L80&L80-R&L86&LC86L

EVB User Guide

GNSS Module Series

Version: 2.0

Date: 2020-12-22

Status: Released

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About the Document

Revision History

Version	Date	Author	Description
1.0	2014-08-18	Bond SUN	Initial
2.0	2020-12-22	Ronnie HU	1. Incorporated the information of L80, L80-R and L86 EVB user guides (created separately years ago) into this manual. 2. Added the applicable module LC86L.

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1 Introduction

In this document you can find the information on how to use the evaluation board (EVB) to develop and test Quectel L80, L80-R, L86, and LC86L modules.

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 L80, L80-R, L86 and LC86L modules. Manufacturers of the terminal should distribute the following safety information to users and operating personnel and include these guidelines into all manuals supplied with the product. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.

	Ensure that the use of the product conforms to the national safety and environmental regulations, and is allowed to be used in the country and in the required environment.
	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 must be powered by a stable voltage source. Additionally, the wiring must 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

The following figure illustrates the top view of the EVB.

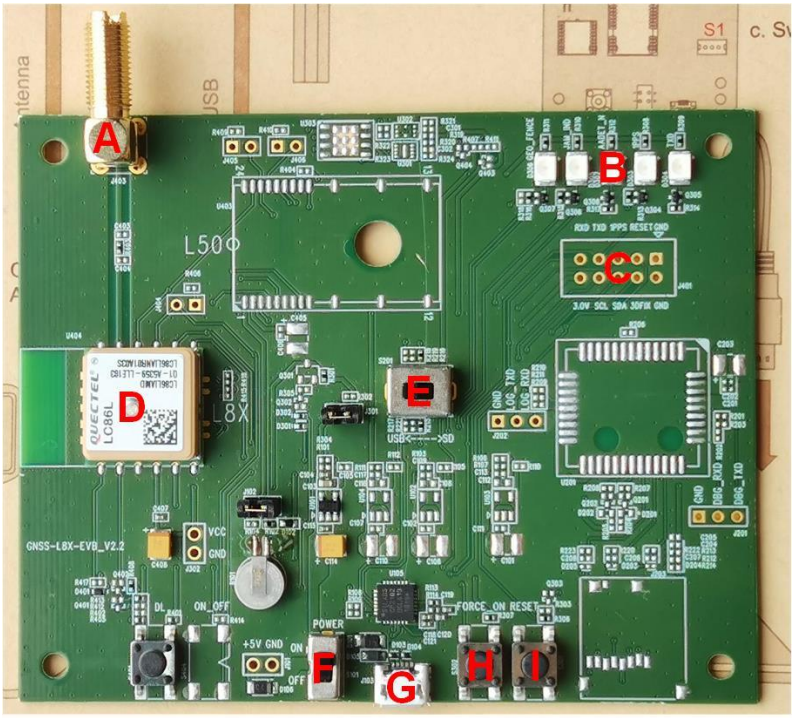


Figure 1: Top View of the EVB

Table 1: Available Interfaces

SN.	Reference Number	Description
A	J403	Antenna connector [1)]
B	D303, D304, D305, D306, D307	Indication LEDs [2)] (see ***Chapter 3.4*** for details)

C	J401	Test points
D	U404	The module
E	S201	USB ←→ SD Card (USB/SD Card alternation switch)
F	S101	POWER switch
G	J103	Micro-USB connector
H	S302	FORCE_ON button [3]
I	S301	RESET button

NOTES

1. [1] The antenna connector is invalid for the L80-R module, as the module does not support an external antenna.
2. [2] The L80-R does not support active antenna detection interface, so the D307 (AADET_N) is invalid for this module as well. Additionally, D305 and D306 are not supported by any of the applicable modules.
3. [3] The L80 and L80-R modules do not support the FORCE_ON interface, so the FORCE_ON button is invalid for those modules.

2.2. EVB Kit Accessories

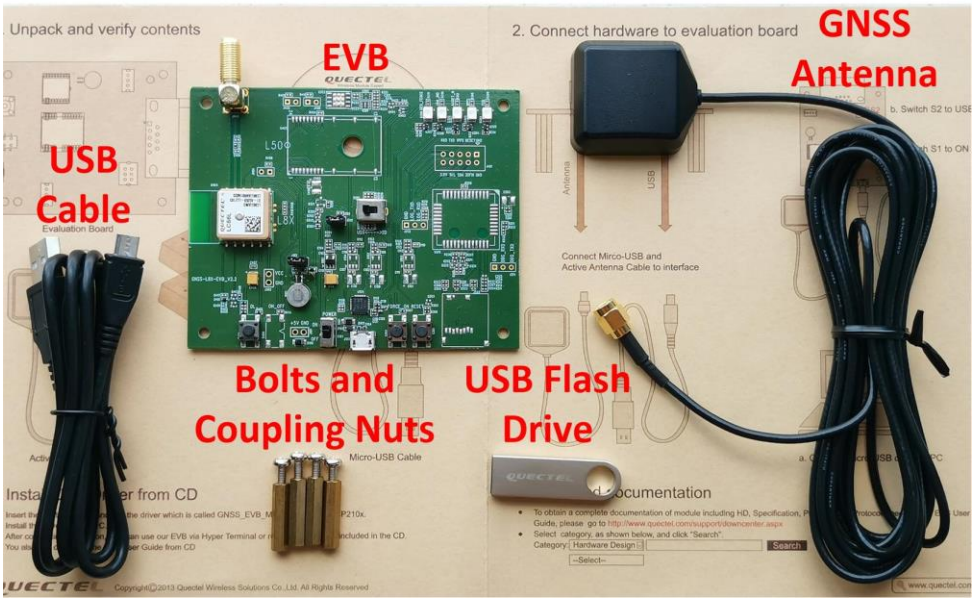


Figure 2: EVB Kit Accessories

Table 2: List of Accessories

Items	Description	Quantity
EVB	Evaluation board	1
USB Cable	Micro-USB cable	1
Antenna	Active GNSS antenna [1)]	1
USB Flash Drive	USB flash drive (including the module-related documents, tools, and drivers)	1
Instruction Sheet	A sheet of paper giving instructions for EVB connection, details of EVB accessories, and much more.	1
Others	Bolts and coupling nuts	4 pairs

NOTE

[1)] As the L80-R module does not support an external antenna, the active antenna is not included in the EVB kit for L80-R.

2.3. EVB and Accessories Assembly

For information on how to connect the EVB and its accessories, see the instruction sheet provided in the EVB Kit. On the following figure you can see the EVB and the accessories when they are assembled.

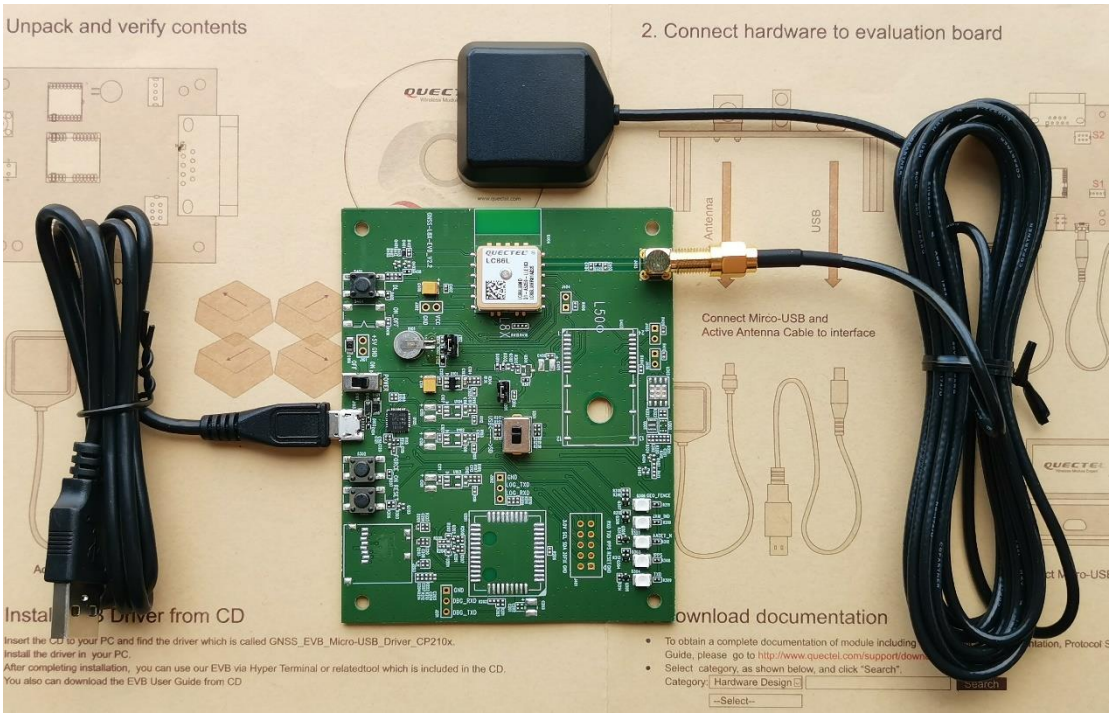


Figure 3: EVB and Accessories Assembly

NOTE

As the L80-R module does not support an external antenna, the active antenna is not included in the EVB kit for L80-R.

3 EVB Interfaces

3.1. Micro-USB Interface

The micro USB connector is used for both power supply input and NMEA sentences output.

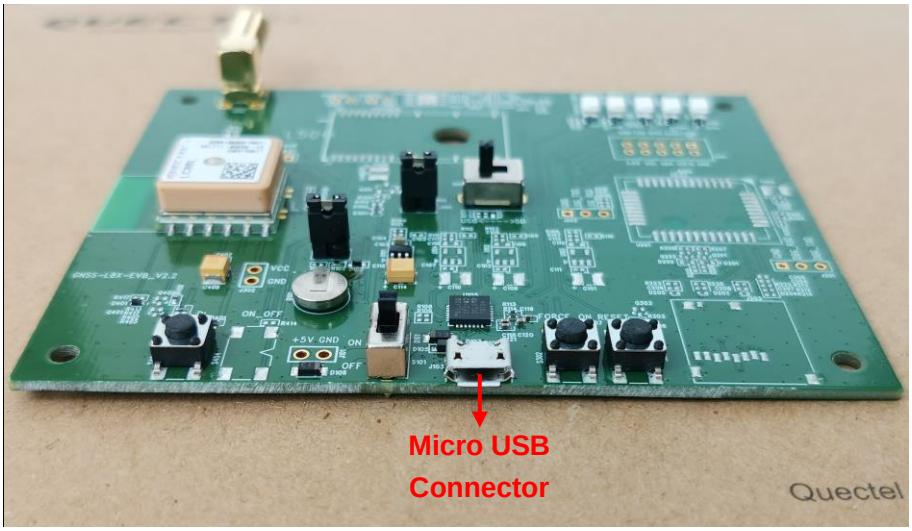


Figure 4: Micro-USB Connector

3.2. Antenna Interface

The EVB is mounted with an antenna connector for the connection with an external active GNSS antenna.

Figure 5: Antenna Connector

NOTE

The antenna connector is invalid for the L80-R module, as the module does not support an external antenna.

3.3. Switches and Buttons

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

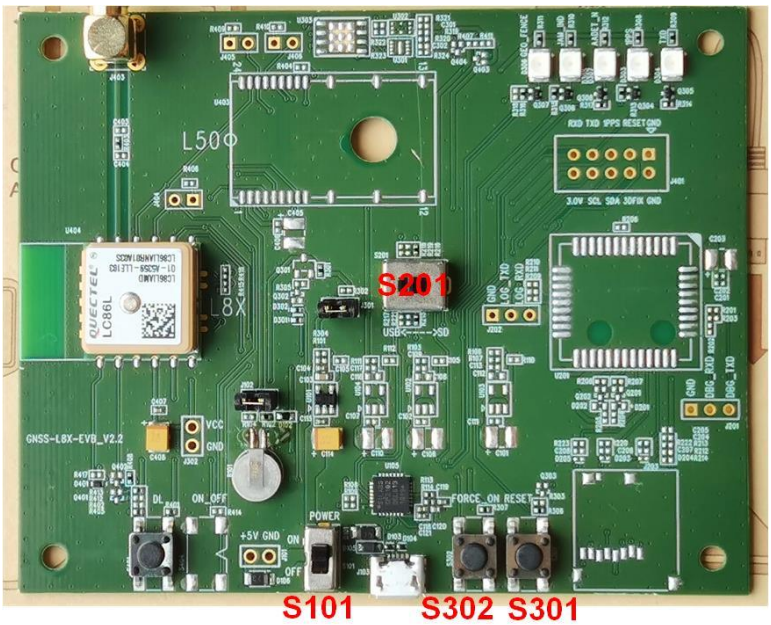


Figure 6: Switches and Buttons

Table 3: Switches and Buttons

Reference No.	Name	I/O	Description
S101	POWER	PI	Powers the EVB on/off
S201	USB ←→ SD (USB/SD alternation switch)	DI	Switches the data communication port. Keep the switch on "USB" side, as the modules do not support the SD-card function.
S302	FORCE_ON [1)]	DI	Short press (press and then release) the button to wake up the module from the backup mode.
S301	RESET	DI	Short press (press and then release) the button to reset the module.

NOTE

[1)] The L80 and L80-R modules do not support the FORCE_ON interface, so the FORCE_ON button is invalid for these modules.

3.4. Status Indication LEDs

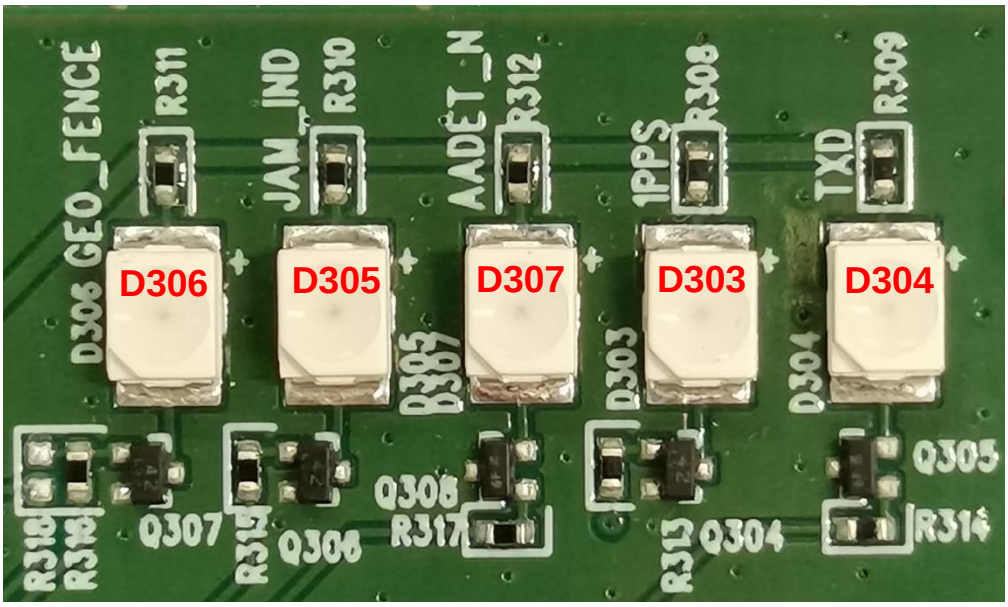


Figure 7: Status Indication LEDs

Table 4: Status Indication LEDs

Reference No.	Name	I/O	Description
D303	1PPS	DO	Flash: successful position fix. The frequency is 1 Hz. Extinct: no position fix.
D304	TXD	DO	Flash: Data output from TXD pin. Extinct: No data output from TXD pin.
D307	AADET_N [1)]	DO	Bright: EVB uses the external active antenna. Extinct: EVB uses the internal patch antenna.

NOTES

1. [1)] L80-R does not support active antenna detection interface, so D307 is invalid for this module.
2. D305 and D306 LEDs are not supported by any of the applicable modules.

3.5. Test Points

The following figure illustrates the EVB test points.

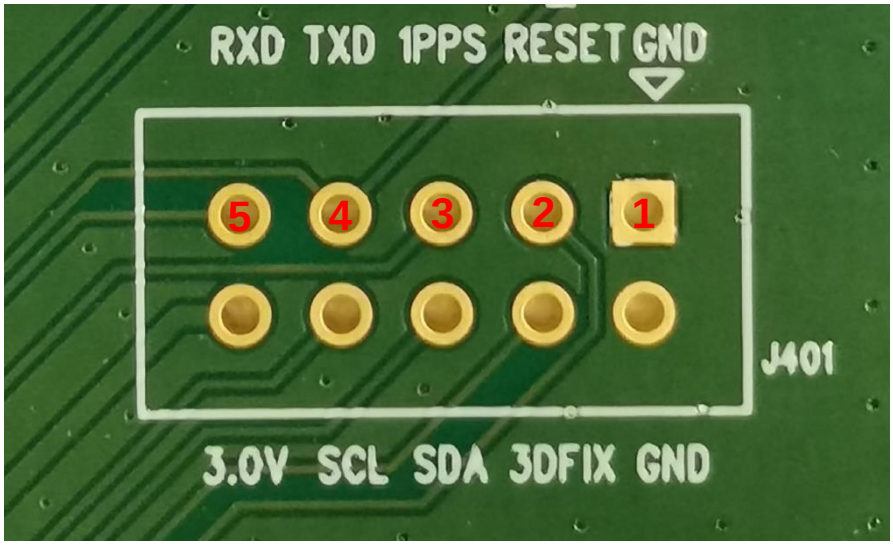


Figure 8: GNSS EVB Test Points (J401)

Table 5: Pin Description of Test Points (J401)

Pin No.	Signal	I/O	Description
1	GND	-	Ground
2	RESET	DI	Resets the module
3	1PPS	DO	1 pulse per second
4	TXD	DO	Transmits data
5	RXD	DI	Receives data

NOTE

The other pins are not supported by the applicable modules.

4 EVB Operation Procedures

This chapter illustrates the EVB operation procedures.

4.1. Communication Through Micro USB Interface

Step 1: Connect the EVB to your computer with a micro-USB cable through the micro-USB interface, and then turn on the POWER switch (S101) to power on the EVB.

Step 2: Run the USB flash drive on the PC to install the USB driver. After installation, the USB port numbers can be viewed through a device manager, as shown below.

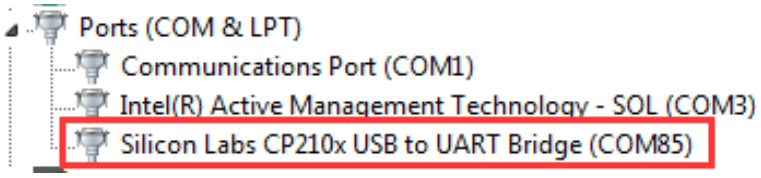


Figure 9: USB Ports

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

The following figure shows the COM Port Setting interface of QCOM: select the correct "**COM Port**" (USB port number shown in the figure above) and set the correct "**Baudrate**" (the default value: 9600 bps). For more details of the usage of QCOM, see ***document [4]***.

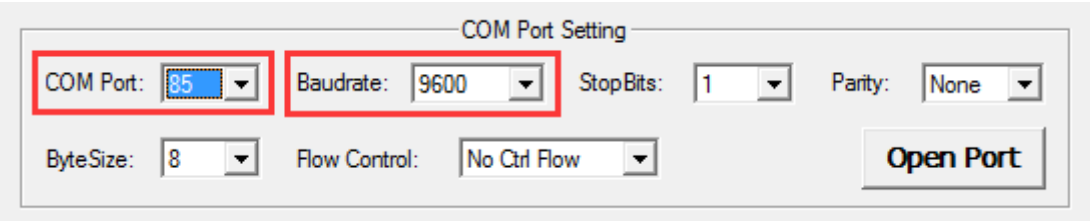


Figure 10: COM Port Setting Interface of QCOM

4.2. Firmware Upgrade

Quectel L80, L86 and LC86L modules upgrade the firmware via micro-USB interface. Follow the procedures below to upgrade firmware.

Step 1: Install and open the firmware upgrade tool FlashTool on your computer.

Step 2: Connect the EVB to the PC with a micro-USB cable through the micro-USB interface, and then turn on the POWER switch (S101) to power on the EVB.

Step 3: Follow the steps below to start firmware upgrade.

a) Click the "**Settings**" → "**Baud rate**" dropdown list and select the "**115200**".
b) Click the "**Settings**" → "**COM Port**" dropdown list and select the COM port.
c) Select the files to be downloaded: tick the boxes next to the "**Reserve**" and the "**ROM**" to select the corresponding file path ("**Reserve**" corresponds to the download management file, and "**ROM**" to the firmware to be downloaded).
d) Click the "**Download**", "**OK**" and "**Go**" buttons to start firmware upgrade.

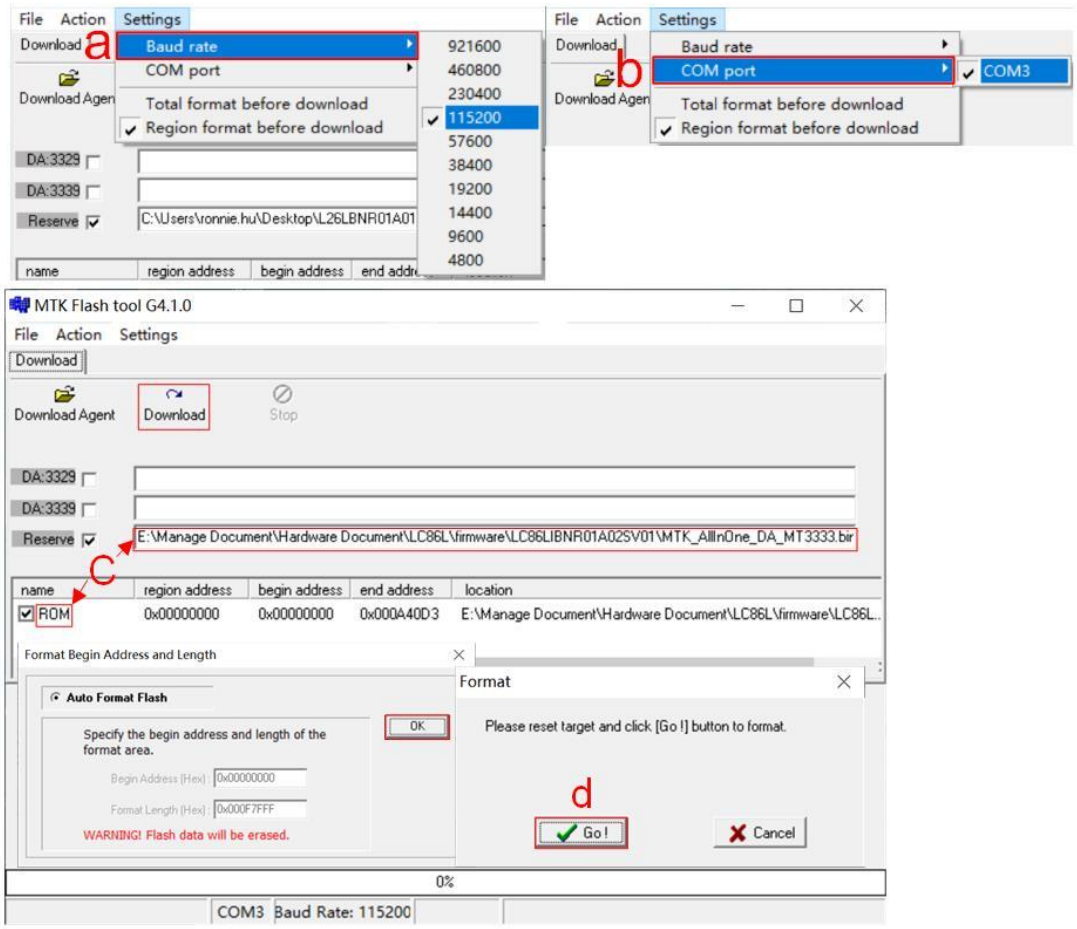


Figure 11: FlashTool Configurations for Firmware Upgrade

NOTE

As the L80-R module is the ROM-based version without built-in Flash, the module has no firmware upgrade function.

5 Using PowerGPS

In this chapter, you can find out how to use PowerGPS, a tool for checking the status of GNSS receivers, when you are working with your EVB.

5.1. COM and Baud Rate Setting

Step 1: After EVB accessories are assembled, turn on the EVB and start PowerGPS (*PowerGPS Trial 2.3.5 is used* as an illustration in this document). After the tool is started, the following interface is displayed with 6 default windows.

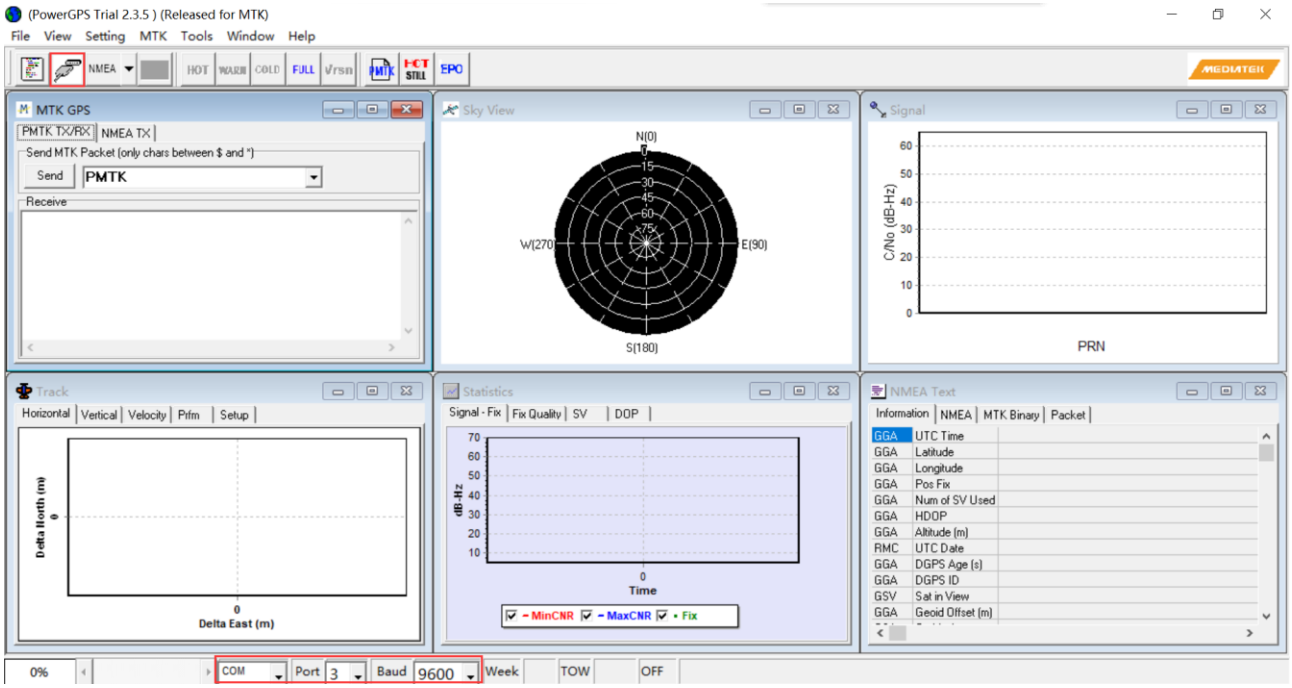


Figure 12: PowerGPS Interface (Not Connected)

Step 2: At the bottom of the interface, select a correct **COM port** and **baud rate** (the modules support 9600 bps by default), then click the button  "**Create Connection**". The following interface is shown when the module is connected.

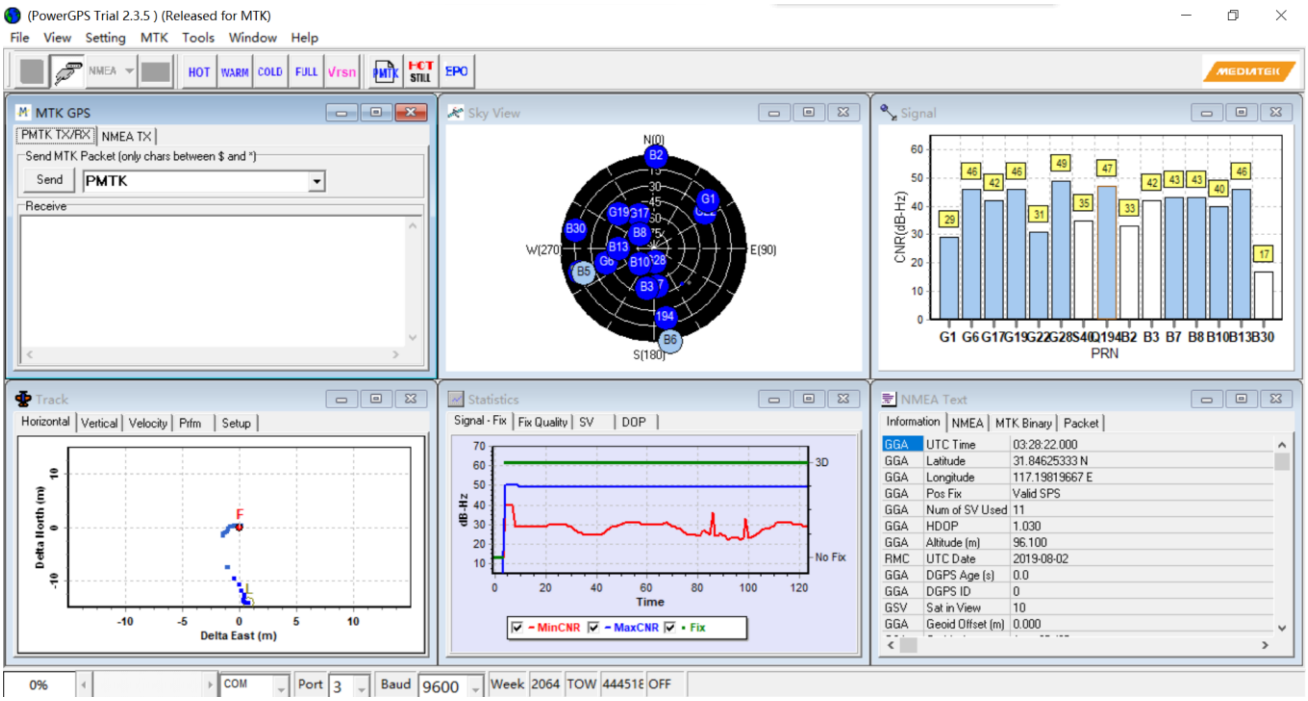


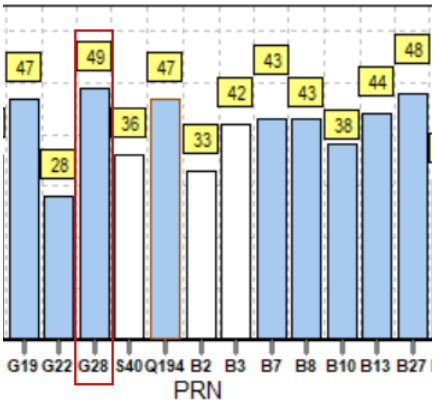
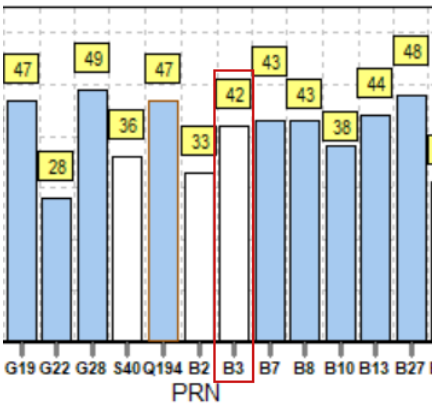
Figure 13: PowerGPS Interface (Connected)

5.1.1. Interface Explained

On the PowerGPS interface, you can view GNSS information, such as CNR message, time, position, speed and precision. To find out more about these parameters, see the table below.

Table 6: PowerGPS Interface Explained

Icon	Explanation
	• A satellite vehicle (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°. • Dark Blue means that this satellite is being tracked.
	• Light blue means that this satellite is not being tracked.

	● The carrier-to-noise ratio (CNR) of PRN 28 is 49 dB/Hz. ● G stands for a GPS satellite, B for a BeiDou satellite, while S means that it is a SBAS satellite. ● Light blue column indicates that the navigation data of this satellite is in use.
	● The CNR of PRN 3 is 42 dB/Hz. ● White column indicates that 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 ● Receiver´s speed

5.2. PMTK Command Sending

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

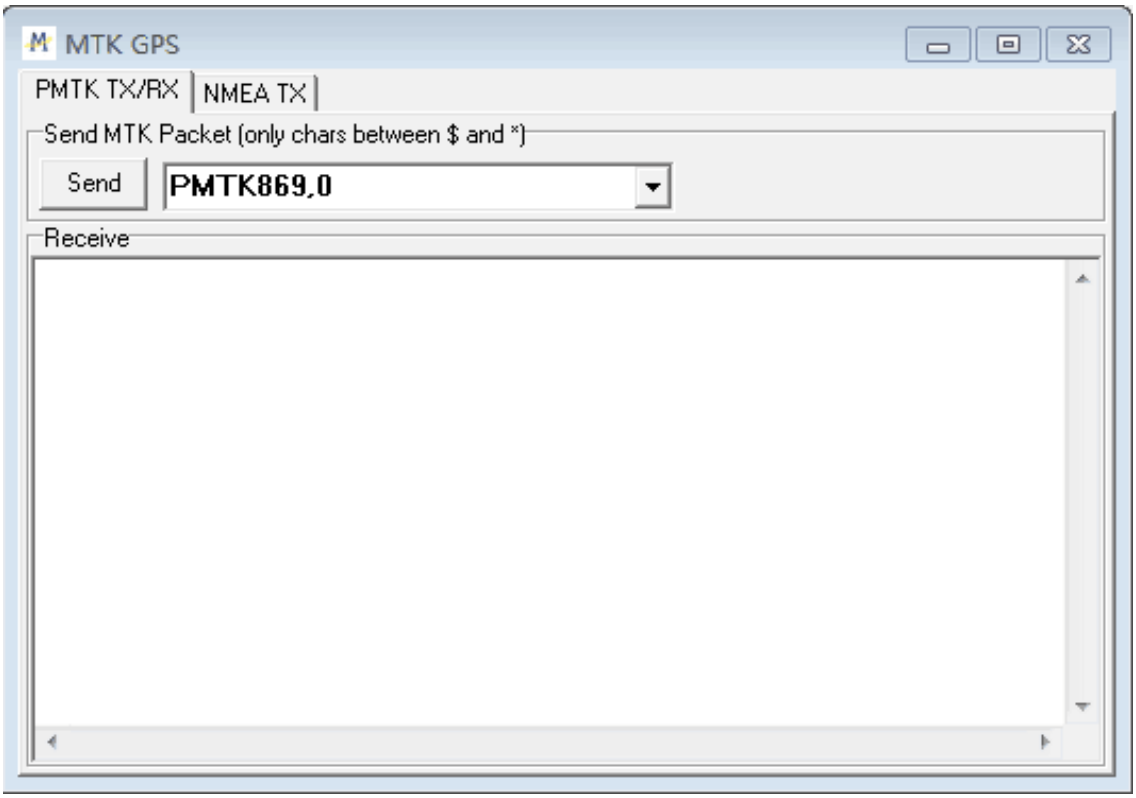


Figure 14: PMTK Command Sending via PowerGPS

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. The test 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:

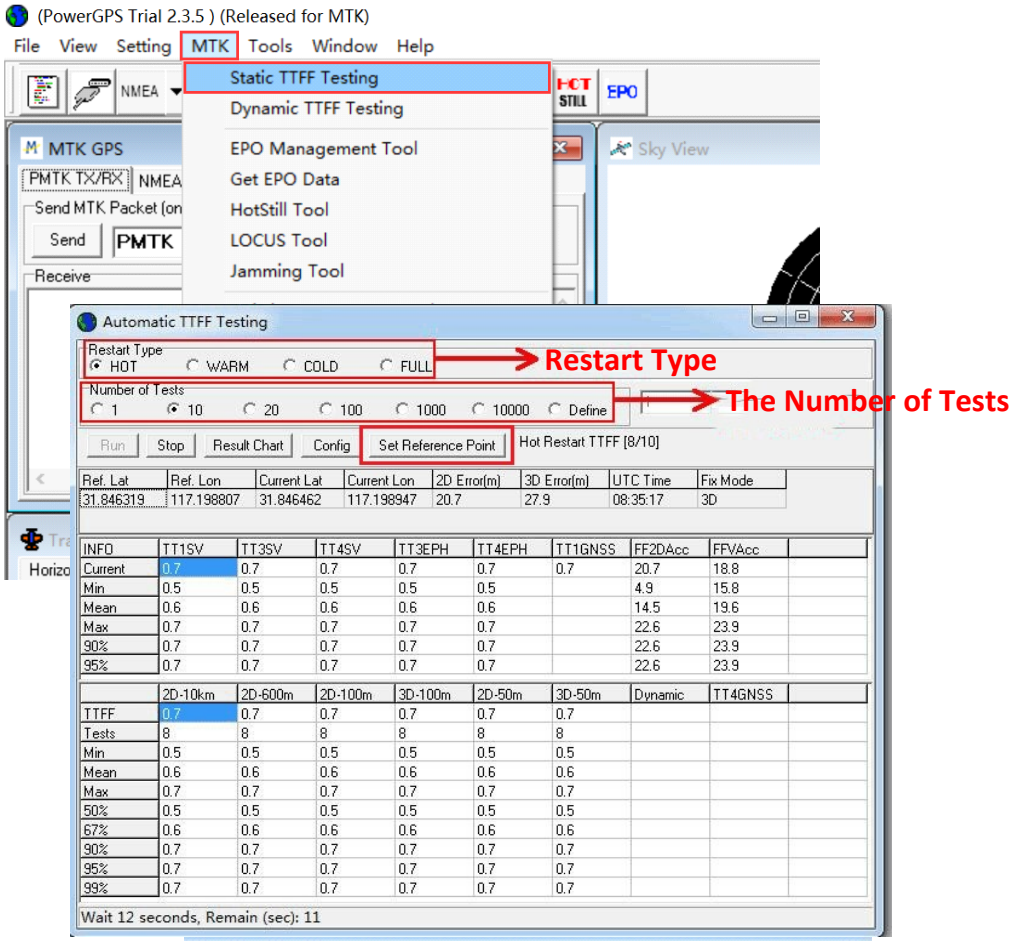


Figure 15: Static TTFF Testing via PowerGPS

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

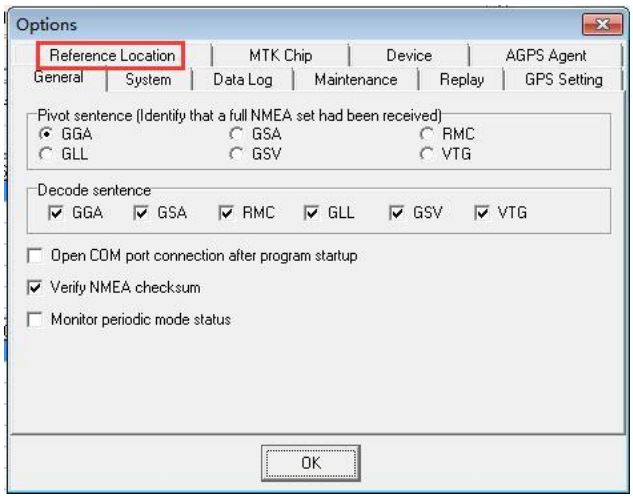


Figure 16: Choose Reference Location

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

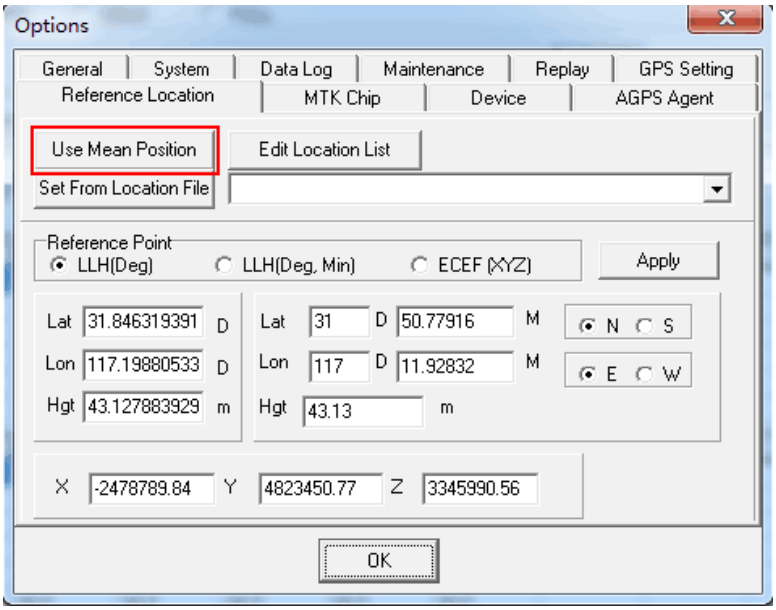


Figure 17: Click Use Mean Position

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**".

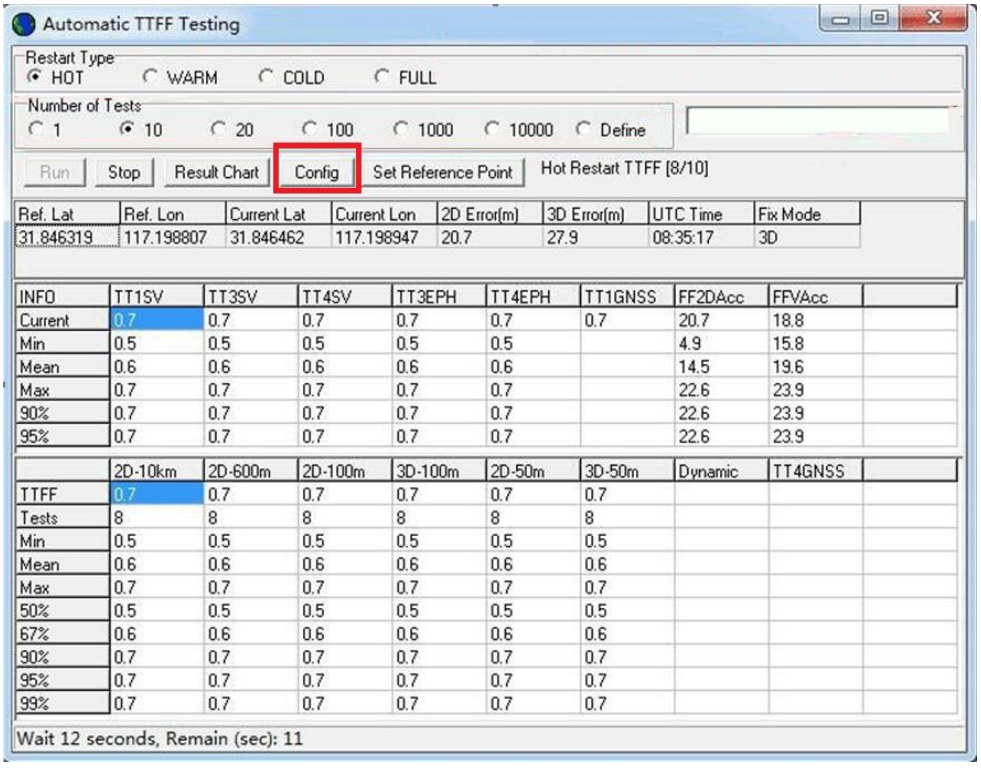


Figure 18: Click Configuration

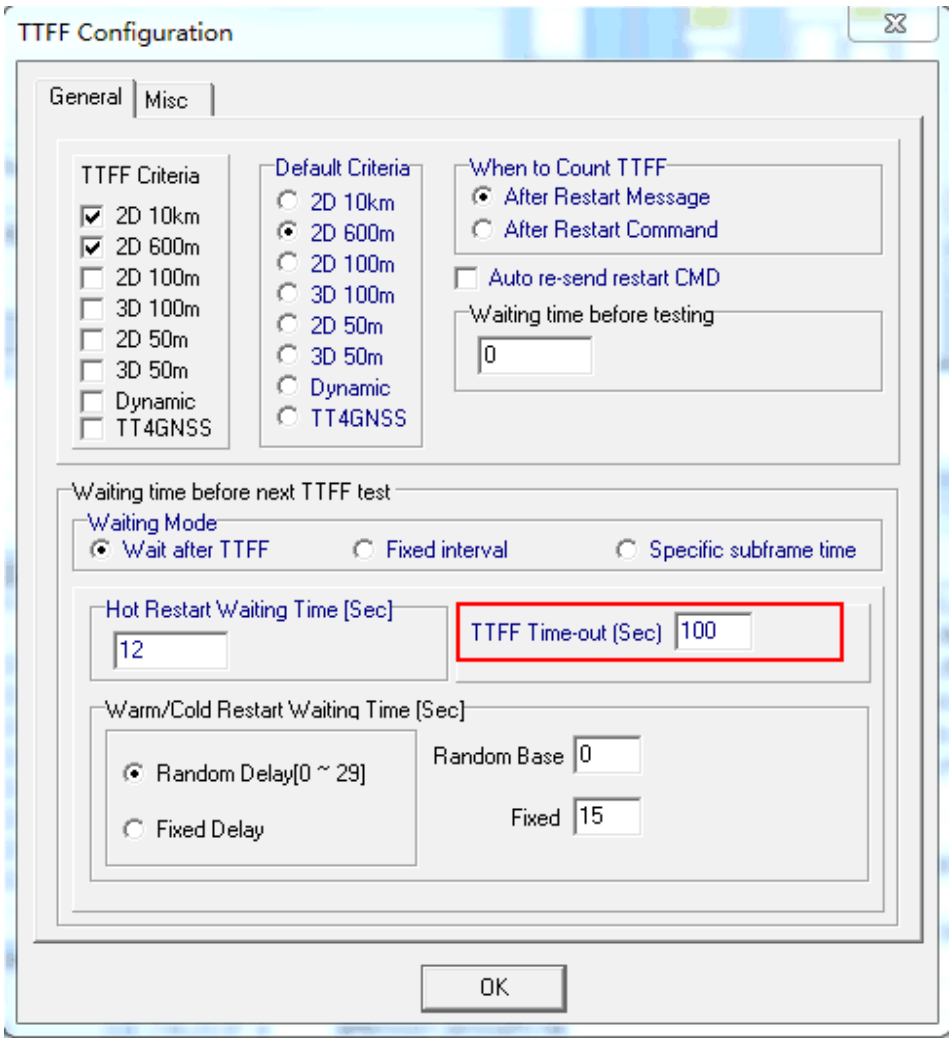


Figure 19: Set TTFF Time-out (Sec)

In general, if hot start is selected, it is recommended to set "**TTFF Time-out (sec)**" to 10 s. If warm start is selected, it can be set as 50 s. Lastly, 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 have been performed, click the "**Run"** button to start the test. The test can be stopped by clicking the "**Stop**" button.

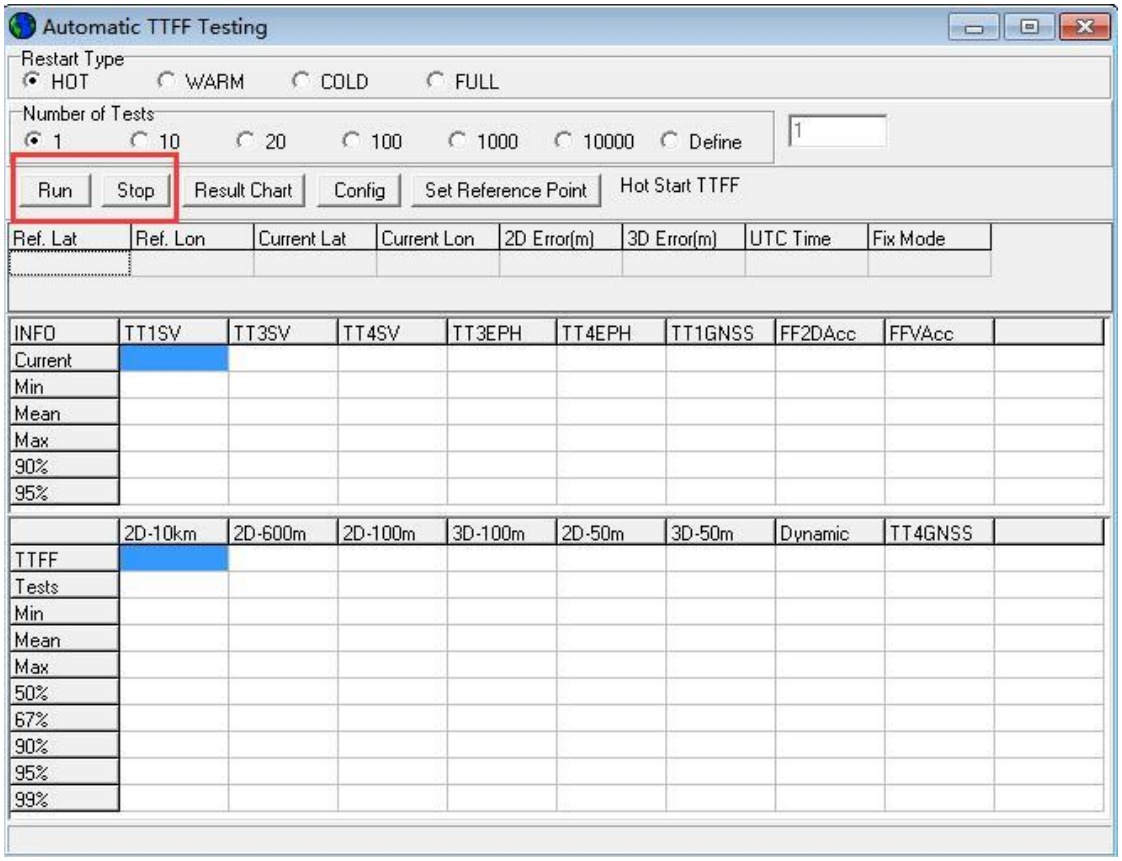


Figure 20: Click Run/Stop Button

Step 5: After testing, you can see the testing results displayed visually in charts. The test results are stored in the directory where the tool is installed.

6 Appendix A References

Table 7: Related Documents

SN	Document Name	Description
[1]	Quectel_L80_Hardware_Design	L80 Hardware Design
[2]	Quectel_L80-R_Hardware_Design	L80-R Hardware Design
[3]	Quectel_L86_Hardware_Design	L86 Hardware Design
[4]	Quectel_LC86L_Hardware_Design	LC86L Hardware Design
[5]	Quectel_L80_GNSS_Protocol_Specification	L80 GNSS Protocol Specification
[6]	Quectel_L80-R_GNSS_Protocol_Specification	L80-R GNSS Protocol Specification
[7]	Quectel_L86_GNSS_Protocol_Specification	L86 GNSS Protocol Specification
[8]	Quectel_L76-LB&L26-LB&LC86L_GNSS_ Protocol_Specification	L76-LB/L26-LB/LC86L GNSS Protocol Specification
[9]	Quectel_L80&L86&LC86L_Reference Design	L80&L86&LC86L Reference Design
[10]	Quectel_L80-R_Reference Design	L80-R Reference Design
[11]	Quectel_QCOM_User_Guide	QCOM User Guide

Table 8: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
BeiDou	BeiDou Navigation Satellite System
COM Port	Communication Port

CNR	Carrier-to-Noise Ratio
DI	Digital input
DO	Digital output
ESD	Electro-Static Discharge
EVB	Evaluation Board
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
GND	Ground
LED	Light Emitting Diode
Micro-USB	Micro Universal Serial Bus
NMEA	National Marine Electronics Association
PC	Personal Computer
PMTK	MTK Proprietary Protocol
PPS	Pulse Per Second
PRN	Pseudorandom Noise
ROM	Read-Only Memory
RXD	Receive Data (Pin)
SBAS	Satellite-Based Augmentation System
SD Card	Secure Digital Card
SPS	Standard Positioning Service
SV	Satellite Vehicle
TTFF	Time to First Fix
TXD	Transmit Data (Pin)
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus

UTC	Universal Time Coordinated
WGS84	World Geodetic System 1984