

L70-R Series

EVB User Guide

GPS Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2014-05-07	Ada LI	Initial
2.0	2016-06-01	Connie ZHOU	1. Incorporated related information of L70-RL 2. Changed the document name from Quectel_L70-R_EVB_User_Guide to Quectel_L70-R_Series_EVB_User_Guide

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1 Introduction

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

L70-R series EVB includes L70-R and L70-RL versions. L70-RL, which comes with a built-in LNA, provides better performance than L70-R in weak signal areas.

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2 Introduction to L70-R Series EVB Kit

2.1. Top and Bottom View

L70-R series EVB includes L70-R and L70-RL versions. The following illustrates the top and bottom view of the EVB, by taking L70-R as the example.

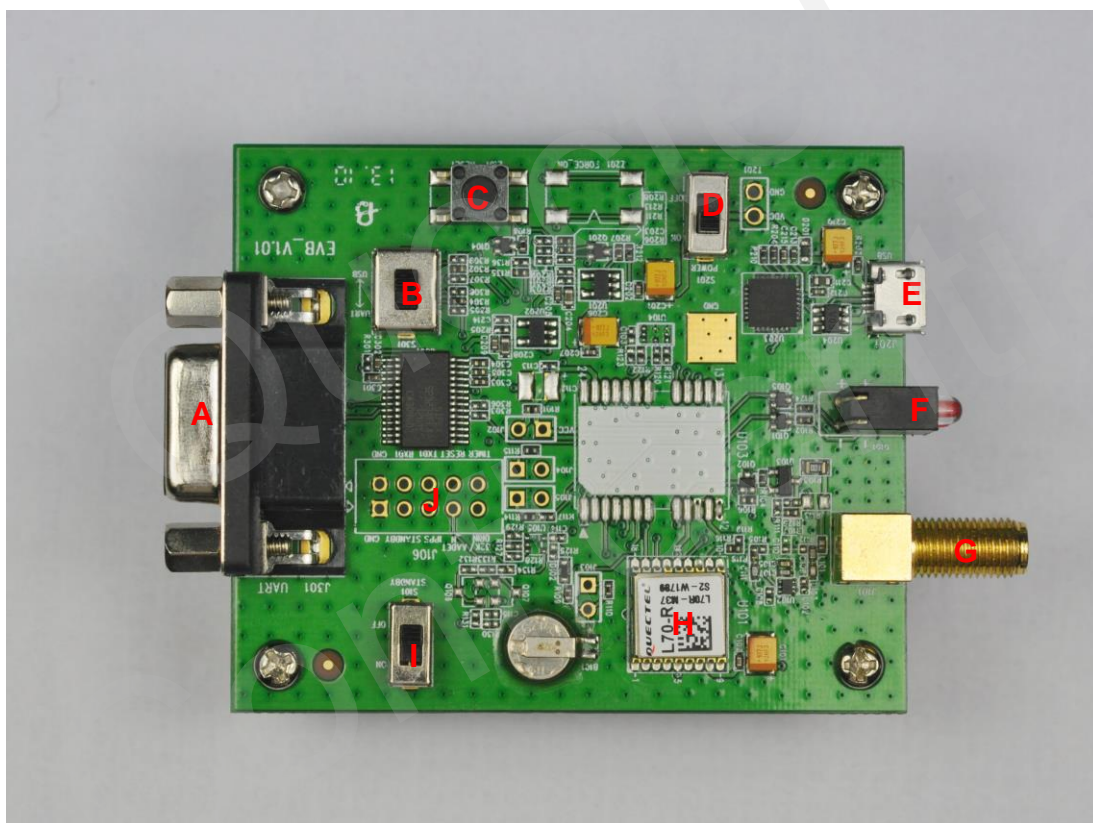


Figure 1: Top View of L70-R EVB

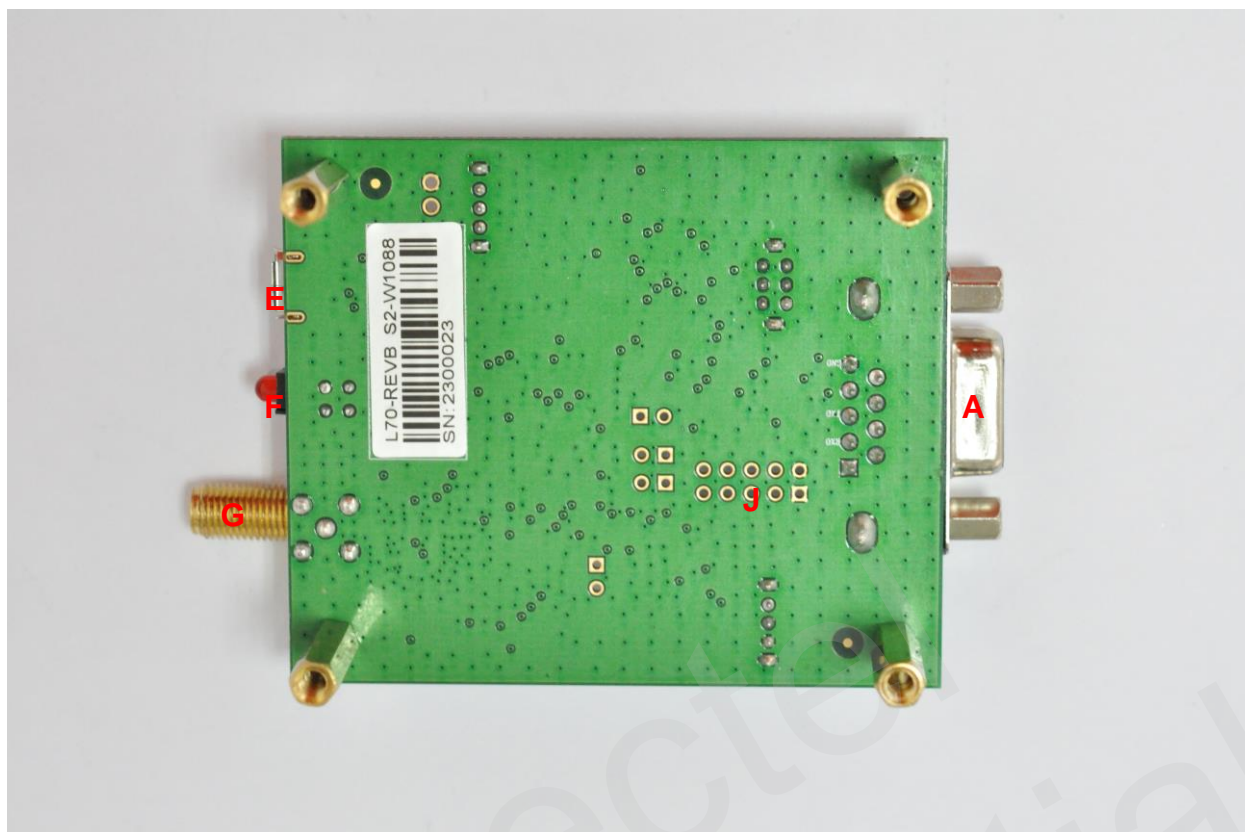


Figure 2: Bottom View of L70-R EVB

- 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-R module (it is L70-RL module in L70-RL EVB)
- 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

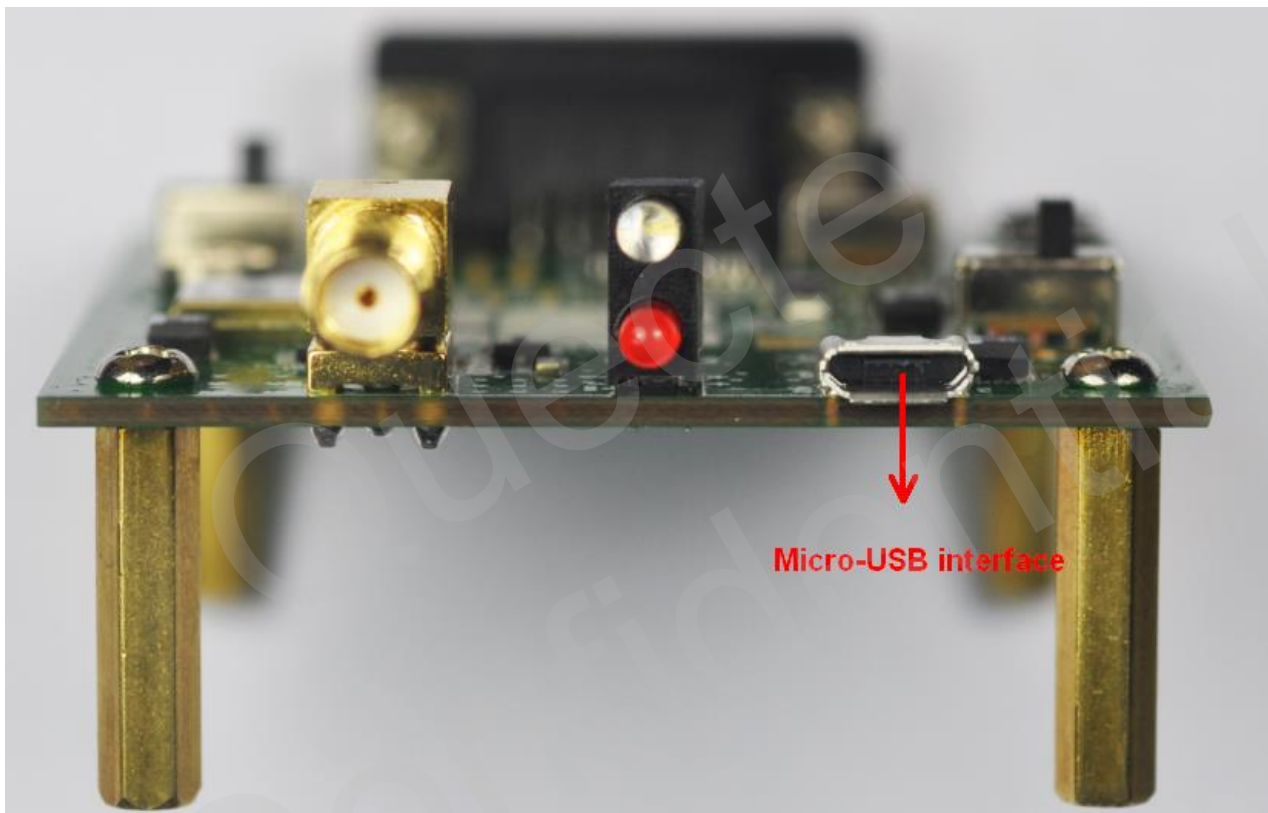


Figure 4: Micro-USB Interface

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 RS232 and Micro-USB cable are necessary, if you want to use UART to output NEMA. So the easiest way is to use Micro-USB cable which is able to provide the power and also 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

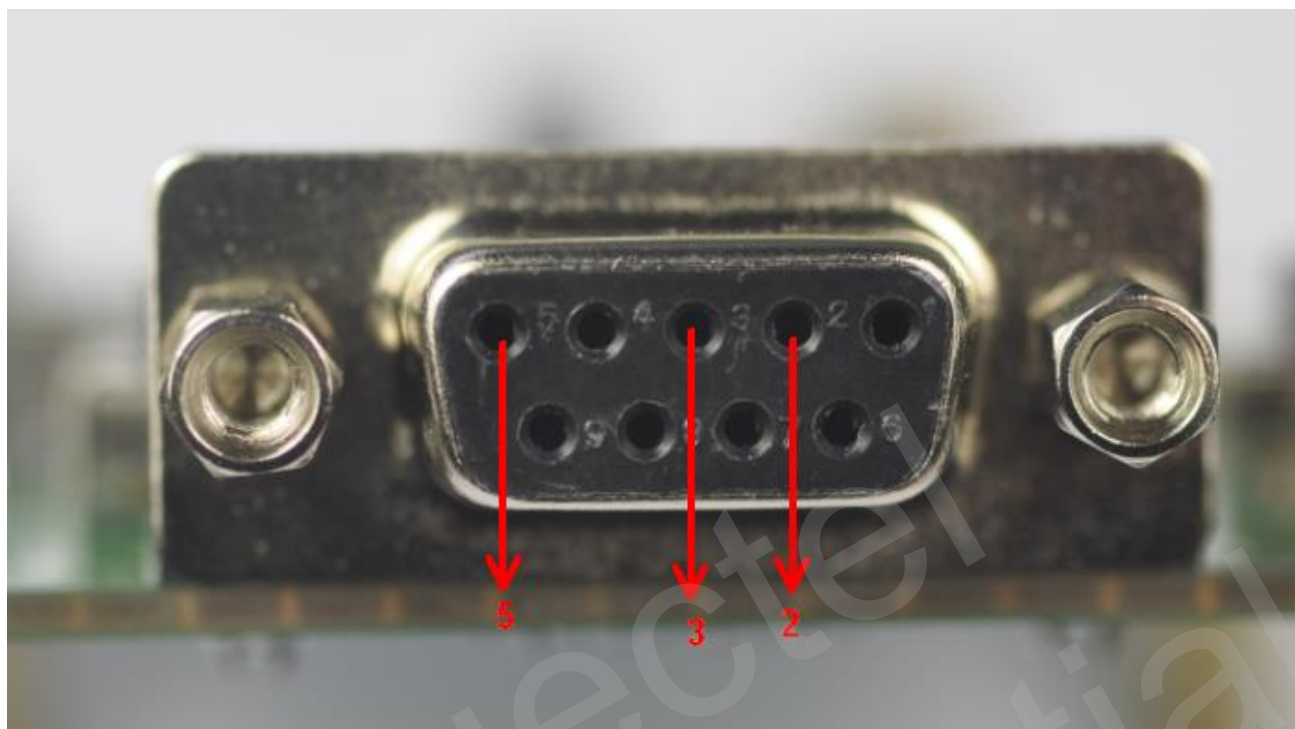


Figure 5: UART Interface

Table 1: Pins of UART Port

Pin No.	Signal	I/O	Description
2	RXD	I	Receive data
3	TXD	O	Transmit data
5	GND		GND

3.3. Antenna Interface

L70-R series EVB includes L70-R and L70-RL versions. The following illustrates the antenna interface and LNA layout of the EVB, by taking L76 as the example.

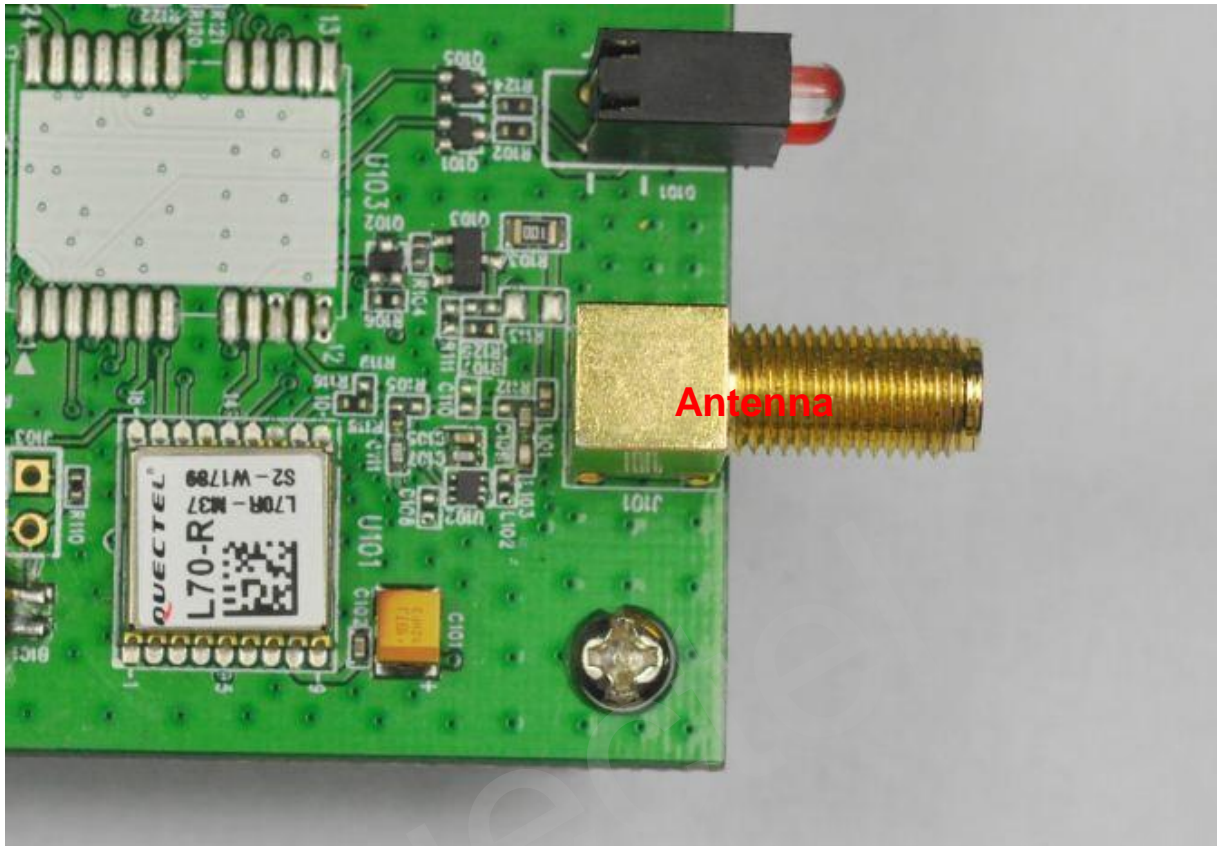


Figure 6: L76-R EVB Antenna Interface

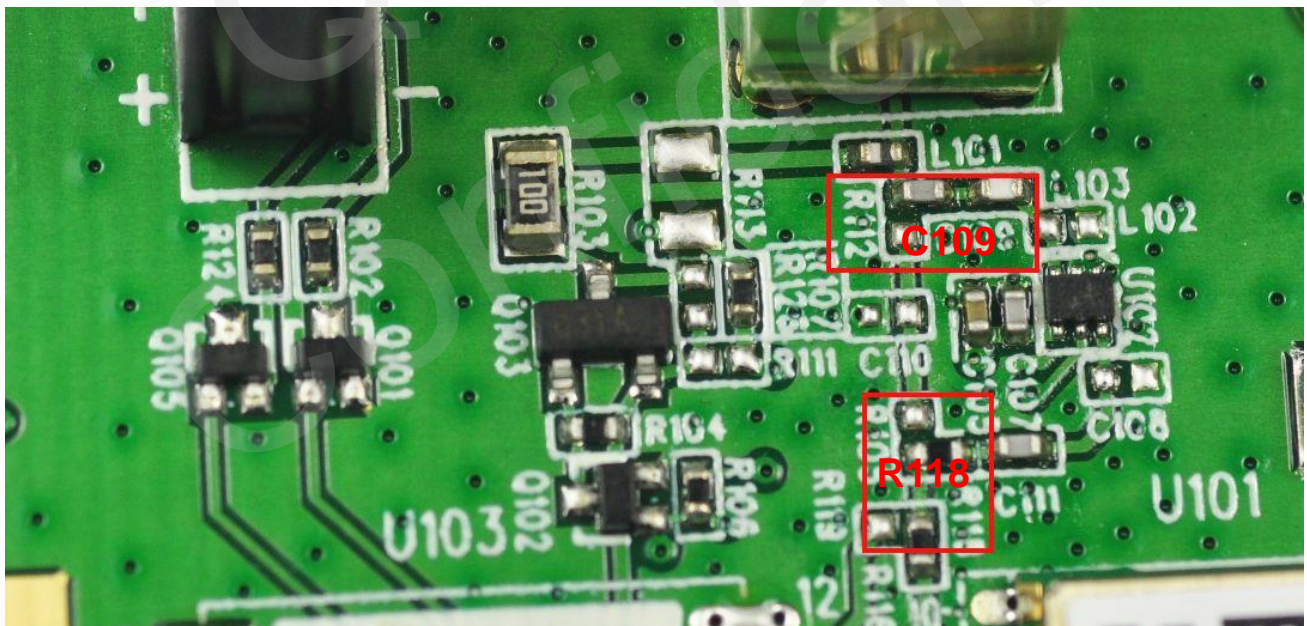


Figure 7: L76-R EVB LNA Layout

Both active antenna and passive antenna can be selected as the external antenna. Please note that 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.

NOTE

There is a built-in LNA in L70-RL module, so LNA is not designed into the L70-RL EVB.

3.4. Switches and Buttons

L70-R series EVB includes L70-R and L70-RL versions. The following illustrates the switches and buttons of the EVB, by taking L70-R as the example.

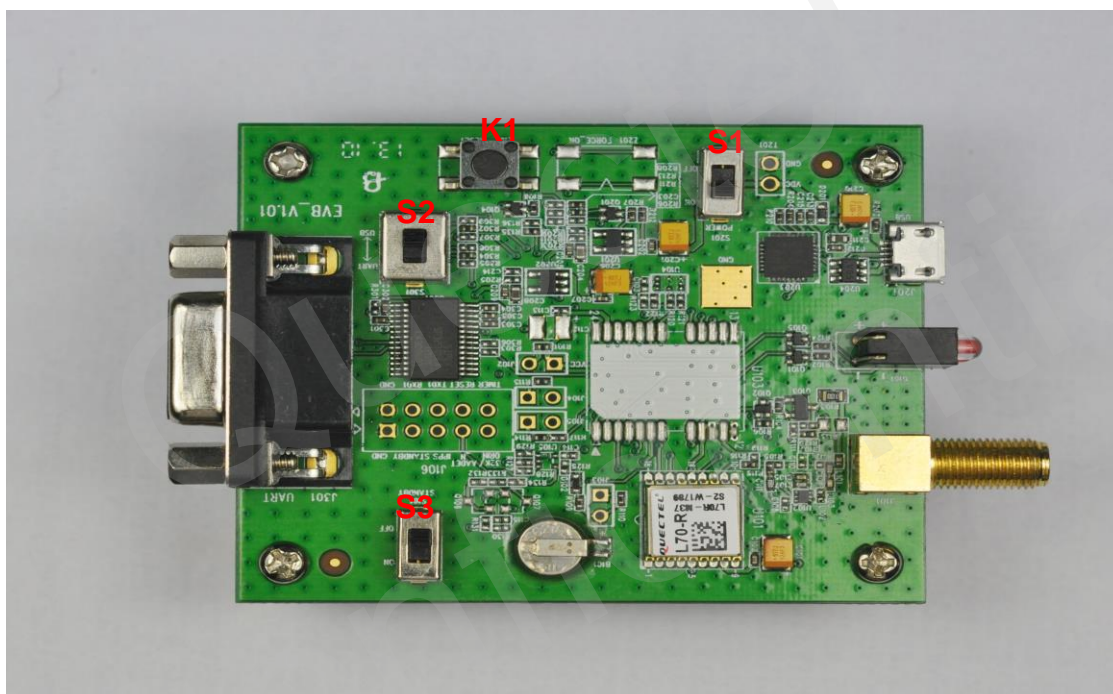


Figure 8: L70-R EVB Switches and Buttons

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: successful fix. The frequency is 1Hz. Extinct: no fix.

3.6. Test Points

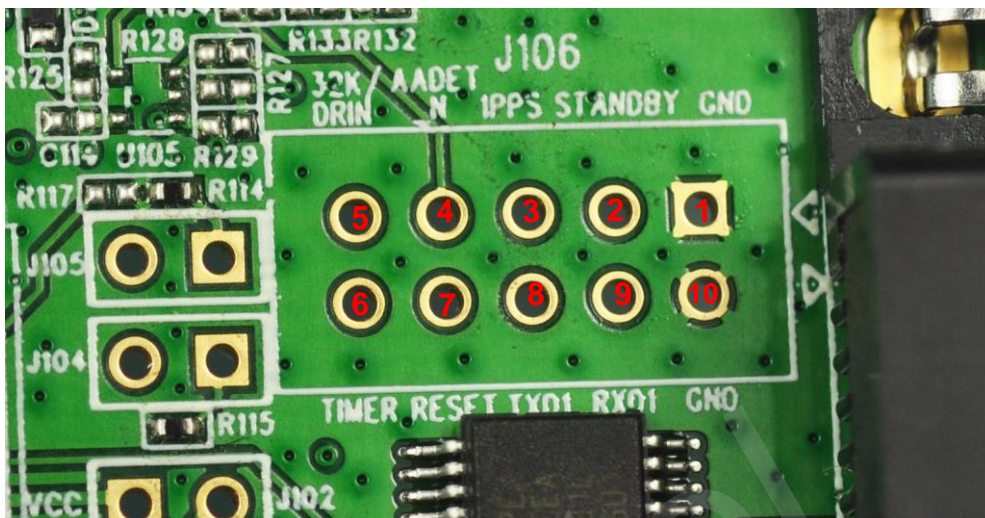


Figure 10: Test Points J106

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	Reserved
5	32K/DRIN		Reserved
6	TIMER(FORCE_ON)		Reserved
7	RESET	I	System reset
8	TXD1	O	Transmit data
9	RXD1	I	Receive data

4 EVB and Accessories

L70-R series EVB and its accessories are shown in Figure 11.



Figure 11: EVB and Accessories

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 downloaded from internet. The download path in our FTP server is as below:

Overseas customers:

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

Domestic customers:

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

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6 Starting PowerGPS

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

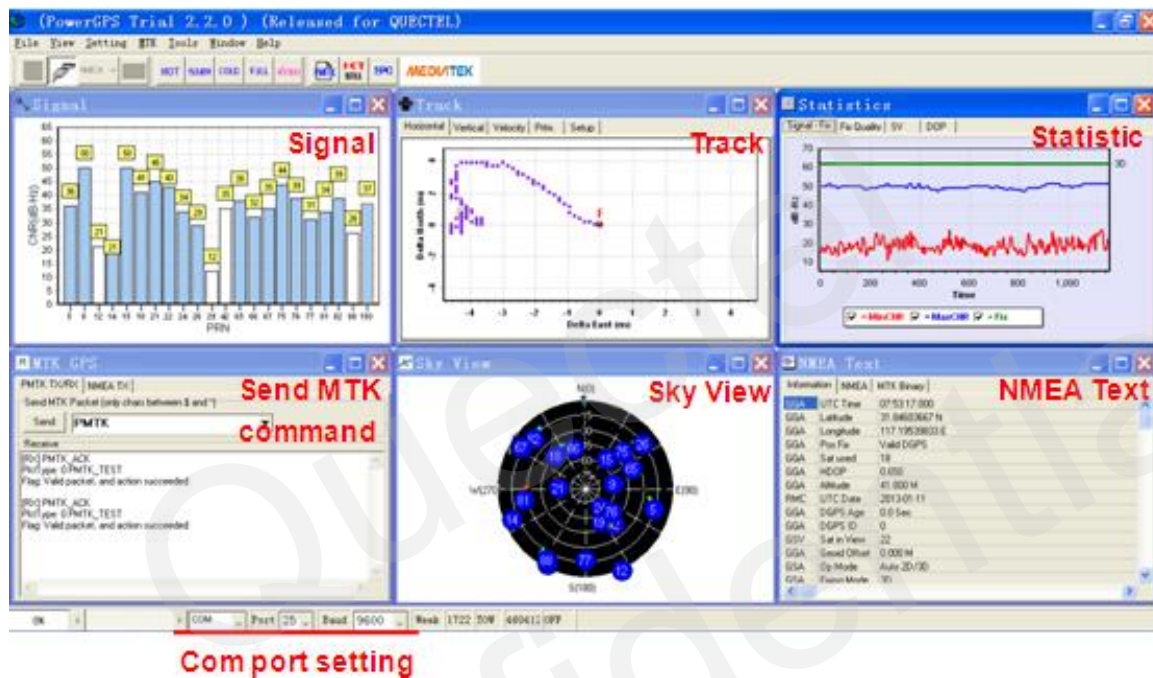
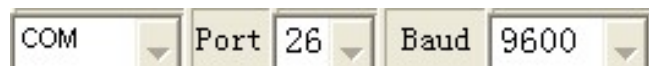




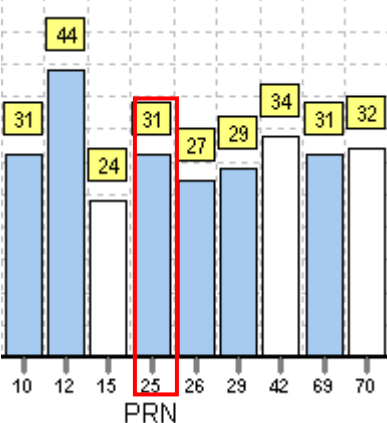
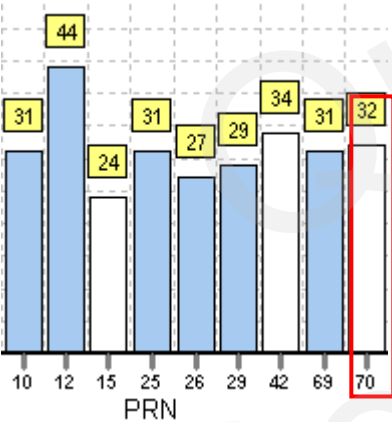
Figure 12: PowerGPS Tool

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



From the PowerGPS window, you 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 31dBHz. Light blue column means the navigation data of this satellite is in use.																
	The CNR of PRN 70 is 32dBHz. 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	<p>UTC time</p> <p>Latitude degree</p> <p>Longitude degree</p> <p>Positing fix</p> <p>The number of satellites being used</p> <p>Horizontal Dilution of Precision</p> <p>Altitude based on WGS84 Datum</p> <p>UTC date</p>
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	<p>Fixing mode: No-Fix, 3D or 2D SPS</p> <p>Satellite being used</p> <p>Position Dilution of Precision</p> <p>Vertical Dilution of Precision</p> <p>Speed of receiver</p>						
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 includes only characters between '\$' and '*', for example: PMTK869,0

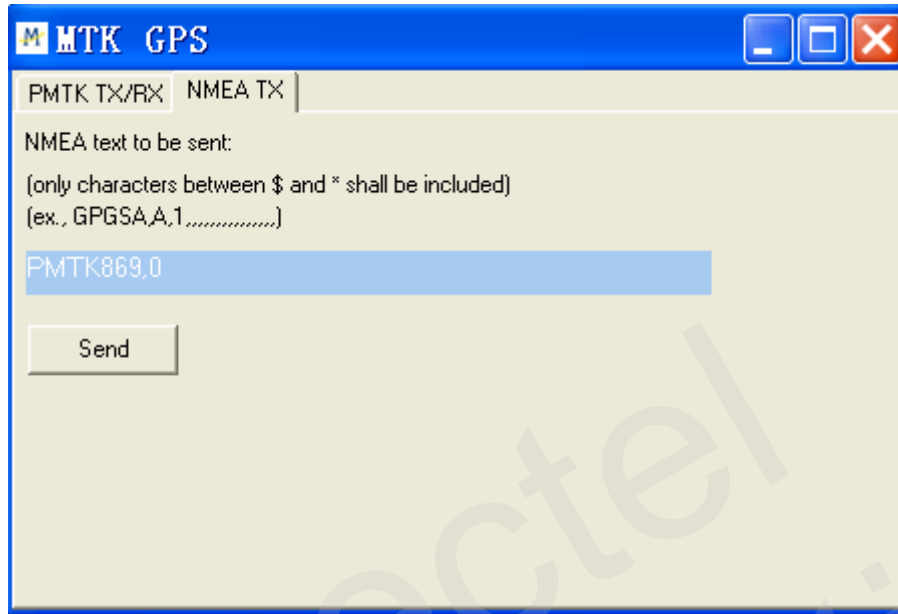


Figure 13: MTK Command

- **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 in 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 following are the detailed configuration steps during TTFF testing:

1. Start "MTK" menu, and then click "**Static TTFF Testing**" to enter Automatic 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

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", and choose "Reference location". After start positioning, click "Use Mean Position", and then click "OK", as shown in the screenshots below:

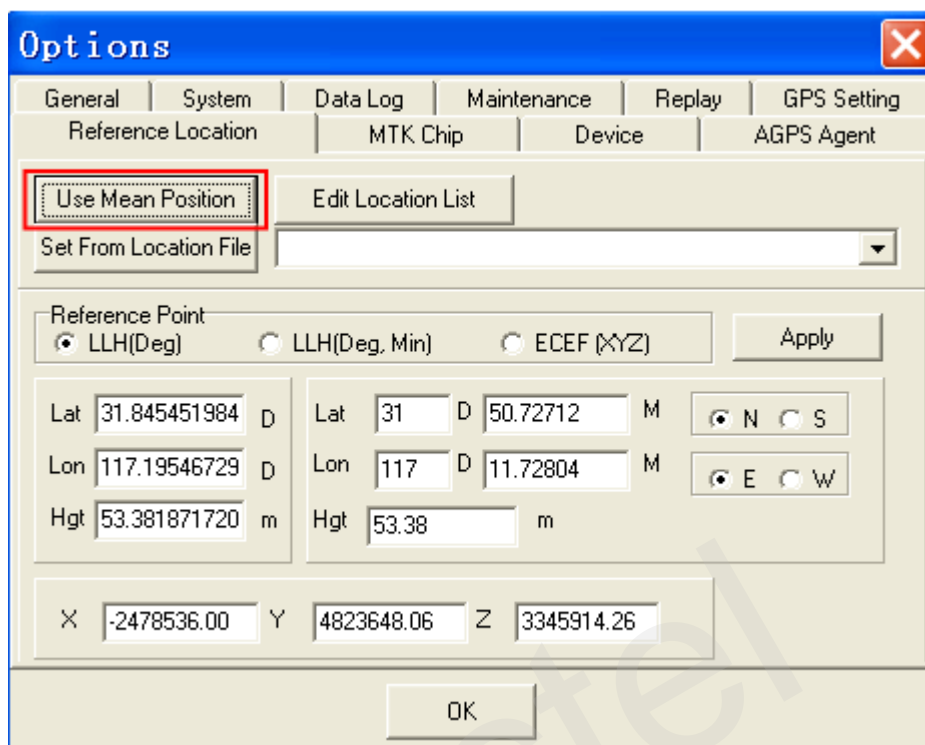


Figure 15: Static TTFF Testing Configuration Options

3. Click **"Config"**, set **"TTFF Time-out (sec)"**, and then click **"OK"**, as shown below:

In general, if you choose hot start, "TTFF Time-out (sec)" is recommended to be set as 10s. If you choose warm start, the "TTFF Time-out (sec)" can be set as 50s. If you choose cold start, the "TTFF Time-out (sec)" can be set as 100s. "TTFF Time-out (sec)" can help you to judge TTFF and save time.

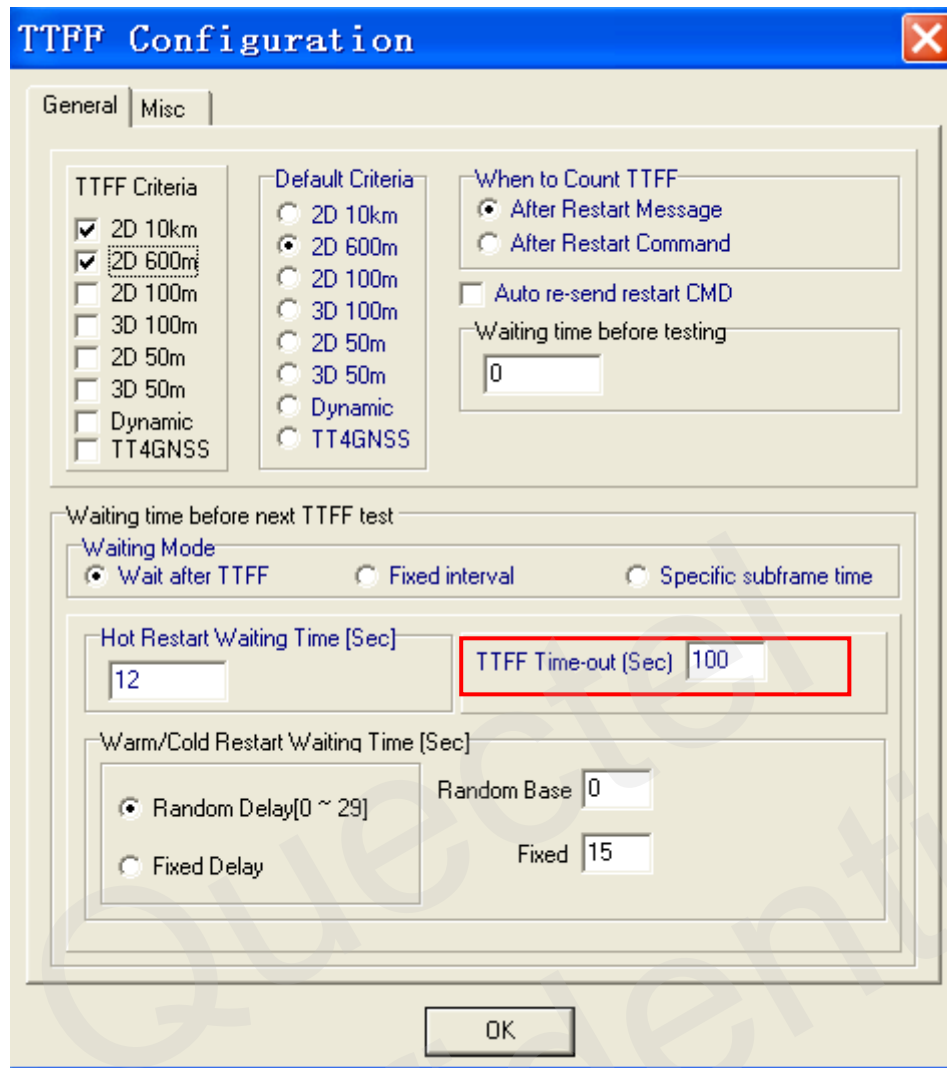


Figure 16: Static TTFF Testing Configuration

4. After the above operations have been completed, click on the **Run** button to start the test and it can be stopped by clicking **Stop** button.
5. 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 References

Table 6: References

SN	Document Name	Remark
[1]	Quectel_L70-R_Series_Hardware_Design	L70-R Series Hardware Design
[2]	Quectel_L70-R_Series_Protocol_Specification	L70-R Series Protocol Specification
[3]	Quectel_L70-R_Series_Reference_Design	L70-R Series 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