

## LG290P (03) RTK Application Note

### **GNSS Module Series**

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## **1** Introduction

Quectel LG290P (03) is a high-precision RTK positioning module that supports multiple GNSS constellations. RTK (Real-time Dynamic) is a real-time differential GNSS technology based on carrier phase measurements, which achieves high-precision positioning centimeter-level accuracy. For more details on RTK, see <u>document [1] RTK application note</u>.

This document explains module RTK function, including RTK application scenarios, RTK related messages, RTK operation guide and RTK FAQs.

### **1.1 RTK Application Scenarios**



The main application scenarios of RTK include lawn mowers, drones, lane-level navigation.

Figure 1: UAV





Figure 2: Automatic Mower

## **2** RTK Related Messages

When RTK is used, RTCM messages are sent to the module through the UART interface. The Quectel LG290P (03) module supports RTCM 10403.3 input messages as shown in the following table.

Message Type	Message Name					
1005	Stationary RTK Reference Station ARP					
1006	Stationary RTK Reference Station ARP with Height					
1073	GPS MSM3					
1074	GPS MSM4					
1075	GPS MSM5					
1076	GPS MSM6					
1077	GPS MSM7					
1083	GLONASS MSM3					
1084	GLONASS MSM4					
1085	GLONASS MSM5					
1086	GLONASS MSM6					
1087	GLONASS MSM7					
1093	Galileo MSM3					
1094	Galileo MSM4					
1095	Galileo MSM5					
1096	Galileo MSM6					
1097	Galileo MSM7					
1113	QZSS MSM3					

#### **Table 1: Supported RTCM Input Messages**

Message Type	Message Name
1114	QZSS MSM4
1115	QZSS MSM5
1116	QZSS MSM6
1117	QZSS MSM7
1123	BDS MSM3
1124	BDS MSM4
1125	BDS MSM5
1126	BDS MSM6
1127	BDS MSM7
1133	NavIC/IRNSS MSM3
1134	NavIC/IRNSS MSM4
1135	NavIC/IRNSS MSM5
1136	NavIC/IRNSS MSM6
1137	NavIC/IRNSS MSM7

## **3** RTK Operation Guide

This chapter introduces the steps to use QGNSS tool for RTK services via Quectel GNSS MODULE EVB. For more details about the EVB, please see <u>document [2] EVB user guide</u>.

#### Tips:

1. After a successful connection between the EVB and the PC, four consecutive serial port numbers will appear, choose the smallest of four consecutive port numbers as shown in figure below:

evice Manager
> 🖵 Network adapters
🗸 🛱 Ports (COM & LPT)
USB Serial Port (COM10)
USB Serial Port (COM11)
USB Serial Port (COM8)
USB Serial Port (COM9)
(COM1)
> 🚍 Print queues

#### Figure 3: Device Manager

2. It is imperative to utilize QGNSS V1.9 or higher versions.

#### The steps to use QGNSS tool for RTK service:

- Step 1: Open QGNSS tool, click for access "Device Information" window as shown in <u>Figure 4:</u> <u>Device Information</u>.
- **Step 2:** Choose the module.
- **Step 3:** Choose the port with the smallest port number among the 4 COM ports.
- Step 4: Choose baudrate. The default baudrate: 460800 bps.
- Step 5: Click "OK".



i 🖓 🚱	▶ 🗈   J   J   J   C 🔐 🕮 🜑 🌭 🕕 📾 🗠
1	
	Pevice Information
	Model 2 LG290P
	Port 3 COM8 USB Serial Port
	Baudrate 4 460800
	Advance 5 OK Cancel

**Figure 4: Device Information** 

Step 6: Click for enter "NTRIP Client" window.

<u>F</u> ile	Device	Vi	ew	Sett	ing	<u>T</u> ool	s	DR	AGNS	s w	indow	<u>H</u> el	р				
8	<u></u>		Ē	1	Jc	Įw.	●	ŀ	C	111	ß		9_	(j)	client	Caster) 🄰	
															6		



Step 7: Fill in the information of "Caster settings" and "NTRIP mount point" as shown in <u>Figure 6:</u> <u>NTRIP Server Configuration</u>. If you have a QuecRTK account, you can also click "QuecRTK" and fill in the relevant information, as shown in <u>Figure 7: QuecRTK Configuration</u>. Test accounts can be obtained from Quectel.

Step 8: Click "Connect To Host" to connect host as shown in *Figure 6: NTRIP Server Configuration*.



MTRIP Client								
Client QuecRTK	7	16:05:39 Send \$GNGGA,						
Caster settings		072810.300,3149.303575,N, 11706.919090.E.						
Address: 1	)9	1,37,0.5,93.7,M,-0.3,M,,*6E						
Port: 7.	70 I	16:05:39 Received (939)bytes from						
Username:		server:						
Password:		16:05:40 Send \$GNGGA,						
		072810.300,3149.303575,N, 11706.919090.E.						
NTRIP caster mount po	int configuration	1,37,0.5,93.7,M,-0.3,M,,*6E						
Update NTRIP source t	table Mount point details							
	able mount point details	16:05:41 Received (939)bytes from server :						
NTRIP mount point:		<ul> <li>♦</li> </ul>						
1	~	16:05:41 Received (939)bytes from						
		server:						
		16:05:41 Send \$GNGGA,						
		072810.300,3149.303575,N,						
		11706.919090,E, 1,37,0.5,93.7,M,-0.3,M,,*6E						
		1,37,0.5,93.7,M,-0.3,M,,"0E						
		16:05:42 Received (939)bytes from						
		server :						
		◆ 16:05:42 Send \$GNGGA.						
Request Interval (sec):	1	072810.300,3149.303575,N,						
Use manual position	,	11706.919090,E,						
Use manual position	5	1,37,0.5,93.7,M,-0.3,M,,*6E						
Connect To Host	Monitor	·						



ntrip Client	- • •
Client QuecRTK 7	ICY 200 OK
MCC Q State	ExpireDate: 2024-09-26 23:59:59
Company ID FILOO	Frequancy: 1 16:07:21 Send \$GNGGA.
Device ID A	072810.300,3149.303575,N,
License Key Fronce and All All All All All All All All All Al	11706.919090,E, 1,37,0.5,93.7,M,-0.3,M,,*6E
	16:07:22 Received (996)bytes from server :
	16:07:22 Send \$GNGGA,
	072810.300,3149.303575,N, 11706.919090,E,
	1,37,0.5,93.7,M,-0.3,M,,*6E
	16:07:23 Send \$GNGGA, 072810.300.3149.303575.N.
	11706.919090,E, 1,37,0.5,93.7,M,-0.3,M,,*6E
	16:07:23 Received (939)bytes from server :
	16:07:24 Received (939)bytes from server :
Request Interval (sec):	♦ 16:07:24 Send \$GNGGA,
Use manual position 8	072810.300,3149.303575,N, 11706,919090,E.
	1,37,0.5,93.7,M,-0.3,M,,*6E
Connect To Host Nonitor	

Figure 7: QuecRTK Configuration

**Step 9:** If configured correctly, you can see the message sent to the RTK server and the differential data received in the right box as shown in *Figure 8: Successful Connection to the Server*.



NTRIP Client	-	o x
Client QuecRTK Caster settings Address: Port: Username: Password: NTRIP caster mount point configuration Update NTRIP source table Mount point details NTRIP mount point:	16:13:51 Send \$GNGGA,081425.000,2516.125894,N, 11020.034012,E,5,38,0.48,140.544,M,0.000,M,1.0,1591*6D 16:13:51 Received (974)bytes from server : 16:13:52 Send \$GNGGA,081426.000,2516.125916,N, 11020.034020,E,5,38,0.48,140.678,M,0.000,M,1.0,1591*68 16:13:52 Received (974)bytes from server : 16:13:53 Send \$GNGGA,081427.000,2516.125937,N, 11020.034030,E,5,38,0.48,140.835,M,0.000,M,1.0,1591*6C 16:13:53 Received (974)bytes from server : 16:13:54 Send \$GNGGA,081428.000,2516.125953,N, 11020.034042,E,5,38,0.48,140.937,M,0.000,M,1.0,1591*67 16:13:54 Received (974)bytes from server : 16:13:55 Send \$GNGGA,081429.000,2516.125967,N, 11020.034055,E,5,38,0.48,141.113,M,0.000,M,1.0,1591*68	~
Request Interval (sec):     1       Use manual position       Connect To Host         ON     Monitor	16:13:55 Received (974)bytes from server : 16:13:56 Send \$GNGGA,081430.000,2516.125988,N, 11020.034067,E,5,38,0.48,141.250,M,0.000,M,1.0,1591*64	~

Figure 8: Successful Connection to the Server

**Step 10:** You can judge whether the module has entered RTK mode by outputting **GGA** messages as shown in *Figure 9: View <Quality> Parameter*.

Text data	
\$GNGGA,053620.000,3149.301496,N,11706.919423,E,4,35,0.47,92.314,M,0.000,M,1.0,3591*5F	
\$GNGGA,053621.000,3149.301495,N,11706.919427,E,4,35,0.47,92.330,M,0.000,M,1.0,3591*5F	
\$GNGGA,053622.000,3149.301492,N,11706.919422,E,4,35,0.47,92.371,M,0.000,M,1.0,3591*5B	
\$GNGGA,053623.000,3149.301490,N,11706.919421,E,4,35,0.47,92.360,M,0.000,M,1.0,3591*5B	
\$GNGGA,053624.000,3149.301491,N,11706.919421,E,4,35,0.47,92.364,M,0.000,M,1.0,3591*59	
\$GNGGA,053625.000,3149.301491,N,11706.919423,E,4,34,0.48,92.354,M,0.000,M,2.0,3591*54	
\$GNGGA,053626.000,3149.301493,N,11706.919421,E,4,35,0.47,92.349,M,0.000,M,2.0,3591*55	
\$GNGGA,053627.000,3149.301490,N,11706.919419,E,4,35,0.47,92.347,M,0.000,M,1.0,3591*51	
\$GNGGA,053628.000,3149.301490,N,11706.919420,E,4,34,0.48,92.347,M,0.000,M,1.0,3591*5A	
\$GNGGA,053629.000,3149.301489,N,11706.919420,E,4,34,0.48,92.357,M,0.000,M,1.0,3591*52	
\$GNGGA,053630.000,3149.301493,N,11706.919424,E,4,35,0.47,92.340,M,0.000,M,1.0,3591*5D	
\$GNGGA,053631.000,3149.301492,N,11706.919426,E,4,35,0.47,92.341,M,0.000,M,1.0,3591*5E	
\$GNGGA,053632.000,3149.301487,N,11706.919422,E,4,34,0.48,92.375,M,0.000,M,1.0,3591*54	
\$GNGGA,053633.000,3149.301486,N,11706.919418,E,4,32,0.48,92.338,M,0.000,M,1.0,3591*52	
\$GNGGA,053634.000,3149.301485,N,11706.919418,E,4,35,0.47,92.348,M,0.000,M,1.0,3591*59	
\$GNGGA,053635.000,3149.301485,N,11706.919418,E,4,35,0.47,92.348,M,0.000,M,1.0,3591*58	
\$GNGGA,053636.000,3149.301489,N,11706.919418,E,4,35,0.47,92.336,M,0.000,M,1.0,3591*5E	
\$GNGGA,053637.000,3149.301489,N,11706.919421,E,4,35,0.47,92.342,M,0.000,M,1.0,3591*56	
\$GNGGA,053638.000,3149.301492,N,11706.919420,E,4,35,0.47,92.341,M,0.000,M,1.0,3591*51	
\$GNGGA,053639.000,3149.301491,N,11706.919418,E,4,34,0.48,92.330,M,0.000,M,1.0,3591*50	
\$GNGGA,053640.000,3149.301495,N,11706.919427,E,4,35,0.47,92.349,M,0.000,M,1.0,3591*56	
\$GNGGA,053641.000,3149.301495,N,11706.919428,E,4,35,0.47,92.340,M,0.000,M,1.0,3591*51	
\$GNGGA,053642.000,3149.301492,N,11706.919424,E,4,35,0.47,92.361,M,0.000,M,1.0,3591*5A	
\$GNGGA,053643.000,3149.301491,N,11706.919421,E,4,35,0.47,92.342,M,0.000,M,1.0,3591*5C	
\$GNGGA,053644.000,3149.301490,N,11706.919421,E,4,35,0.47,92.337,M,0.000,M,1.0,3591*58	
\$GNGGA,053645.000,3149.301492,N,11706.919424,E,4,35,0.47,92.353,M,0.000,M,1.0,3591*5C	
\$GNGGA,053646.000,3149.301491,N,11706.919423,E,4,35,0.47,92.360,M,0.000,M,1.0,3591*5B	
\$GNGGA,053650.000,3149.301495,N,11706.919424,E,4,35,0.47,92.328,M,0.000,M,1.0,3591*53	
Filter GGA	





## **4** RTK FAQs

- 1. What is the default coordinate system for GNSS modules?
  - WGS84 coordinate system
- 2. Why does the <Quality> parameter in GGA show "5" (RTK float) instead of "4" (RTK fixed) after using RTK?
  - If the quality indicator displays '5', it indicates that the module has received RTK messages, but it
    is unable to achieve the high-precision positioning. It may be due to severe interference from the
    surrounding environment, such as magnetic field, trees, resulting in an insufficient number of
    received satellites signals. In such cases, it is necessary to move the module to an open area for
    testing.
- 3. Possible reasons for not being able to access RTK?
  - Account abnormality
  - Extremely harsh GNSS signal conditions
  - The RTK injection link is unstable or the injected data type does not match
  - The module did not receive RTK data

# **5** Appendix References

#### **Table 2: Related Document**

#### **Document Name**

- [1] Quectel\_GNSS\_RTK\_Application\_Note
- [2] Quectel\_GNSS\_Module\_EVB\_User\_Guide

#### **Table 3: Terms and Abbreviations**

Abbreviation	Description
ARP	Antenna Reference Point
GGA	Global Positioning System Fix Data
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
NTRIP	Networked Transport of RTCM via Internet Protocol
RTCM	Radio Technical Commission for Maritime services
RTK	Real Time Kinematic
UART	Universal Asynchronous Receiver/Transmitter
WGS84	World Geodetic System 1984