

L70 EVB User Guide

GPS Module Series

Rev. L70_EVB_User_Guide_V2.0

Date: 2013-05-31



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

Quectel Wireless Solutions Co., Ltd.

Room 501, Building 13, No.99, Tianzhou Road, Shanghai, China, 200233

Tel: +86 21 5108 6236

Mail: info@quectel.com

Or our local office, for more information, please visit:

<http://www.quectel.com/support/salesupport.aspx>

For technical support, to report documentation errors, please visit:

<http://www.quectel.com/support/techsupport.aspx>

GENERAL NOTES

QUECTEL OFFERS THIS INFORMATION AS A SERVICE TO ITS CUSTOMERS. THE INFORMATION PROVIDED IS BASED UPON CUSTOMERS' REQUIREMENTS. QUECTEL MAKES EVERY EFFORT TO ENSURE THE QUALITY OF THE INFORMATION IT MAKES AVAILABLE. QUECTEL DOES NOT MAKE ANY WARRANTY AS TO THE INFORMATION CONTAINED HEREIN, AND DOES NOT ACCEPT ANY LIABILITY FOR ANY INJURY, LOSS OR DAMAGE OF ANY KIND INCURRED BY USE OF OR RELIANCE UPON THE INFORMATION. ALL INFORMATION SUPPLIED HEREIN ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

COPYRIGHT

THIS INFORMATION CONTAINED HERE IS PROPRIETARY TECHNICAL INFORMATION OF QUECTEL CO., LTD. TRANSMITTABLE, REPRODUCTION, DISSEMINATION AND EDITING OF THIS DOCUMENT AS WELL AS UTILIZATION OF THIS CONTENTS ARE FORBIDDEN WITHOUT PERMISSION. OFFENDERS WILL BE HELD LIABLE FOR PAYMENT OF DAMAGES. ALL RIGHTS ARE RESERVED IN THE EVENT OF A PATENT GRANT OR REGISTRATION OF A UTILITY MODEL OR DESIGN.

Copyright © Quectel Wireless Solutions Co., Ltd. 2013. All rights reserved.

About the document

History

Revision	Date	Author	Description
1.0	2013-02-21	Dishon ZHOU	Initial
2.0	2013-05-28	Ada LI	Hardware upgraded

Contents

About the document	2
Contents	3
Table Index	4
Figure Index	5
1 Introduction	6
2 Introduction to EVB Kit	7
2.1. EVB Top and Bottom View	7
2.2. EVB Accessories	9
3 Interface Application	10
3.1. USB Interface	10
3.2. UART Interface	11
3.3. Antenna Interface	12
3.4. Switches and Buttons	13
3.5. Operating Status LEDs	14
3.6. Test Points	15
4 EVB and Accessories	16
5 Install Device Driver	17
6 Starting PowerGPS	18
7 Appendix A Reference	24

Table Index

TABLE 1: PINS OF UART PORT	11
TABLE 2: SWITCHES AND BUTTONS	13
TABLE 3: OPERATING STATUS LEDS	14
TABLE 4: PINS OF J106	15
TABLE 5: EXPLANATIONS OF POWERGPS WINDOW	19
TABLE 6: REFERENCE	24
TABLE 7: ABBREVIATIONS	24

Quectel
Confidential

Figure Index

FIGURE 1: EVB TOP VIEW	7
FIGURE 2: EVB BOTTOM VIEW	8
FIGURE 3: EVB ACCESSORIES	9
FIGURE 4: MICRO-USB INTERFACE	10
FIGURE 5: UART INTERFACE	11
FIGURE 6: ANTENNA INTERFACE	12
FIGURE 7: LNA LAYOUT	12
FIGURE 8: SWITCHES AND BUTTONS	13
FIGURE 9: OPERATING STATUS LEDS	14
FIGURE 10: TEST POINTS J106	15
FIGURE 11: EVB AND ACCESSORY EQUIPMENTS	16
FIGURE 12: POWERGPS TOOL	18
FIGURE 13: MTK COMMAND	20
FIGURE 14: STATIC TTFF TESTING	21
FIGURE 15: STATIC TTFF TESTING CONFIGURATION OPTIONS	22
FIGURE 16: STATIC TTFF TESTING CONFIGURATION	23

1 Introduction

This document defines and specifies the usage of L70 EVB (Evaluation Board). You can get useful information about L70 EVB and GPS demo tool from this document.

Quectel
Confidential

2 Introduction to EVB Kit

2.1. EVB Top and Bottom View

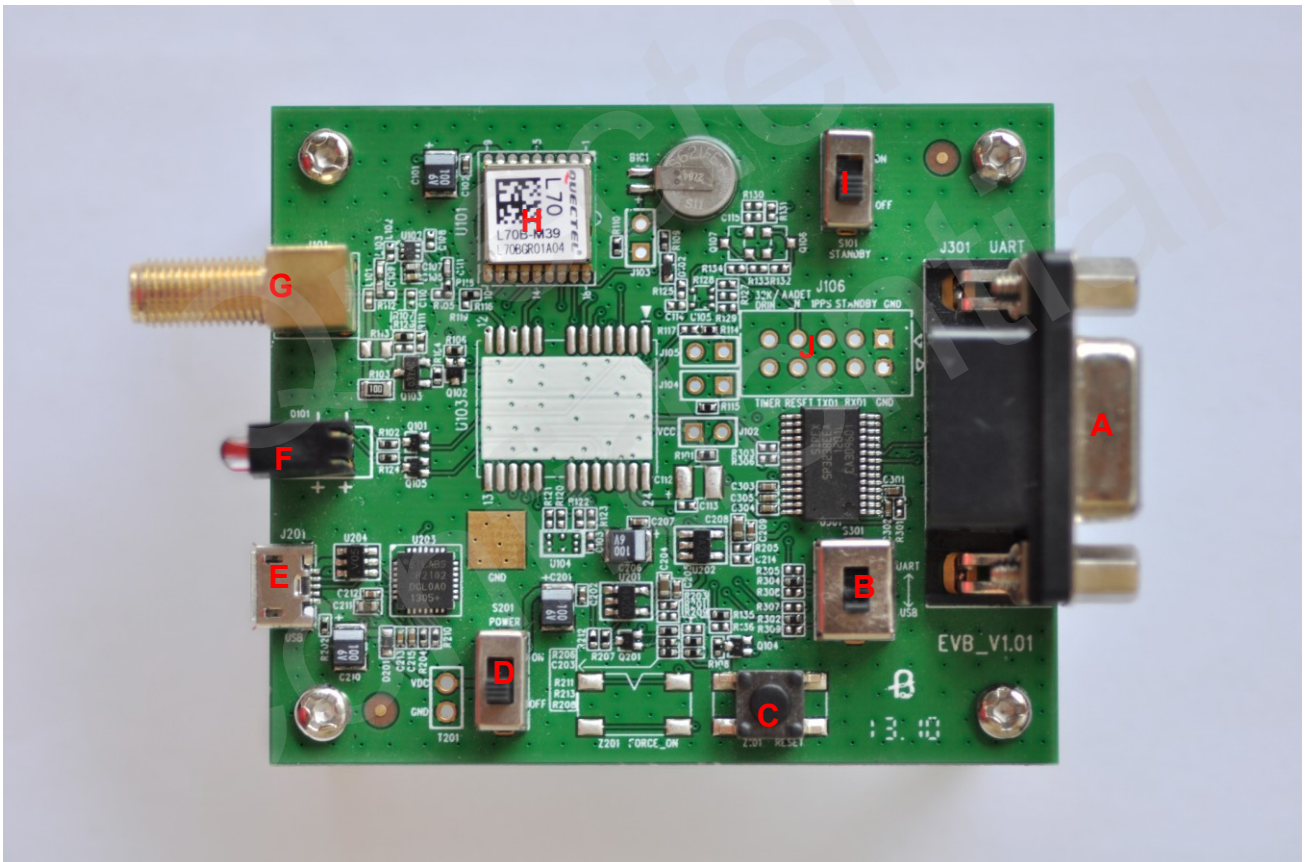


Figure 1: EVB Top View

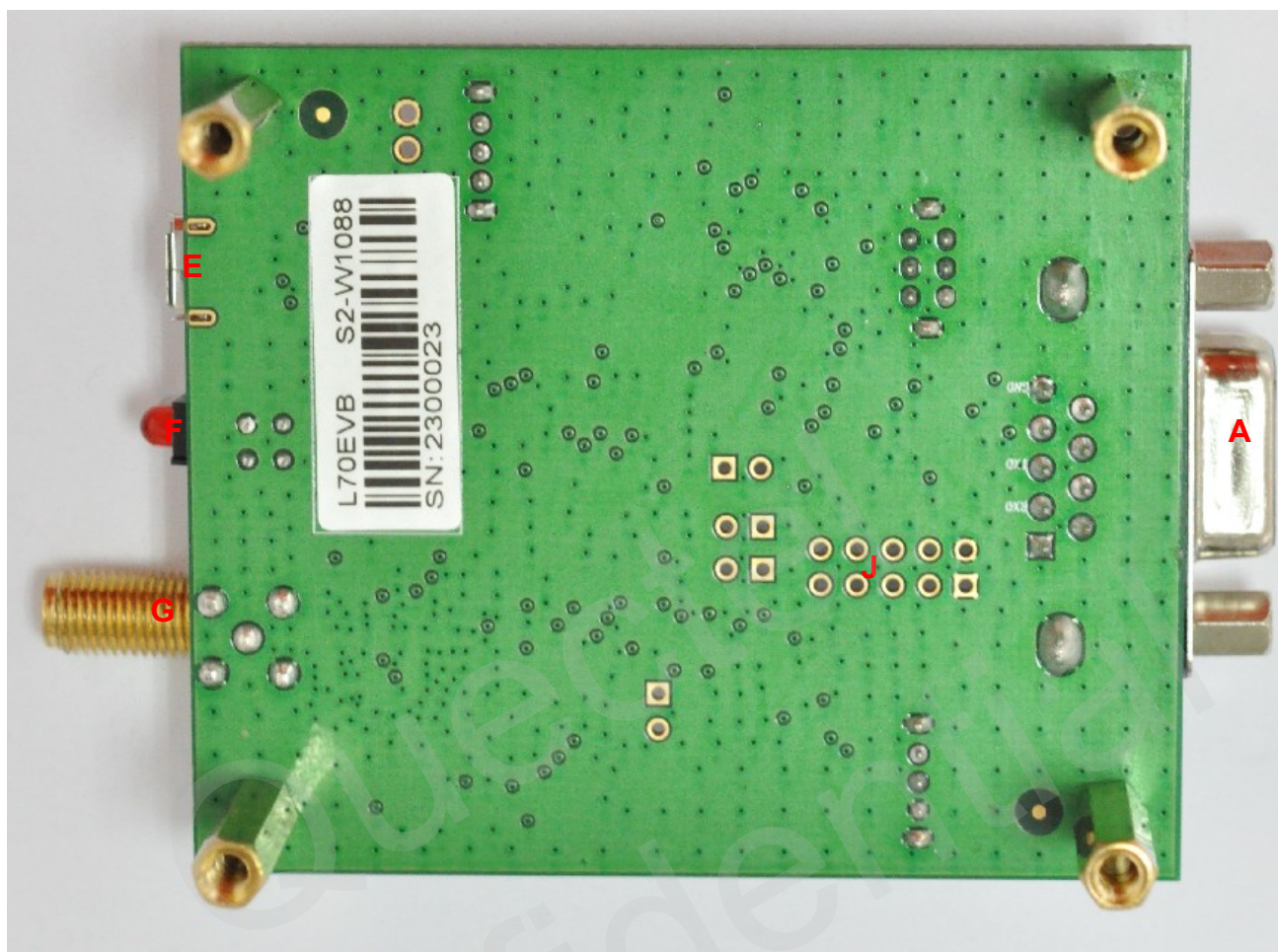


Figure 2: EVB Bottom View

- A: UART port
- B: Serial port alternation switch
- C: RESET button
- D: POWER switch
- E: Micro-USB port
- F: Indication LEDs
- G: Antenna interface
- H: L70 Module
- I: STANDBY switch
- J: Test points

2.2. EVB Accessories



Figure 3: EVB Accessories

- A: USB cable
- B: GPS active antenna (3.3V)

3 Interface Application

3.1. USB Interface

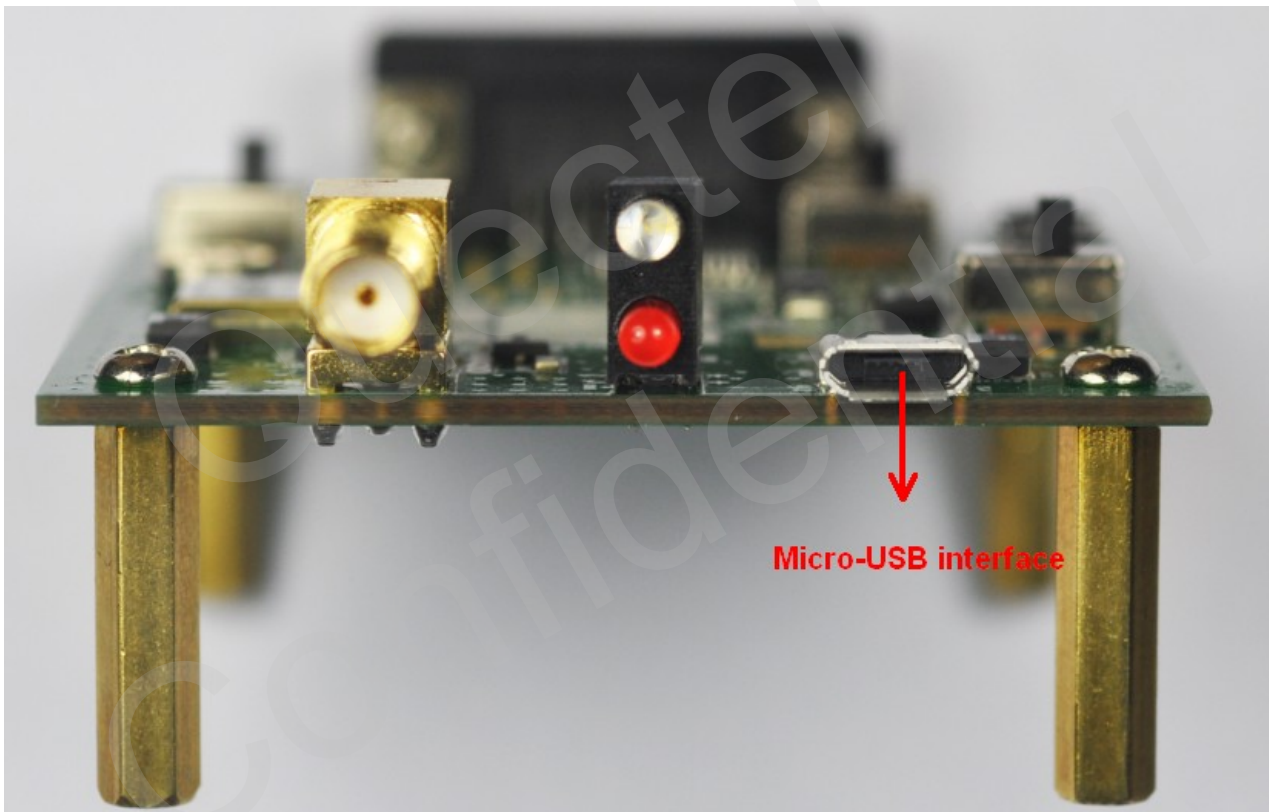


Figure 4: Micro-USB Interface

The main power is supplied via Micro-USB interface. Quectel provides two ways for data communication: Micro-USB and UART interface which are controlled by serial port alternation switch (S2). Both of RS232 and Micro-USB cable are necessary, if you want to use UART in order to output NEMA. So the easy way is that use Micro-USB cable which both provides the power and output NEMA. You can make alternation between UART port and Micro-USB interface via switch (S2).

NOTE

If you want to use PowerGPS Tool, UART interface is recommended for data communication.

3.2. UART Interface



Figure 5: UART Interface

Table 1: Pins of UART port

Pin	Signal	I/O	Description
2	RXD	I	Receive data
3	TXD	O	Transmit data
5	GND		GND

3.3. Antenna Interface

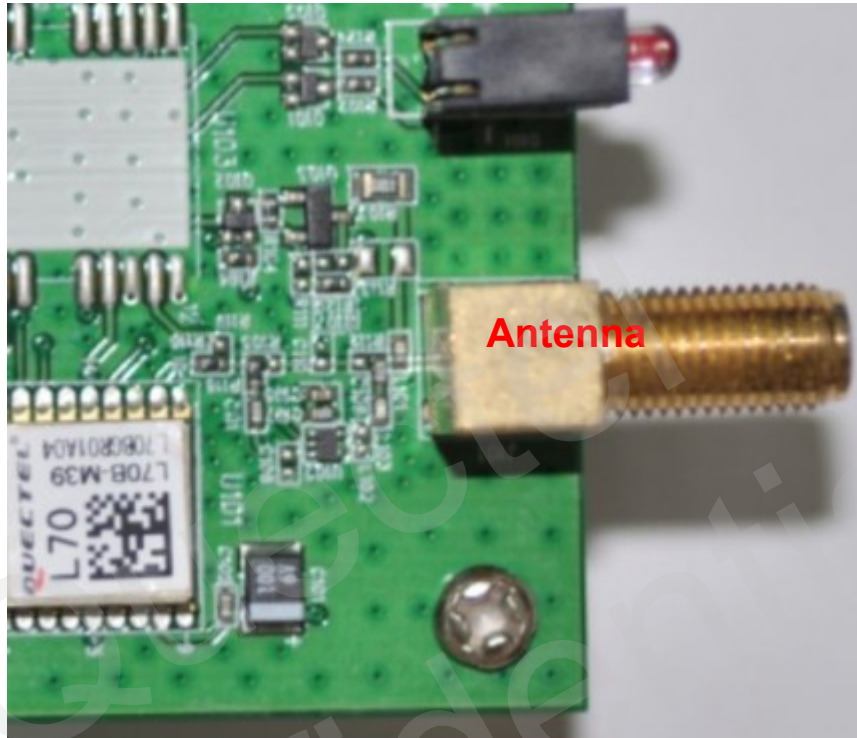


Figure 6: Antenna Interface

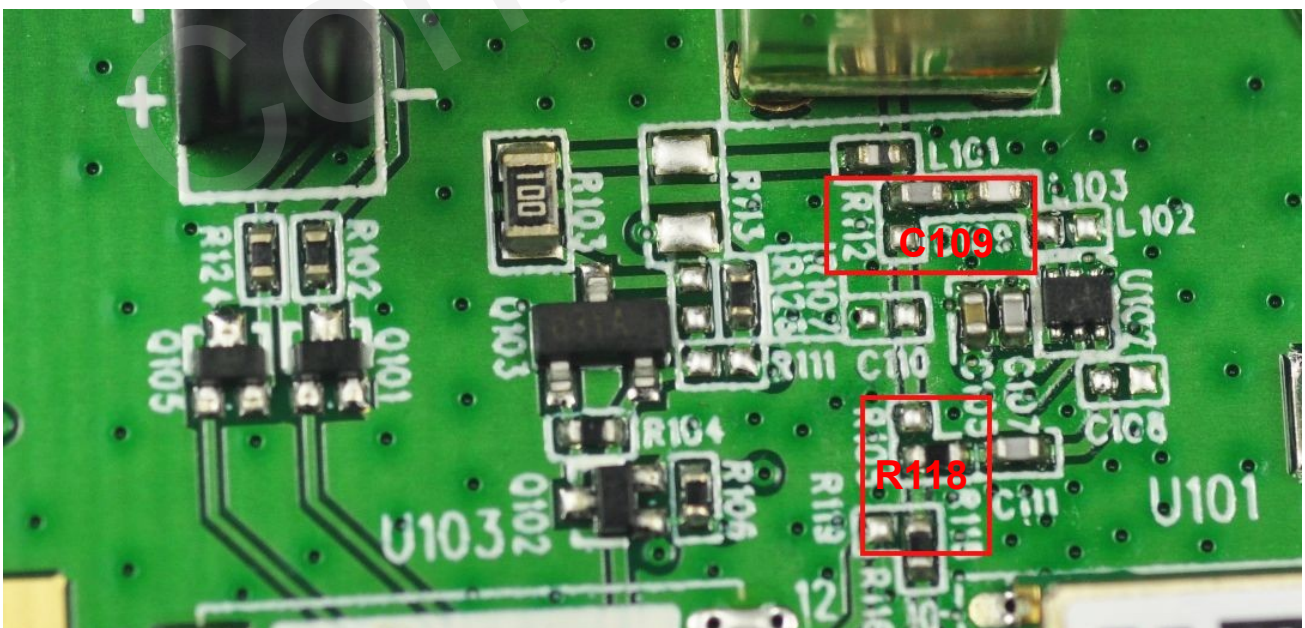


Figure 7: LNA Layout

For choice of external antenna, both of active antenna and passive antenna can be selected. Please note the LNA is installed in the EVB by default, so you have to move C109 to R112 and R118 to R105, when you want to remove the LNA for test.

3.4. Switches and Buttons

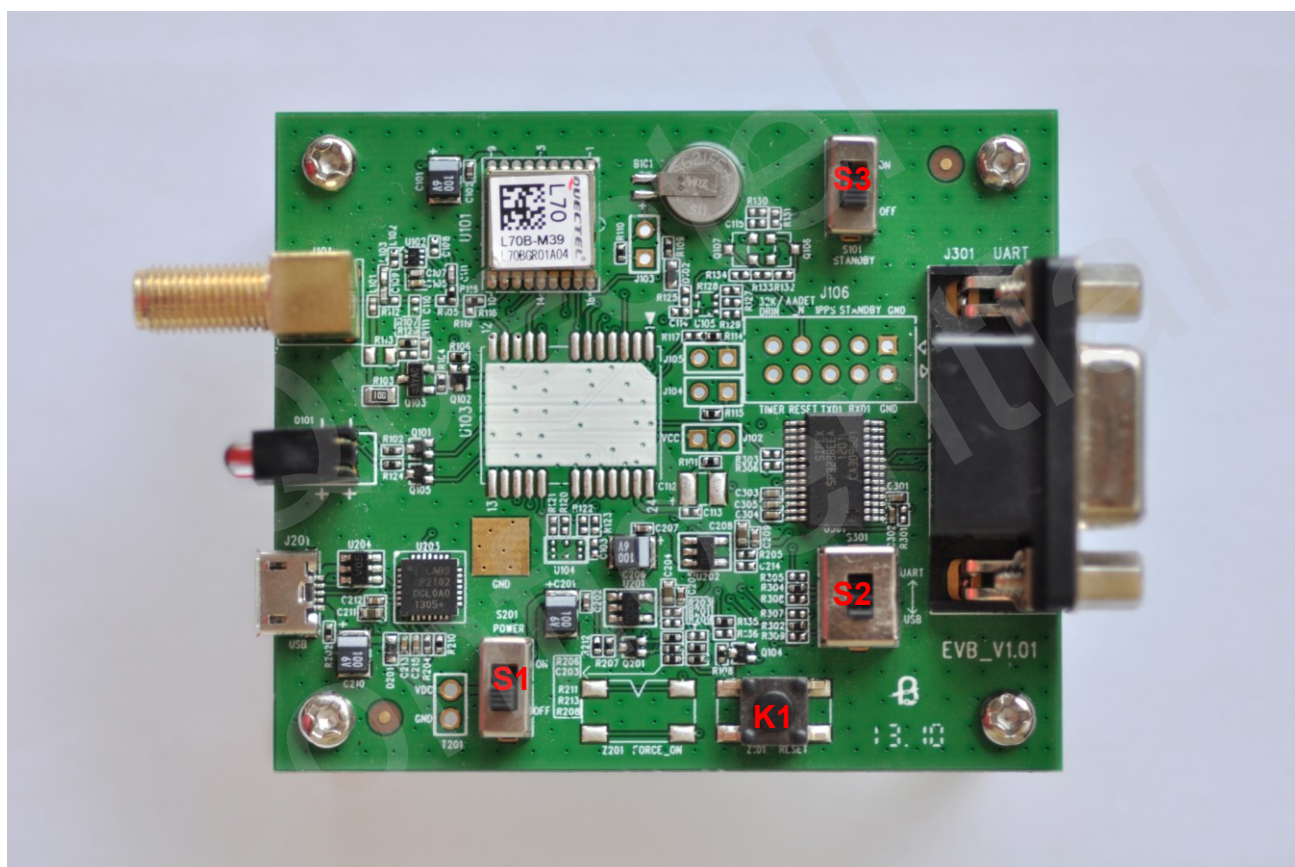


Figure 8: Switches and Buttons

Table 2: Switches and Buttons

Part	Name	I/O	Description
S1	POWER	I	Control power supply via Micro-USB.
S2	Serial port alternation switch	I	QUECTEL EVB supplies two communicative ways: Micro-USB and UART which are controlled by switch.

S3	STANDBY	I	The module will enter into standby mode when switching from OFF to ON, and exit from standby mode in the opposite operation.
K1	RESET	I	Press and release this button, then the module will reset.

3.5. Operating Status LEDs



Figure 9: Operating Status LEDs

Table 3: Operating status LEDs

Part	Name	I/O	Description
L1	TXD1	O	Flash: turn on successfully. Micro-USB or UART1 port can output messages. Extinct: fail to turn on the module.
L2	1PPS	O	Flash: fix successfully. The frequency is 1Hz. Extinct: no fix.

3.6. Test Points

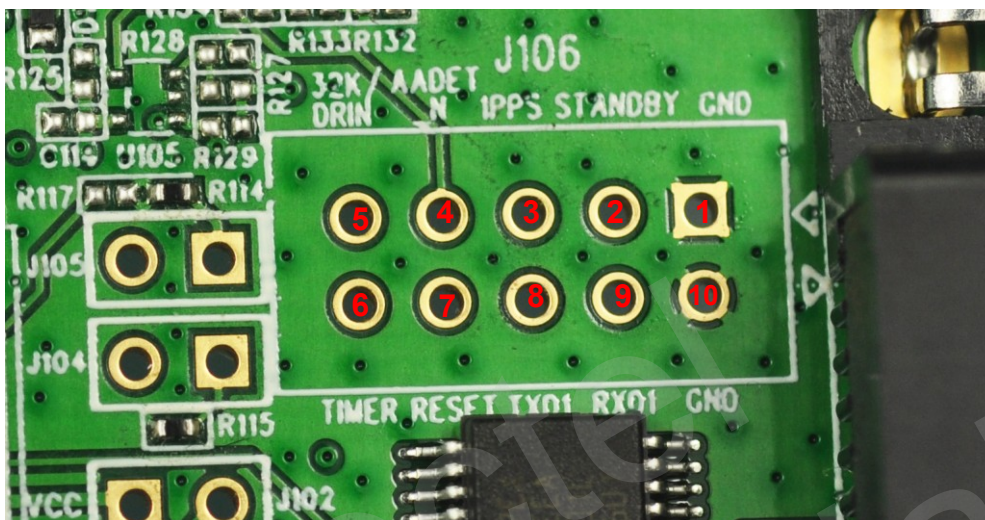


Figure 10: Test Points J106

Table 4: Pins of J106

Pin	Signal	I/O	Description
1/10	GND		Ground
2	STANDBY	I	Enter or exit standby mode
3	1PPS	O	1 pulse per second
4	AADET_N	I	Active antenna open circuit detection
5	32K/DRIN		Reserved
6	TIMER(FORCE_ON)	O	Logic high will force module to be waked up from backup mode. Keep this pin open or pulled low before entering into backup mode. If unused, keep this pin open.
7	RESET	I	System reset
8	TXD1	O	Transmit data
9	RXD1	I	Receive data

4 EVB and Accessories

The EVB and its accessories are equipped as shown in Figure 11.

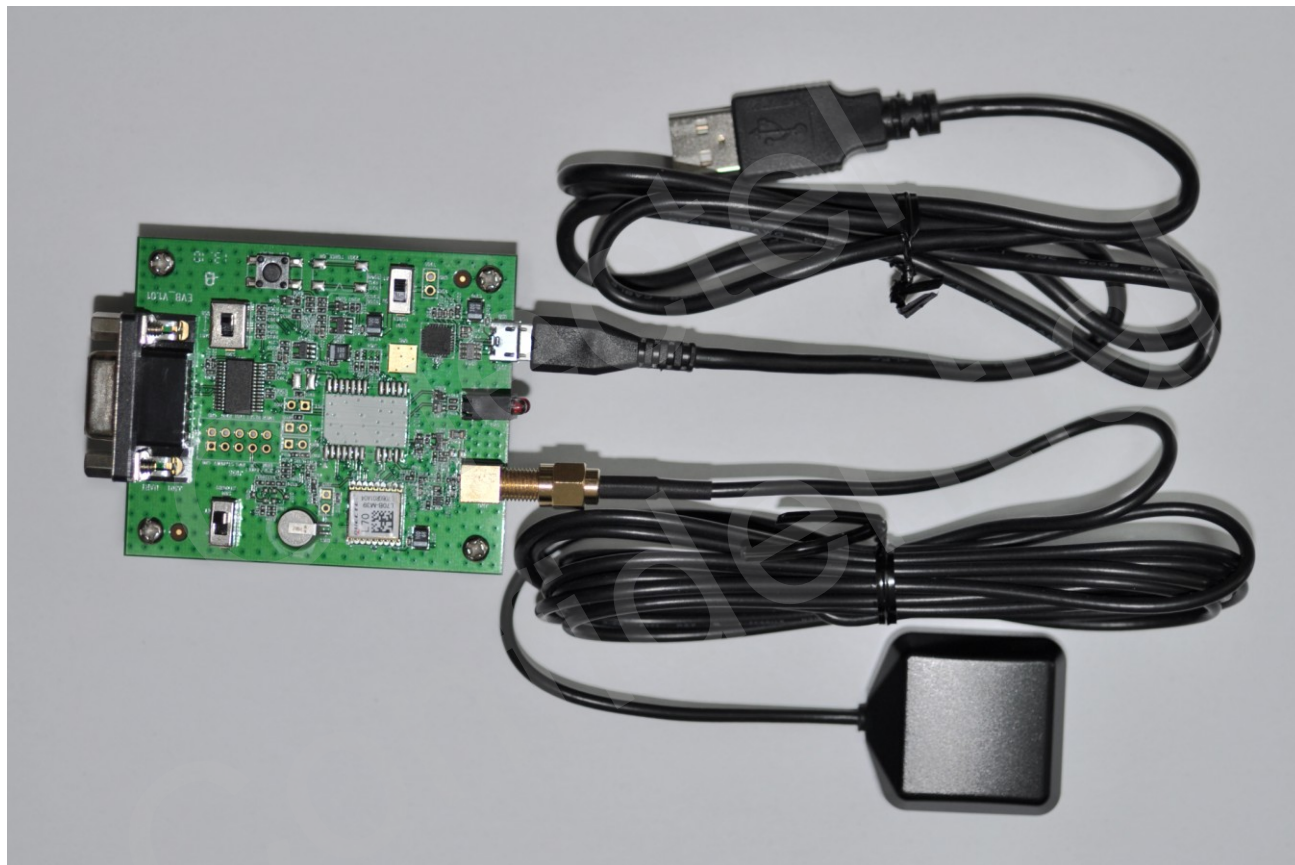


Figure 11: EVB and Accessory Equipments

5 Install Device Driver

Please note that you need to install the driver of Micro-USB, when use Micro-USB for data communication. The driver has been stored in our FTP server. The driver of CP210x also can be download from internet. The download path of our FTP server is as below:

Overseas customer: /d:/FTP/OC/Overseas_Technical/Overseas_Module Official Documents/GNSS Module/Common/04 Tool Kit/ GNSS_EVB_Micro-USB_Driver_CP210x.

Domestic customer: /d:/FTP/CC/Domestic_Technical/Domestic_Module Official Documents/GNSS Module/Common/04 Tool Kit/ GNSS_EVB_Micro-USB_Driver_CP210x.

Quectel
Confidential

6 Starting PowerGPS

The PowerGPS version is V2.2.0. The PowerGPS tool can help user to view the status of GPS&GLONASS receiver conveniently. When the tool is opened, the following window will be displayed:

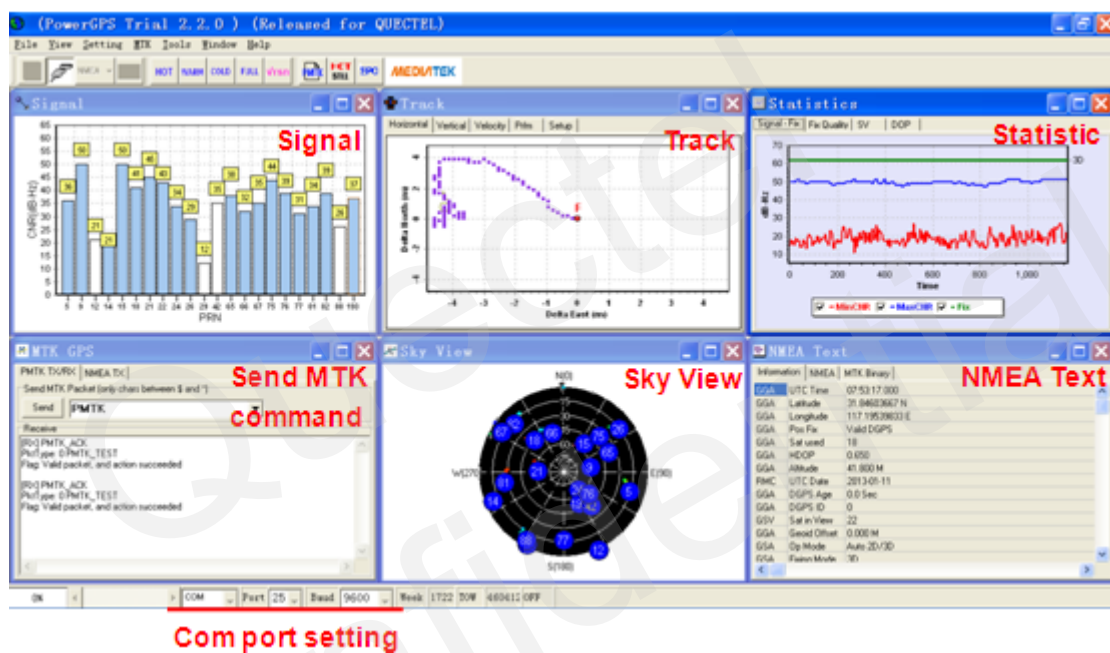
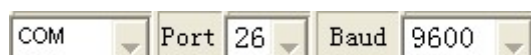


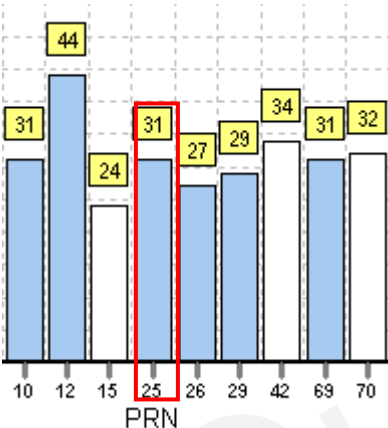
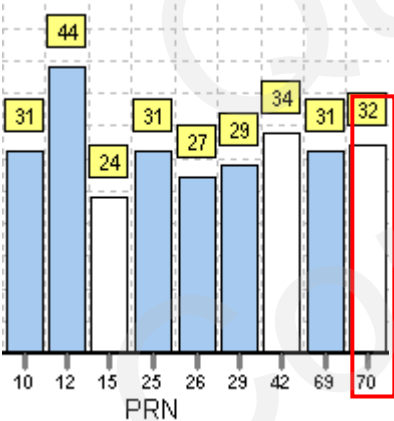
Figure 12: PowerGPS Tool

After EVB accessories are assembled, turn on the module and start up the PowerGPS. Select a correct COM port and baud rate (L70 module supports 9600bps by default), then click the button “Create Connection”.



From the PowerGPS window, user can view CNR message, time, position, speed, precision and so on. Explanations are listed in Table 5.

Table 5: Explanations of PowerGPS Window

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°. Dark blue means this satellite is in tracking.																
	Light blue means this satellite is not in tracking.																
	The CNR of PRN 25 is 31dB/Hz. Light blue column means the navigation data of this satellite is in use.																
	The CNR of PRN 70 is 32dB/Hz. White column means the navigation data of this satellite is not in use. The range of GLONASS SVID is 65-96.																
<table border="1"> <tr><td>UTC Time</td><td>08:54:07.000</td></tr> <tr><td>Latitude</td><td>31.84580167 N</td></tr> <tr><td>Longitude</td><td>117.19548500 E</td></tr> <tr><td>Pos Fix</td><td>Valid DGPS</td></tr> <tr><td>Sat used</td><td>17</td></tr> <tr><td>HDOP</td><td>0.630</td></tr> <tr><td>Altitude</td><td>16.200 M</td></tr> <tr><td>UTC Date</td><td>2013-01-11</td></tr> </table>	UTC Time	08:54:07.000	Latitude	31.84580167 N	Longitude	117.19548500 E	Pos Fix	Valid DGPS	Sat used	17	HDOP	0.630	Altitude	16.200 M	UTC Date	2013-01-11	UTC time Latitude degree longitude degree Positing fix Using the number of satellites Horizontal Dilution of Precision Altitude based on WGS84 Datum UTC date
UTC Time	08:54:07.000																
Latitude	31.84580167 N																
Longitude	117.19548500 E																
Pos Fix	Valid DGPS																
Sat used	17																
HDOP	0.630																
Altitude	16.200 M																
UTC Date	2013-01-11																
<table border="1"> <tr><td>Fixing Mode</td><td>3D</td></tr> <tr><td>Sat Used</td><td>18 25 14 21 15 31</td></tr> <tr><td>PDOP</td><td>1.680</td></tr> <tr><td>VDOP</td><td>1.410</td></tr> <tr><td>Speed (m/s)</td><td>0.005</td></tr> </table>	Fixing Mode	3D	Sat Used	18 25 14 21 15 31	PDOP	1.680	VDOP	1.410	Speed (m/s)	0.005	Fix type: No-Fix, 3D or 2D SPS Using satellite Position Dilution of Precision Vertical Dilution of Precision Speed of receiver						
Fixing Mode	3D																
Sat Used	18 25 14 21 15 31																
PDOP	1.680																
VDOP	1.410																
Speed (m/s)	0.005																

PMTK Command

You can send PMTK command by PowerGPS. The format of PMTK command is included only characters between '\$' and '*', for example: PMTK869,0.

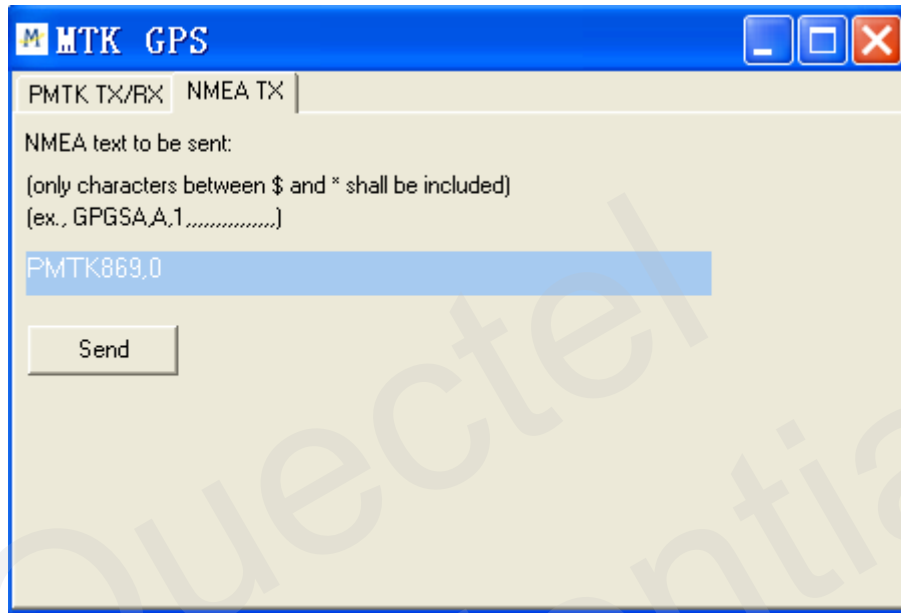


Figure 13: MTK Command

Automatic TTFF Testing

This tool allows you to measure the TTFF (Time to First Fix) under different testing conditions. You can choose to test the TTFF from full start, cold start, warm start and hot start and the number of tests can be chosen from 1, 10, 20, 100, 1000 and 10000. Click on the Run button to start the test and it can be stopped by clicking on the Stop button. The configuration is as below:

Start "MTK" menu, and click "Static TTFF Testing", then "Static TTFF Testing" as shown below:

Automatic TTFF Testing

Restart Type: ☐ HOT ☒ WARM ☐ COLD ☐ FULL → Restart

Number of Tests: ☐ 1 ☒ 10 ☐ 20 ☐ 100 ☐ 1000 ☐ 10000 ☐ Define → The number of tests

Run Stop Result Chart Config Set Reference Point Warm Restart TTFF [4/10]

Ref. Lat	Ref. Lon	Current Lat	Current Lon	2D Error(m)	3D Error(m)	UTC Time	Fix Mode
31.845411	117.195496	31.845265	117.195385	19.3	37.8	03:10:29	3D

INFO	TT1SV	TT3SV	TT4SV	TT3EPH	TT4EPH	TT1GNSS	FF2DAcc	FFVAcc
Current	0.8	0.8	0.8	2.3	2.3	2.3	19.3	32.5
Min	0.8	0.8	0.8	2.3	2.3		9.0	32.1
Mean	0.9	0.9	1.0	2.6	2.6		15.8	35.5
Max	1.1	1.1	1.1	3.1	3.1		19.3	40.2
90%	1.1	1.1	1.1	3.1	3.1		19.3	40.2
95%	1.1	1.1	1.1	3.1	3.1		19.3	40.2

	2D-10km	2D-600m	2D-100m	3D-100m	2D-50m	3D-50m	Dynamic	TT4GNSS
TTFF	2.3	2.3	2.3	2.3	2.3	2.3		
Tests	4	4	4	4	4	4		
Min	2.3	2.3	2.3	2.3	2.3	2.3		
Mean	2.6	2.6	2.6	2.6	2.6	2.6		
Max	3.1	3.1	3.1	3.1	3.1	3.1		
50%	2.4	2.4	2.4	2.4	2.4	2.4		
67%	2.9	2.9	2.9	2.9	2.9	2.9		
90%	3.1	3.1	3.1	3.1	3.1	3.1		
95%	3.1	3.1	3.1	3.1	3.1	3.1		
99%	3.1	3.1	3.1	3.1	3.1	3.1		

Wait 5 seconds, Remain (sec): 4

Figure 14: Static TTFF Testing

Click “Set reference point”, choose “Reference location”. After start positioning, click “Use Mean Position”, then click “OK”. As shown in the screenshots below:

Options

General | System | Data Log | Maintenance | Replay | GPS Setting

Reference Location | MTK Chip | Device | AGPS Agent

☒ Use Mean Position

Set From Location File

Reference Point

☒ LLH(Deg) ☐ LLH(Deg, Min) ☐ ECEF (XYZ)

Lat D Lat D M ☒ N ☐ S

Lon D Lon D M ☒ E ☐ W

Hgt m Hgt m

X Y Z

Figure 15: Static TTFF Testing Configuration Options

Click “Config”, set “TTFF Time-out (sec)”, then click “OK”, shown as below:

In generally, if you choose hot start, “TTFF Time-out (sec)” sets 10s. If you choose warm start, the “TTFF Time-out (sec)” sets 50s. If you choose cold start, the “TTFF Time-out (sec)” sets 100s. “TTFF Time-out (sec)” can help you judge TTFF and save time.

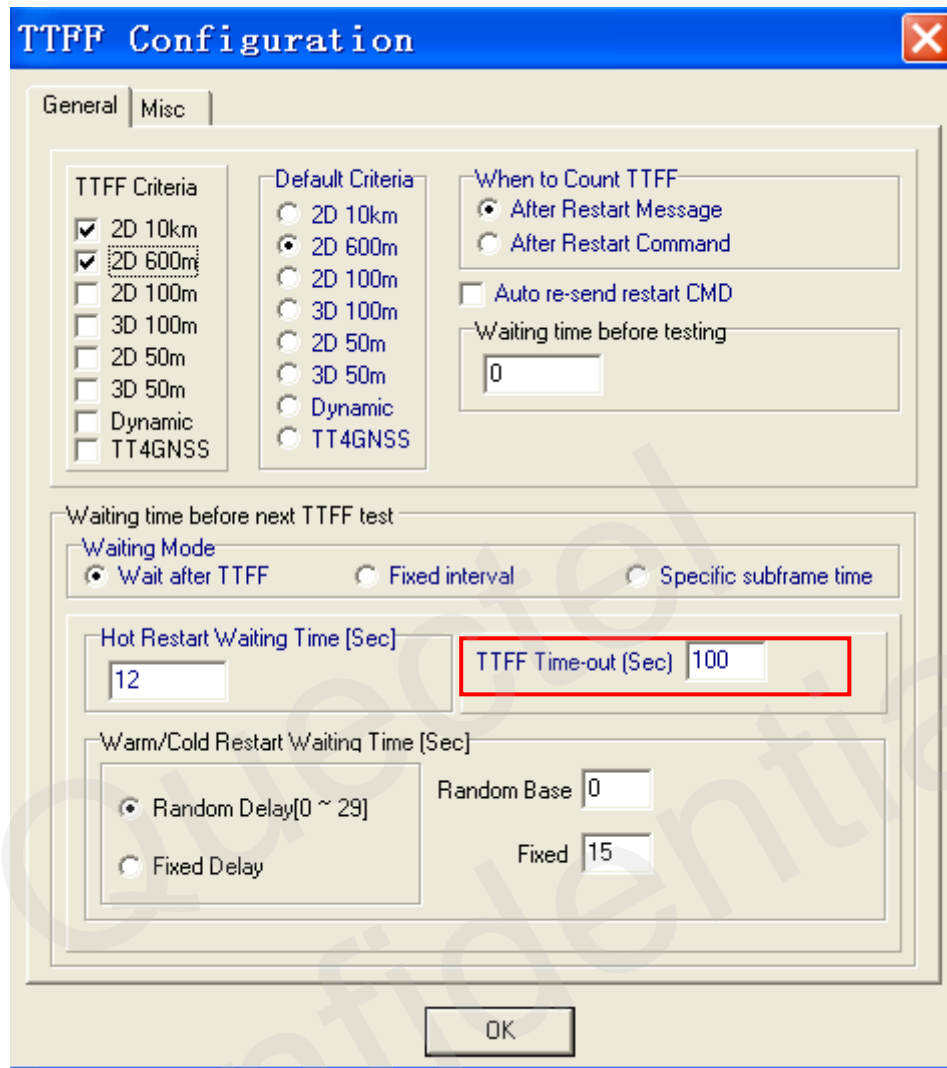


Figure 16: Static TTFF Testing Configuration

The above operation is completed. Click on the Run button to start the test and it can be stopped by clicking Stop button.

After finishing the testing, you can see the testing result charts. Of course, the result also will be stored in the tool installation path, and you can view the corresponding log.

7 Appendix A Reference

Table 6: Reference

SN	Document name	Remark
[1]	L70_Hardware_Design	L70 Hardware Design
[2]	L70_Protocol_Specification	L70 Protocol Specification
[3]	L70_Reference Design	L70 Reference Design

Table 7: Abbreviations

Abbreviation	Description
CNR	Carrier-to-Noise Ratio
GPS	Global Positioning System
LED	Light Emitting Diode
PPS	Pulse Per Second
PRN	Pseudorandom Noise
SPS	Standard Positioning Service
SV	Satellite Vehicle
UART	Universal Asynchronous Receiver & Transmitter
UTC	Universal Time Coordinated
WGS84	World Geodetic System 1984