

L70-R EVB User Guide

GPS Module Series

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About the Document

History

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Contents

Abo	out the	Pocument2
Cor	ntents	
Tab	le Ind	ex4
Fig	ure Ind	dex5
1	Introd	duction6
2	Introd	duction to EVB Kit7
	2.1.	EVB Top and Bottom View7
	2.2.	EVB Accessories
3	Interf	ace Application10
	3.1.	USB Interface
	3.2.	UART Interface
	3.3.	Antenna Interface
	3.4.	Switches and Buttons
	3.5.	Operating Status LEDs
	3.6.	Test Points
4	EVB a	and Accessories
5	Insta	II Device Driver
6	Starti	ing PowerGPS
7	Арре	ndix A Reference



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

L70-R_EVB_User Guide



Figure Index

FIGURE 1: EVB TOP VIEW	
FIGURE 2: EVB BOTTOM VIEW	
FIGURE 3: EVB ACCESSORIES	
FIGURE 4: MICRO-USB INTERFACE 10	
FIGURE 5: UART INTERFACE11	
FIGURE 6: ANTENNA INTERFACE	
FIGURE 7: LNA LAYOUT	
FIGURE 8: SWITCHES AND BUTTONS	
FIGURE 9: OPERATING STATUS LEDS	
FIGURE 10: TEST POINTS J106	
FIGURE 11: EVB AND ACCESSORY EQUIPMENTS	
FIGURE 12: POWERGPS TOOL	
FIGURE 13: MTK COMMAND	
FIGURE 14: STATIC TTFF TESTING	
FIGURE 15: STATIC TTFF TESTING CONFIGURATION OPTIONS	
FIGURE 16: STATIC TTFF TESTING CONFIGURATION	



1 Introduction

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



GPS Module Series L70-R EVB User Guide

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-R 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 touse 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	J	Receive data
3	TXD	0	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	0	Flash: turn on successfully. Micro-USB or UART1 port can output messages. Extinct: fail to turn on the module.
L2	1PPS	0	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	1	Enter or exit standby mode
3	1PPS	0	1 pulse per second
4	AADET_N		Reserved
5	32K/DRIN		Reserved
6	TIMER(FORCE_ON)		Reserved
7	RESET	I	System reset
8	TXD1	0	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 downloaded 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.



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:

(PowerGPS Trial 2.2.0) (Released f is just jetting III Jude Ender Belp	or QUECTEL)	
	NEOUTEK	
Signal	🗙 🗣 Track 📃 🗖 🗙	Statistics 📰 🖬 🖬
Signa Signa	Provental Veneral Veneral Person Senar Track	Type:/T
INTK GPS	X Sthr Vice	
TRE DOPE: NAMES DOI: N	K d wcrouperson	Memorin SMEA HTX Broad NMEA Text UNE UTCTIVE 015117000 NMEA Text USA Landow TEMENTARY SMEA SMEA SMEA USA Landow TEMENTARY SMEA SMEA SMEA SMEA USA Landow TEMENTARY SMEA SMEA SMEA SMEA USA Landow TEMENTARY SMEA <

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 module supports 9600bps by default), 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

lcon	Explanation
65	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.
1	Light blue means this satellite is not in tracking.
44 31 31 24 24 27 29 34 31 32 24 44 10 12 15 25 26 29 42 69 70 PRN	The CNR of PRN 25 is 31dB/Hz. Light blue column means the navigation data of this satellite is in use.
44 31 31 24 27 29 34 31 32 24 27 29 44 31 32 44 10 12 15 25 26 29 42 69 70 PRN	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.
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
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



• PMTK Command

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

M MTK GPS	
PMTK TX/RX NMEA TX	
NMEA text to be sent:	
(only characters between \$ and * shall be included) (ex., GPGSA,A,1,)	
PMTK869,0	
Send	

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:



🔁 Aut c	matic	TTFF '	Testin	g					
Restart Typ	e • WA	RM O	COLD (FULL		🕂 Resta	rt		
Number of C 1	Tests 10	C 20	© 100	C 1000	C 10000	C Define	1	The of te	number sts
Run	Stop Re	sult Chart	Config 9	et Reference	Point War	m Restart TTF	F [4/10]		
Ref. Lat	Ref. Lon	Current	Lat Curren	t Lon 2D E	rror(m) 3D	Error(m) U	TC Time	Fix Mode	
31.845411	117.19549	31.8452	65 117.19	5385 19.3	37.	8 03	3:10:29	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	
vlean	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	
30%	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			
l ests	4	4	4	4	4	4			
			0.0	2.2	0.0				
Min	2.3	2.3	2.3	2.3	2.3	2.3			
Min Mean	2.3	2.3	2.3	2.3	2.3	2.3			
Min Mean Max	2.3 2.6 3.1	2.3 2.6 3.1	2.3 2.6 3.1	2.3 2.6 3.1	2.3 2.6 3.1	2.3 2.6 3.1			
Min Mean Max 50%	2.3 2.6 3.1 2.4	2.3 2.6 3.1 2.4	2.6 3.1 2.4	2.6 3.1 2.4	2.6 3.1 2.4	2.3 2.6 3.1 2.4			
Min Mean Max 50% 57%	2.3 2.6 3.1 2.4 2.9	2.3 2.6 3.1 2.4 2.9	2.3 2.6 3.1 2.4 2.9	2.3 2.6 3.1 2.4 2.9	2.3 2.6 3.1 2.4 2.9	2.3 2.6 3.1 2.4 2.9			2
Min Mean Max 50% 67% 90%	2.3 2.6 3.1 2.4 2.9 3.1	2.3 2.6 3.1 2.4 2.9 3.1	2.3 2.6 3.1 2.4 2.9 3.1	2.3 2.6 3.1 2.4 2.9 3.1	2.3 2.6 3.1 2.4 2.9 3.1	2.3 2.6 3.1 2.4 2.9 3.1			2
Min Mean 50% 67% 90% 95%	2.3 2.6 3.1 2.4 2.9 3.1 3.1	2.3 2.6 3.1 2.4 2.9 3.1 3.1	2.3 2.6 3.1 2.4 2.9 3.1 3.1	2.3 2.6 3.1 2.4 2.9 3.1 3.1	2.3 2.6 3.1 2.4 2.9 3.1 3.1	2.3 2.6 3.1 2.4 2.9 3.1 3.1			2

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:



General System Data Log Maintenance Replay GPS Setting Reference Location MTK Chip Device AGPS Agent Use Mean Position Edit Location List Set From Location File Edit Location List Reference Point LLH(Deg, Min) ECEF (XYZ) Apply Lat 31.845451984 D Lat 31 D 50.72712 M N S Lon 117 D 11.72804 M E W Hgt 53.381871720 Mgt 53.38 			
Use Mean Position Edit Location List Set From Location File Reference Point LLH(Deg) LLH(Deg, Min) ECEF (XYZ) Apply Lat 31.845451984 D Lat 31 D 50.72712 M N S Lon 117.19546729 D Lon 117 D 11.72804 M E C W Hgt 53.381871720 m Hgt 53.38 m			
Reference Point C LLH(Deg, Min) C ECEF (XYZ) Apply Lat 31.845451984 D Lat 31 D 50.72712 M N C S Lon 117.19546729 D Lon 117 D 11.72804 M E C W Hgt 53.381871720 m Hgt 53.38 m T <td< td=""></td<>			
Lat 31.845451984 D Lat 31 D 50.72712 M Image: N Image: N			
Lon 117.19546729 D Lon 117 D 11.72804 M FECW Hgt 53.381871720 m Hgt 53.38 m			
Hgt 53.381871720 m Hgt 53.38 m			
× -2478536.00 Y 4823648.06 Z 3345914.26			
ОК			

Figure 15: Static TTFF Testing Configuration Options

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

In general, if you choose hot start, set "TTFF Time-out (sec)" as10s. If you choose warm start, set the "TTFF Time-out (sec)" as 50s. If you choose cold start, set the "TTFF Time-out (sec)" as 100s. "TTFF Time-out (sec)" can help you to judge TTFF and save time.



TTFF Configuration 🛛 🔀	
General Misc	
TTFF Criteria Default Criteria ✓ 2D 10km C 2D 10km ✓ 2D 600m C 2D 00m ✓ 2D 600m C 2D 100m ✓ 2D 100m C 2D 100m ✓ 2D 100m C 3D 100m ✓ 3D 100m C 3D 100m ✓ 3D 50m C 3D 50m ✓ Dynamic C TT4GNSS	
Waiting time before next TTFF test Waiting Mode Wait after TTFF C Fixed interval C Specific subframe time Hot Restart Waiting Time [Sec] TTFE Time-out (Sec) 100	
Random Delay[0 ~ 29]	
C Fixed Delay Fixed 15	
ОК	

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]	Quectel_L70-R_Hardware_Design	L70-R Hardware Design
[2]	Quectel_L70-R_Protocol_Specification	L70-R Protocol Specification
[3]	Quectel_L70-R_Reference Design	L70-R 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