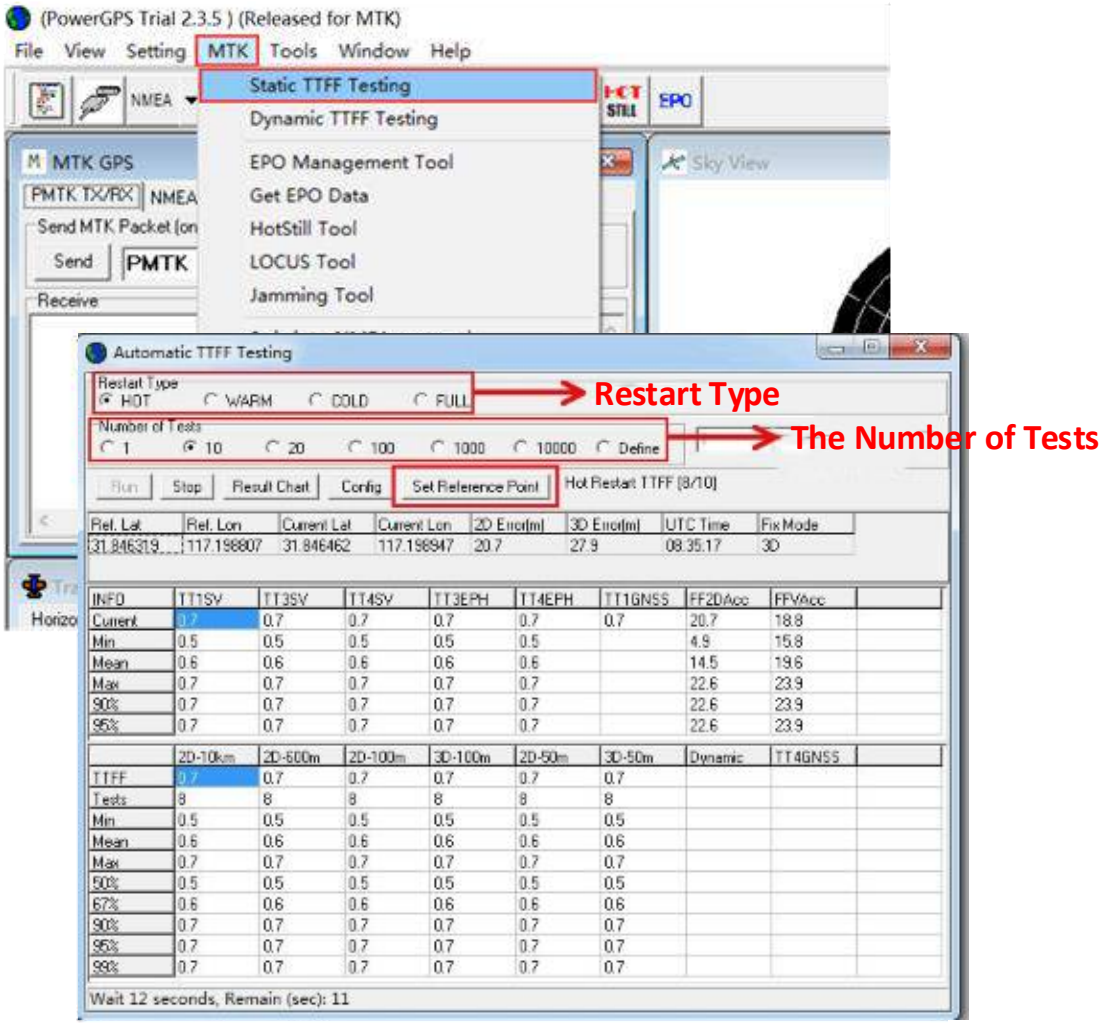


Figure 15: Static TTFF Testing via PowerGPS

Step 2: Click "**Set Reference Point**" and the Options window will be shown as below, then choose "**Reference Location**".

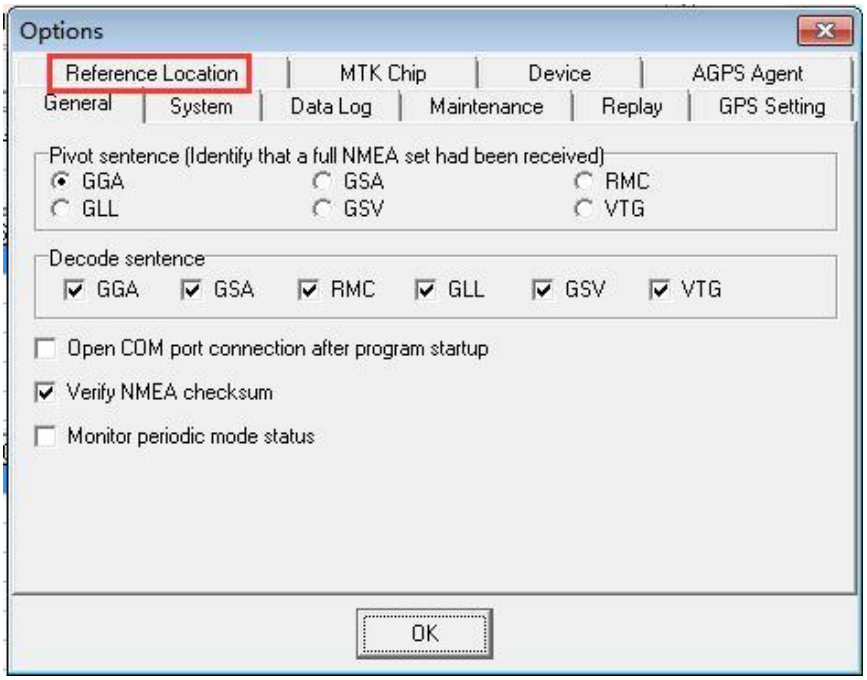


Figure 16: Choose Reference Location

After that, the interface will be shown as below. Click "**Use Mean Position**" and then "**OK**".

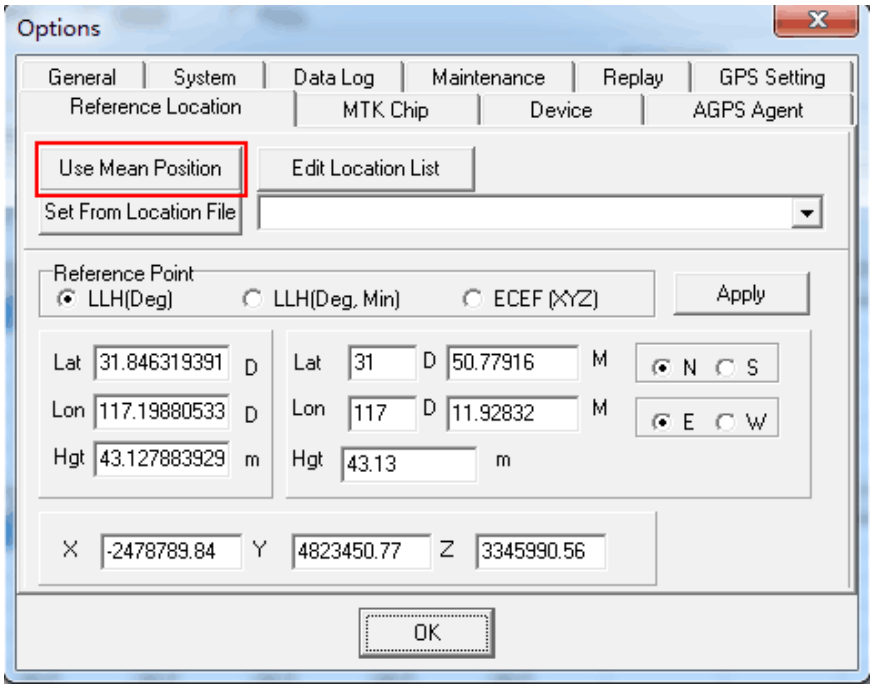


Figure 17: Click Use Mean Position

Step 3: Return to the interface shown as below and click "**Config**" to get to TTFF Configuration interface. Then set "**TTFF Time- out (sec)**", and finally click "**OK**".

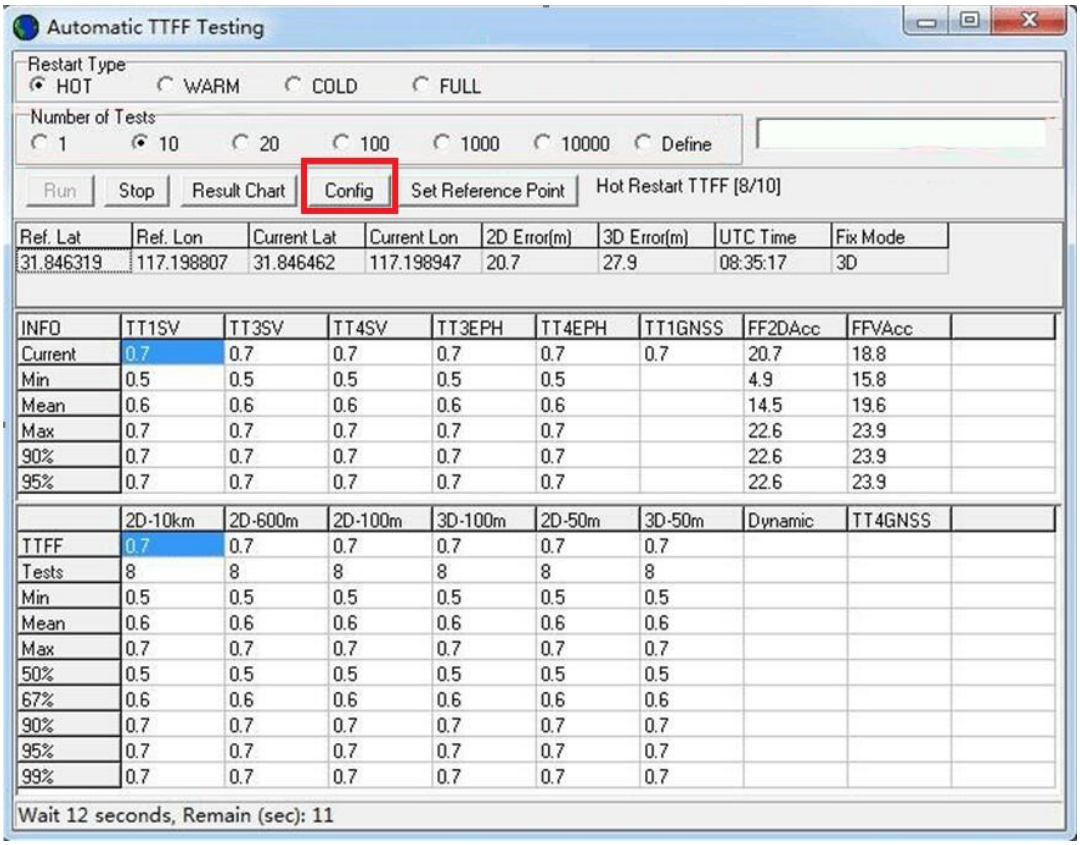


Figure 18: Click Config

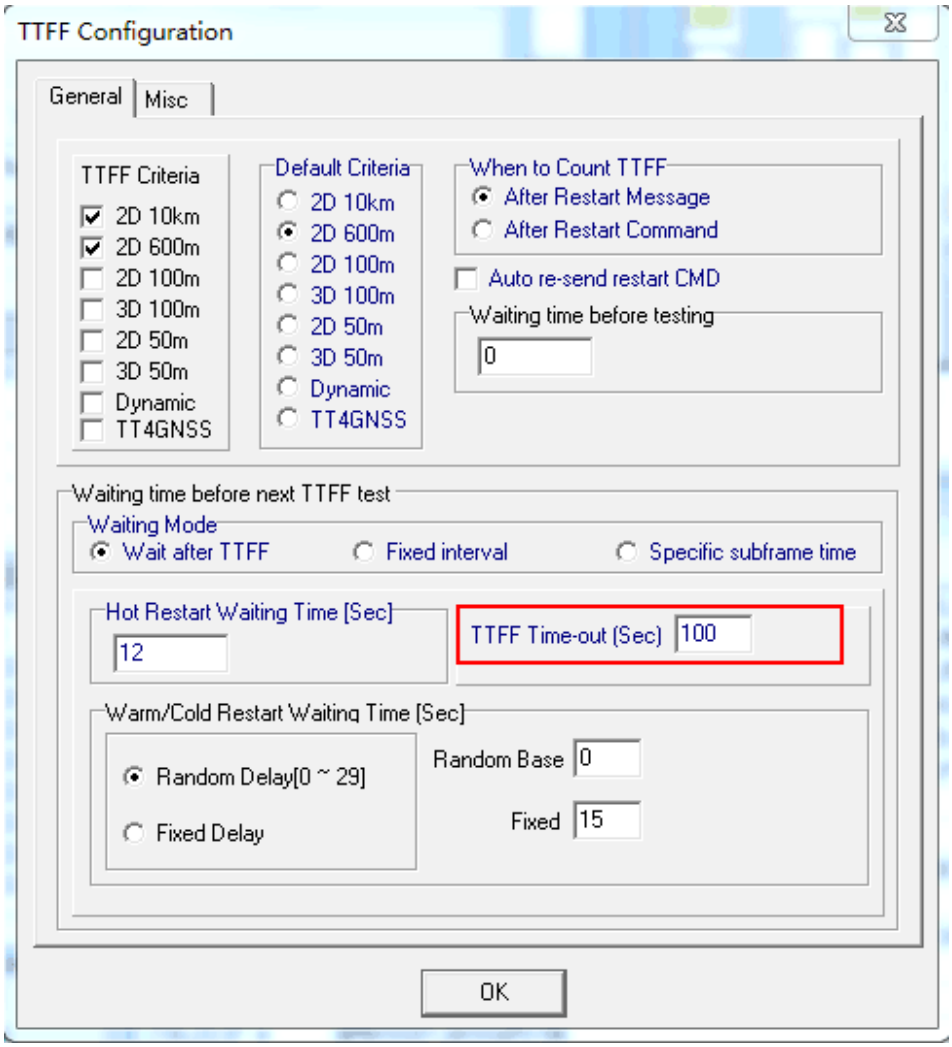


Figure 19: Set TTFF Time-out (Sec)

Generally, if hot start is selected, "**TTFF Time-out (sec)**" is recommended to be set as 10 s. If warm start is selected, it can be set as 50 s. If cold start is selected, it can be set as 100 s. "**TTFF Time–out (sec)**" can help judge TTFF and save time.

Step 4: After all above operations, click the "**Run"** button to start the test and it can be stopped by clicking "**Stop**" button.

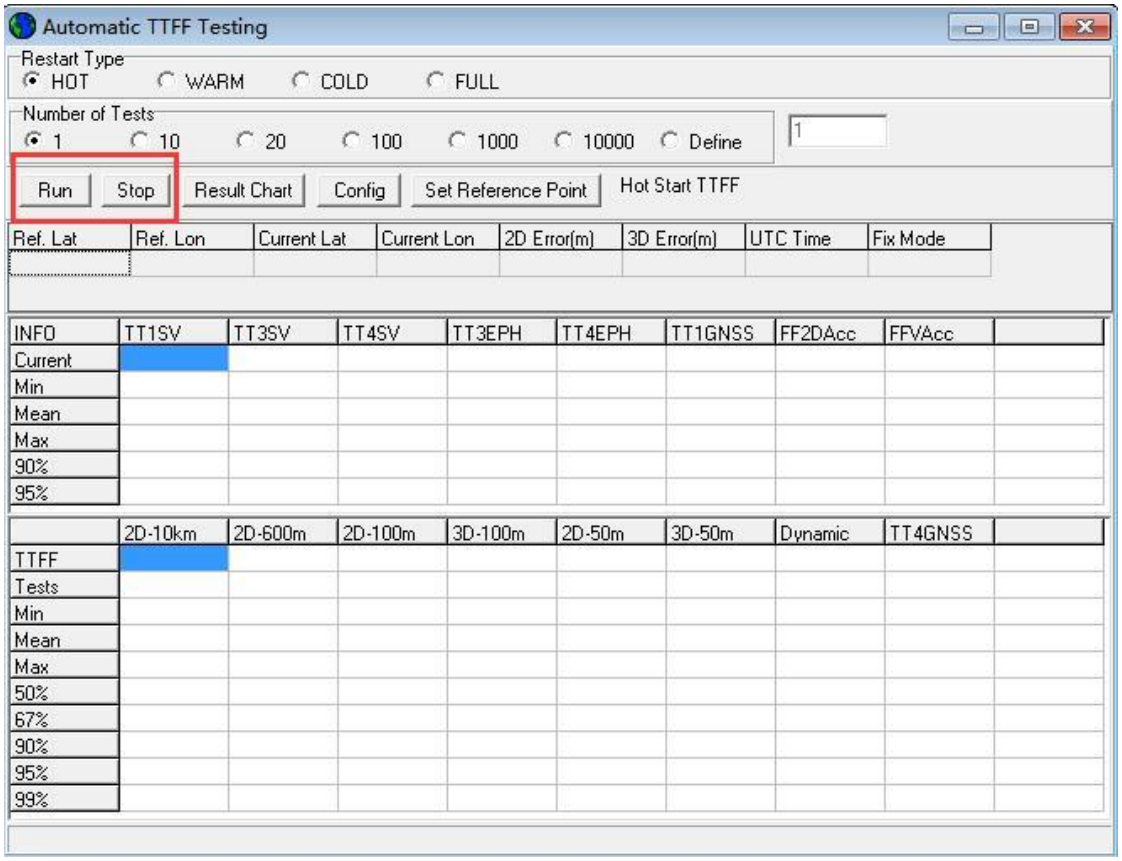


Figure 19: Click Run/Stop Button

Step 5: After finishing the testing, users can see the testing result charts. The test result will be stored in the directory where the tool is installed, for convenient view of the log at any time.

6 Appendix A Reference

Table 7: Related Documents

SN	Document Name	Remark
[1]	Quectel_LC86L_Hardware_Design	LC86L Hardware Design
[2]	Quectel_L76-LB&L26-LB&LC86L_GNSS_Protocol_Specification_V1.1	L76-LB&L26-LB&LC86L GNSS Protocol Specification
[3]	Quectel_LC86L_Reference Design	LC86L Reference Design
[4]	Quectel_QCOM_User_Guide	QCOM User Guide

Table 8: Terms and Abbreviations

Abbreviation	Description
CNR	Carrier-to-Noise Ratio
DI	Digital input
DO	Digital output
GPS	Global Positioning System
GLONASS	Globalnaya Navigazionnaya Sputnikovaya Sistema, or Global Navigation Satellite System (Russia's version of GPS)
GNSS	Global Navigation Satellite System
HDOP	Horizontal Dilution of Precision
IO	Bidirectional
LED	Light Emitting Diode
PDOP	Position Dilution of Precision
PI	Power input

PO	Power output
PPS	Pulse Per Second
PRN	Pseudorandom Noise
SPS	Standard Positioning Service
SV	Satellite Vehicle
UART	Universal Asynchronous Receiver & Transmitter