GNSS DGPS-RTCM Test Guide

GNSS Module Series

Rev. GNSS_DGPS-RTCM_Test_Guide_V1.0

Date: 2016-11-25

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About the Document

History

Revision	Date	Author	Description
1.0	2016-11-25	Alvin CHEN	Initial

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1 Introduction

This document mainly introduces how to use the RTCM function of Quectel GNSS module based on MTK's platform. RTCM versions of V2.0, V2.1, V2.2, V2.3 are supported now.

This document is applicable to Quectel L76-L module currently.

2 RTCM Test With Ntrip

2.1. Brief Introduction of Ntrip

Ntrip (Networked Transport of RTCM via Internet Protocol) is designed to disseminate differential correction data or other kinds of GNSS streaming data to stationary or mobile users over the Internet, allowing simultaneous PC, Laptop, PDA, or receiver connections to a broadcasting host.

Ntrip system consists of four elements which are described as below:

- **NtripSources:** generate data streams (correction data) at a specific location.
- **NtripServers:** transfer data streams from a source to the NtripCaster.
- **NtripCaster:** the major system component, works as a server. It receives data streams from NtripServers which are from all over the world, responds to request from NtripClients and sends data streams to NtripClients.
- **NtripClients:** finally access data streams of desired NtripSources on the NtripCaster.

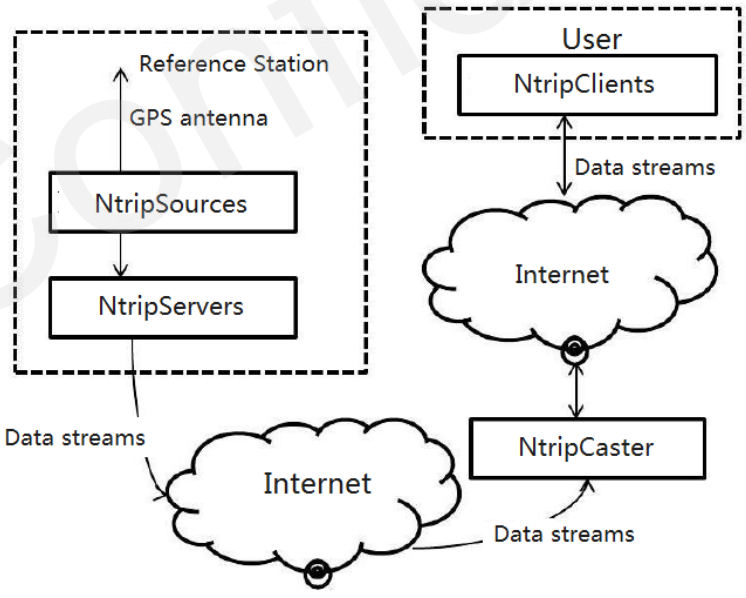

Figure 1: Ntrip System

2.2. RTCM Client Setup

Users should only use RTCM client to receive data streams (differential correction data) from Internet.

The RTCM client used by Quectel is “Bnc210-Windows-static.exe”, which can be downloaded from http://igs.bkg.bund.de/ntrip/download.

2.3. Ntrip Client Demo

The Ntrip client demo is shown as following figure.

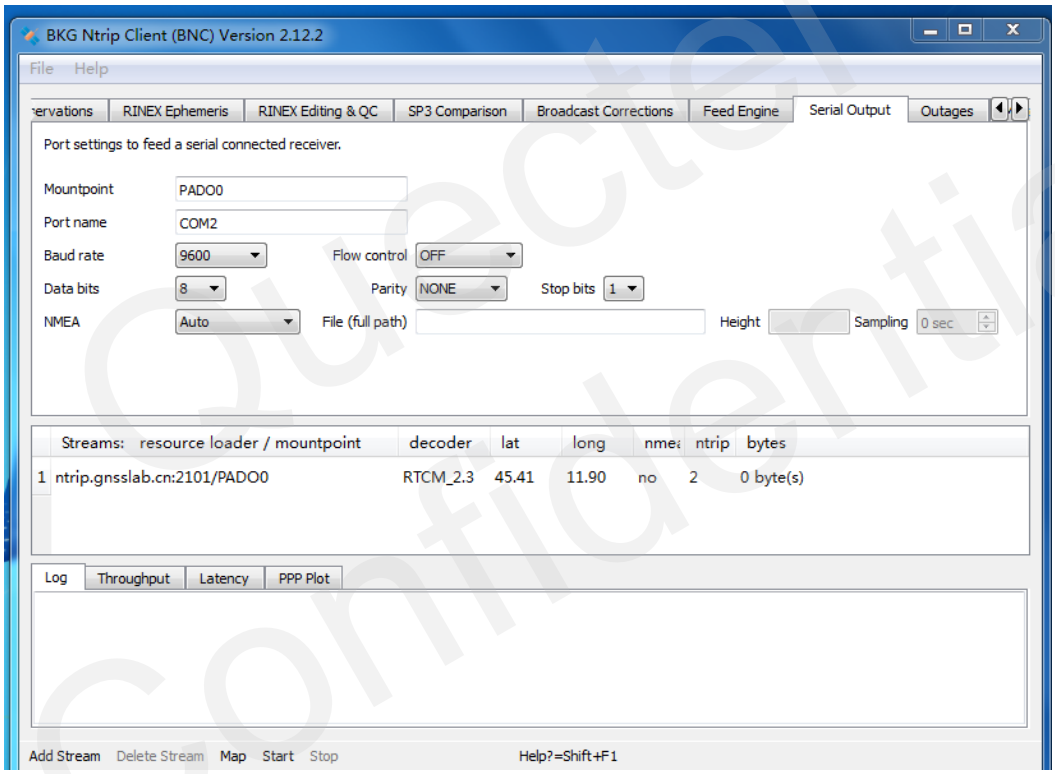

Figure 2: Ntrip Client Demo

2.4. Add Stream Window

1. Click **"Add Stream"** to open the "Add Stream" window, and then click **"Caster"** to open the "Add Stream from Caster" window.

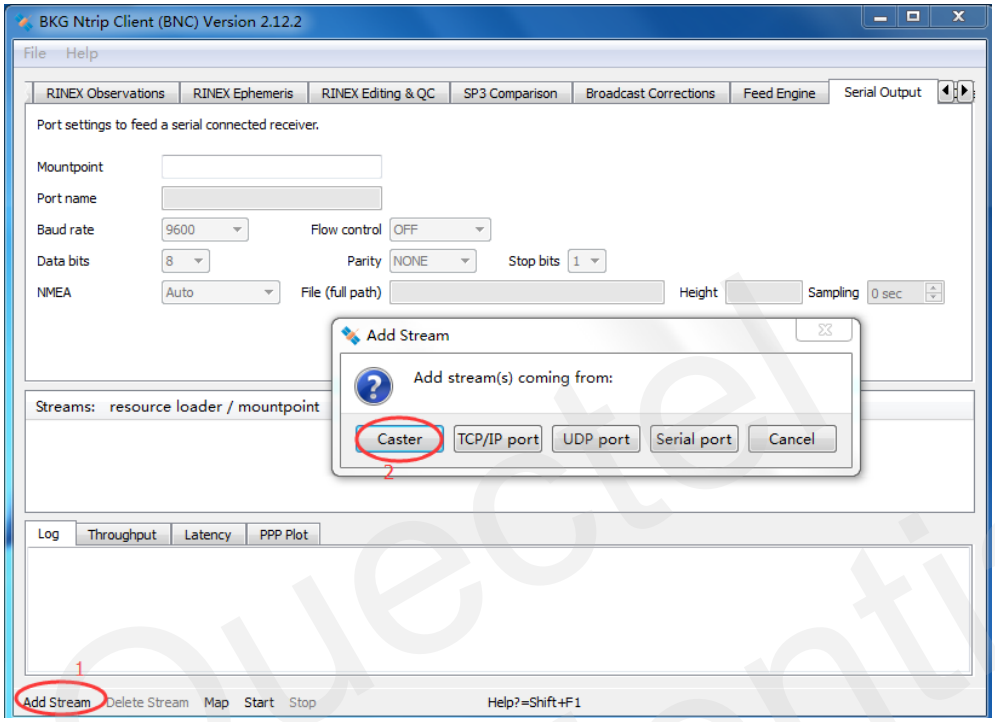

Figure 3: Add Stream Window

2. Click **"Get table"** to display streams.

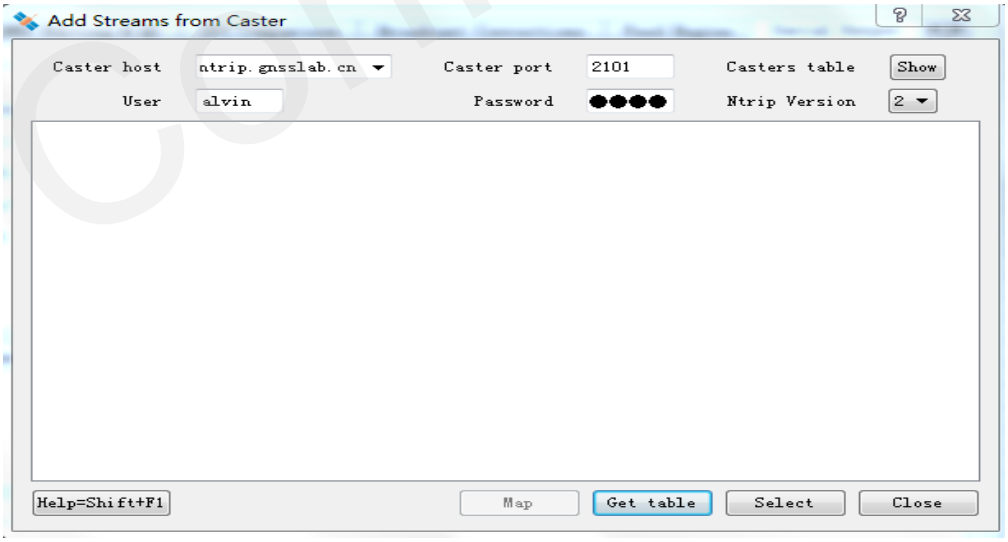

Figure 4: Add Stream from Caster Window

- **Caster host and Caster port:** IP address and port of NtripCaster, the selection of NtripCaster is arbitrary, but users must ensure that whether their network can visit IP address of NtripCaster. Please note that different NtripCasters have different data streams. These NtripCasters listen at ports “80” and “2101”. The detailed information of NtripCaster is in link: http://ntrip.org.

- **User and Password:** Users must apply for user ID and password from NtripCaster.

The stream is shown as following figure.

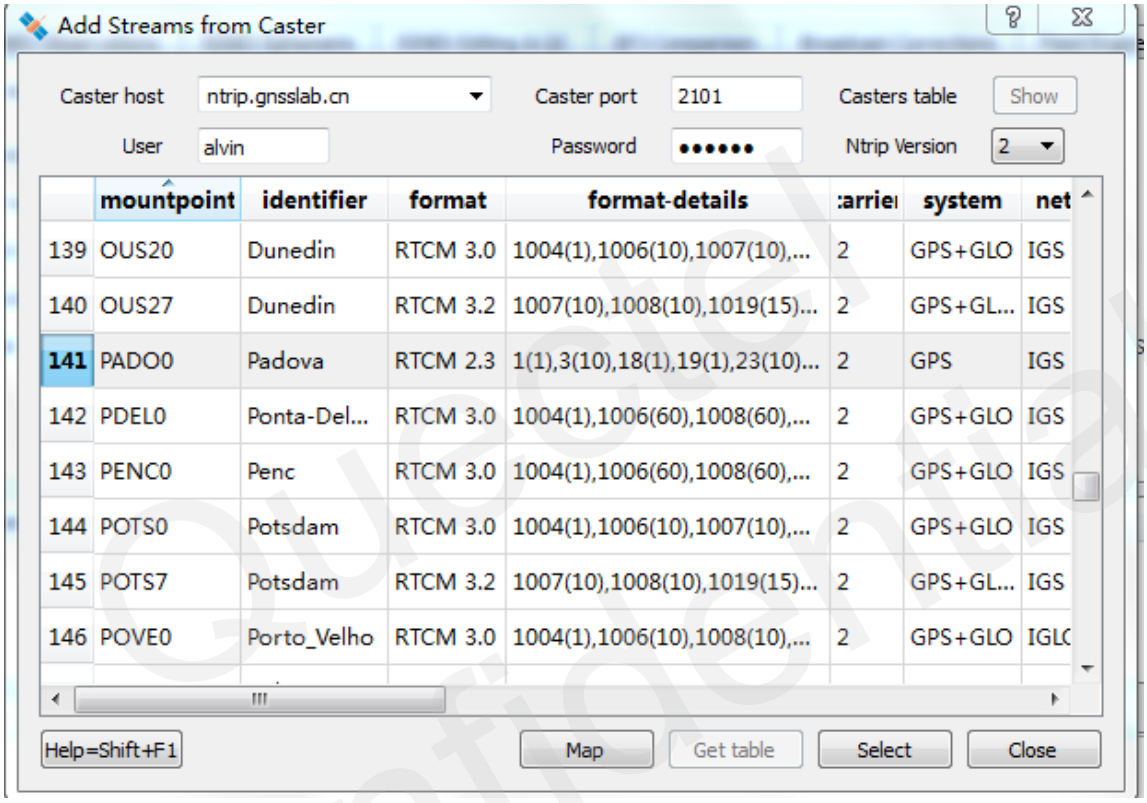

Figure 5: Stream Table

3. Select one **“mountpoint”** and then click **“Select”** to add stream.

2.5. Serial Output Window

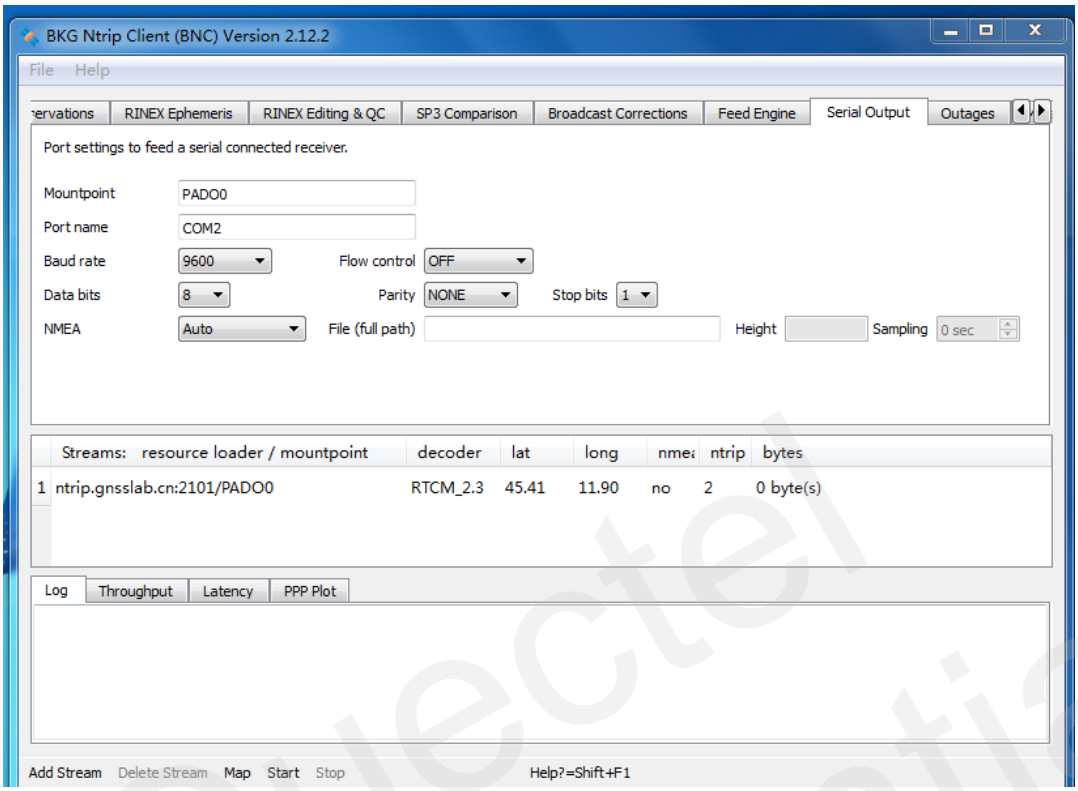

Figure 6: Serial Output Window

- **Mountpoint:** Optional. Enter a **"Mountpoint"** to forward its corresponding stream to serial connected GNSS receiver. When selecting one of the serial communication options listed below, make sure that users' selection can be configured to serial connected receiver.

- **Port Name:** Mandatory if **"Mountpoint"** is set. Enter the serial **"Port name"** selected on users' host for communication with the serial connected receiver. Valid port names are Windows COM1 and COM2.

- **Baud rate:** Choose the right baud rate according to users' test environment.

- **Flow Control:** Mandatory if **"Mountpoint"** is set. Select a **"Flow control"** for the serial output link. Please note that users' selection must equal to the flow control configured to the serial connected device. Select **"OFF"** if users are not clear about this.

- **Parity:** Mandatory if **"Mountpoint"** is set. Select the **"Parity"** for the serial output link. Please note that parity is often set as **"NONE"**.

- **Data Bits:** Mandatory if **"Mountpoint"** is set. Select the number of **"Data bits"** for the serial output link. Please note that **"8"** data bits are often used.

- **Stop Bits:** Mandatory if **"Mountpoint"** is set. Select the number of **"Stop bits"** for the serial output link. Note that **"1"** stop bit is often used.

- **NMEA:** Mandatory for VRS streams. Select **"Auto"** to automatically forward all NMEA-GGA messages coming from users' serial connected GNSS receiver to the Ntrip Broadcaster and/or save them in a file.

2.6. Quectel Test Environment

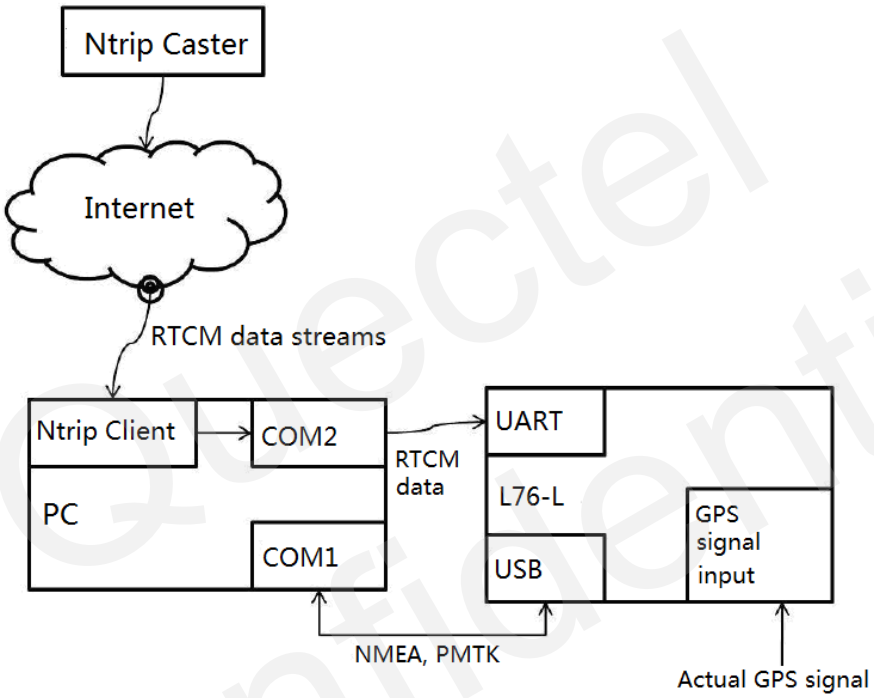

Figure 7: Quectel Test Environment

- **Test model:** L76-L

- **NtripCaster:** ntrip.gnsslab.cn (located in Wuhan, China)

- **Streams:** PADO0, RTCM format version 2.3 (NtripSources located in Padova, Italy)

NOTE

Because there is no NtripSources near Quectel, we had to select the NtripSources far away from Quectel.

2.7. RTCM Test Procedures

1. Ntrip COM Port Setting:
   Baud rate: 9600
   Port number: COM2
   Connect COM2 to UART of L76-L

2. Select the data streams: PADO0. And then click “START”.

3. Output L76-L GPS signal port with actual GPS signal.

4. PowerGPS connection.

5. Issue the following commands in PowerGPS
   --PMTK104
   --PMTK301,1
   --PMTK250,1,1,9600

6. Wait for position fixing.

2.8. Fix Position Without RTCM Input

The positioning information will be shown below without the RTCM data input.

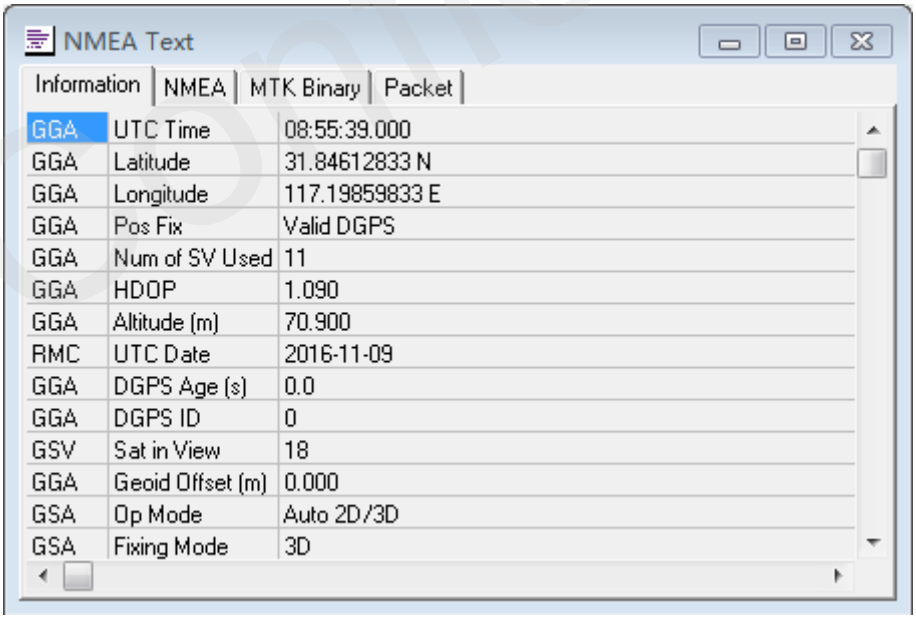

Figure 8: NMEA Text without RTCM Data Input

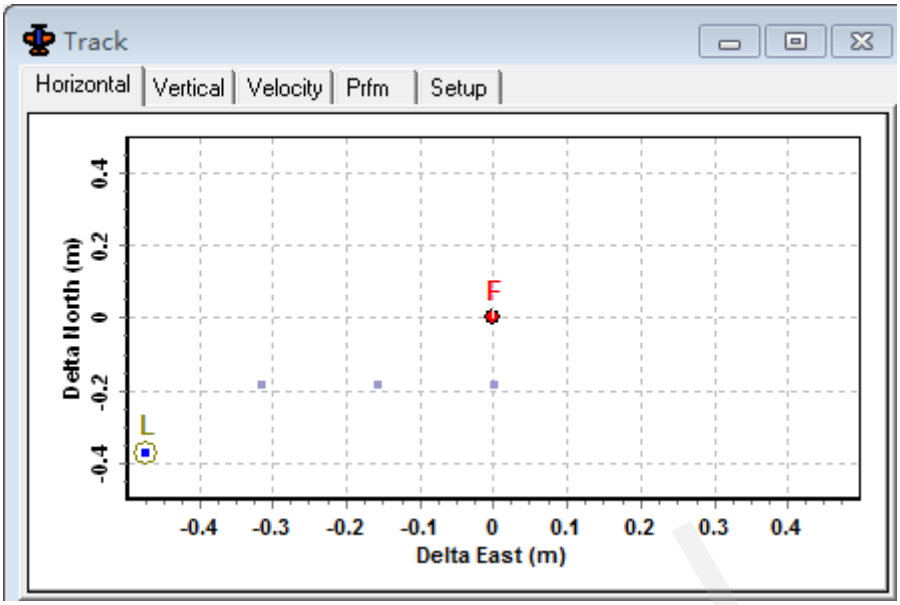

Figure 9: Position Fixing

As seen from the above two figures, using strong GPS signal can stabilize positioning.

2.9. Fix Position with RTCM Input

The positioning information will be shown below with the RTCM data input.

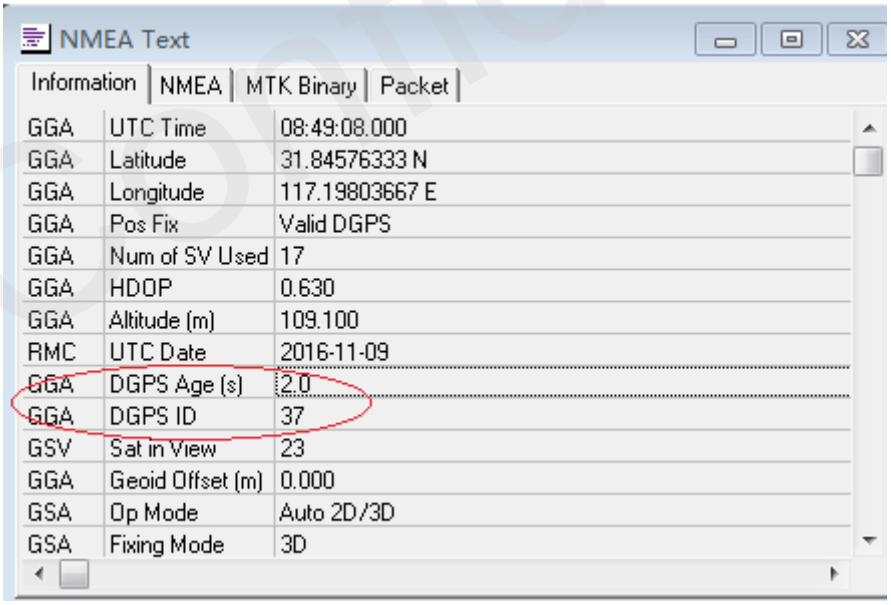

Figure 10: NMEA Text with RTCM Data Input

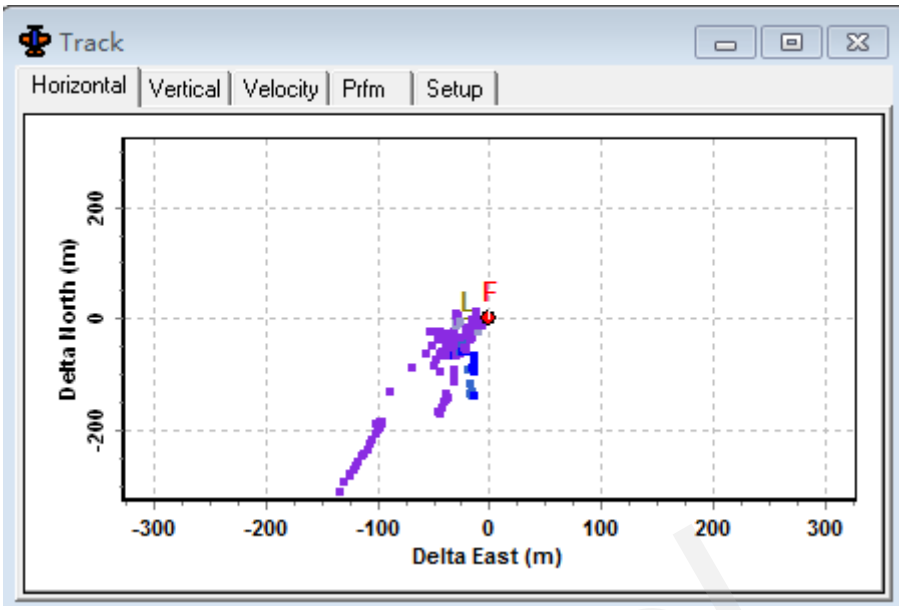

Figure 11: Position Fixing

As seen from the above figures, GPS mode is DGPS, DGPS ID (Reference Station Number) is 37, and DGPS Age is 2.0s.

But we found that with the RTCM data input, the positioning accuracy does not get better.

Reason: The reference station (located in Padova, Italy) is far away from user, so the RTCM data works as interference and cannot improve positioning accuracy.

Conclusion: NtripSources which are selected should be near users because interference in NtripSources is almost similar to interference in users.

3 Customer FAQs

3.1. RTCM Versions Supported by Quectel

Question:
Which versions does Quectel GNSS series module support? And does it support RTK-GPS?

Answer:
Quectel GNSS series module supports RTCM function and supports these RTCM message types: type 1, 2, 3, and 9, and these four message types are all defined in *RTCM SC-104 V2.x Specification* (V2.x represents V2.0, V2.1, V2.2, V2.3). Quectel GNSS series module does not support RTCM V3.x version and RTK.

3.2. UART Settings

Question:
We found that L76-L's RTCM input port is UART (PIN16, PIN17), while the NMEA output port is USB (PIN2, PIN3), can the RTCM input port be changed as USB?

Answer:
Sorry, it's not feasible. Only UART (PIN16, PIN17) can receive RTCM data. We must use Quectel GNSS series module whose COM port can support RTCM input for testing.

3.3. DGPS Information in NMEA

Question:
How does Quectel GNSS series module know that RTCM data has been received? Does NMEA sentence show something about getting RTCM data?

Answer:
GPGGA can show some RTCM information such as DGPS Age and DGPS ID.

3.4. Accuracy is Improved Less

Question:
Reference station is located in Incheon (40km far away from user) and RTCM data is received over the Internet. RTCM version 2.0 and 2.3 are tested, but the positioning accuracy is improved less.

Answer:
Correction method is defined in *RTCM SC-104 Specification*.

Correction Formula: PR(t)=PRM(t)+PRC(t).

GNSS receiver only gets PRC (Pseudorange Correction) from RTCM messages and applies it to PRM (Pseudorange Measurement), receiver cannot guarantee the validity of the data. So if accuracy is improved less, there may be two reasons:

1. Reference station is far away from user.
2. Reference station generates RTCM message incorrectly.

4 Appendix A References

Table 1: Related Documents

SN	Document Name	Remark
[1]	RTCM SC-104 v2.x Specification	Supports RTCM versions of 2.0, 2.1, 2.2 and 2.3
[2]	RTCM SC-104 Specification	Supports RTCM versions of 2.0, 2.1, 2.2, 2.3 and 3.x

Table 2: Terms and Abbreviations

Abbreviation	Description
DGPS	Differential Global Positioning System
FAQ	Frequently Asked Questions
GGA	Global Positioning System Fix Data
GNSS	Global Navigation Satellite System
GSV	GNSS Satellites in View
GPS	Global Positioning System
HOOP	Horizontal Dilution of Precision
ID	Identification
IP	Internet Protocol
NMEA	National Marine Electronics Association
NTRIP	Networked Transport of RTCM via Internet Protocol
PC	Personal Computer
PDA	Personal Digital Assistant
PMTK	Private Protocol of MTK

PR	Pseudorange
PRC	Pseudorange Correction
PRM	Pseudorange Measurement
RMC	Recommended Minimum Position Data
RTCM	Radio Technical Commission for Maritime services
RTK	Real-time Kinematic
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
UTC	Coordinated Universal Time
VRS	Virtual Reference Station