EC200N-CN&EC800M-CN GNSS Application Note

LTE Standard Module Series

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About the Document

Revision History

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-	2022-02-26	Yang LIU/ Evin ZHU/ Felix LIU	Creation of the document
1.0.0	2023-02-07	Yang LIU/ Evin ZHU/ Felix LIU	Preliminary

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1 Introduction

Quectel EC200N-CN and EC800M-CN modules integrate the multi-GNSS engine which supports GPS, BeiDou, Galileo and GLONASS systems. The high-performance GNSS engine is suitable for various application scenarios with low cost and accurate positioning requirements, and supports location tracking without any network assistance. This makes the following applicable modules widely used in fields such as turn-by-turn navigation, asset tracking, personnel tracking, location-aware games, as well as home and fleet management.

1.1. GNSS Turning On/Off Procedures

The GNSS of EC200N-CN and EC800M-CN modules support location calculation without any network assistance. GNSS turning on/off procedures are shown below:

Step 1: Configure GNSS parameters through **AT+QGPSCFG**.
Step 2: Turn on GNSS through **AT+QGPS=1**.
Step 3: Obatin the positioning information in any of the following three ways after turning on GNSS and fixing position successfully:
    (1) NMEA sentences are not output by default. You can select the output port of NMEA sentences through **AT+QGPSCFG="outport"**.
    (2) Obtain positioning information such as latitude, longitude, height, GNSS positioning mode, time, number of satellites directly through **AT+QGPSLOC**.
    (3) Set **AT+QGPSCFG="nmeasrc",1** to enable acquisition of specified NMEA sentences through **AT+QGPSGNMEA**, the specified NMEA sentences cannot be acquired through **AT+QGPSGNMEA** if **AT+QGPSCFG="nmeasrc",0** is set.
Step 4: Turn off GNSS through **AT+QGPS=0** or **AT+QGPSEND**.

1.2. Supported NMEA Sentence Types

The default NMEA sentences of the modules are compatible with NMEA 0183 protocol, and three kinds of prefixes are available to differentiate NMEA sentences of different satellite systems, as illustrated below.

GPS NMEA sentences have the prefix "GP":

- GPGGA – Global positioning system fix data, such as time, position
- GPRMC – Recommended minimum specific GNSS data
- GPGSV – GPS satellites in view, such as number of satellites in view, satellite ID numbers
- GPGSA – GNSS DOP and active satellites
- GPVTG – Course over ground and ground speed
- GPGLL – Longitude and latitude

BeiDou NMEA sentences have the prefixes "GB":

- GBGGA – Global positioning system fix data, such as time, position
- GBRMC – Recommended minimum specific GNSS data
- GBGSV – BeiDou satellites in view, such as number of satellites in view and satellite ID numbers
- GBGSA – BeiDou DOP and active satellites
- GBVTG – Course over ground and ground speed
- GBGLL – Longitude and latitude

Galileo NMEA sentences have the prefixes "GA":

- GAGGA – Global positioning system fix data, such as time, position
- GARMC – Recommended minimum specific GNSS data
- GAGSV – Galileo satellites in view, such as number of satellites in view and satellite ID numbers
- GAGSA – Galileo DOP and active satellites

GLONASS NMEA sentences have the prefixes "GL":

- GLGGA – Global positioning system fix data, such as time, position
- GLRMC – Recommended minimum specific GNSS data
- GLGSV – GLONASS satellites in view, such as number of satellites in view and satellite ID numbers
- GLGSA – GLONASS DOP and active satellites

GNSS Multi-constellations NMEA sentences have the prefix "GN":

- GNGGA – Global positioning system fix data, such as time, position
- GNRMC – Recommended minimum specific GNSS data
- GNGSA – GNSS DOP and active satellites
- GNVTG – Course over ground and ground speed
- GNGLL – Longitude and latitude

NOTE

EC200N-CN module does not support GLONASS and Galileo systems currently.

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2 Description of GNSS AT Commands

2.1. AT Command Introduction

2.1.1. Definitions

- **<CR>**   Carriage return character.
- **<LF>**   Line feed character.
- **<...>**   Parameter name. Angle brackets do not appear on the command line.
- **[...]**   Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on the command line. When an optional parameter is not given in a command, the new value equals its previous value or the default settings, unless otherwise specified.
- **Underline**   Default setting of a parameter.

2.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. In tables presenting commands and responses throughout this document, only the commands and responses are presented, and **<CR>** and **<LF>** are deliberately omitted.

Table 1: Types of AT Commands

Command Type	Syntax	Description
Test Command	**AT+<cmd>=?**	Test the existence of the corresponding command and return information about the type, value, or range of its parameter.
Read Command	**AT+<cmd>?**	Check the current parameter value of the corresponding command.
Write Command	**AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]**	Set user-definable parameter value.
Execution Command	**AT+<cmd>**	Return a specific information parameter or perform a specific action.

2.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you learn about the use of the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendations or suggestions about how to design a program flow or what status to set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there is a correlation among these examples, or that they should be executed in a given sequence.

2.3. AT Commands Description

2.3.1. AT+QGPSCFG   Configure GNSS

This command queries and configures various GNSS settings, including the output port and output types of NMEA sentences.

AT+QGPSCFG Configure GNSS	
Test Command **AT+QGPSCFG=?**	Response **+QGPSCFG: "outport",(**list of supported **<out_port>**s**)** **+QGPSCFG: "nmeasrc",(**list of supported **<NMEA_src>**s**)** **+QGPSCFG: "gpsnmeatype",(**range of supported **<GPS_NMEA_type>**s**)** **+QGPSCFG: "gnssconfig",(**list of supported **<GNSS_config>**s**)** **+QGPSCFG: "autogps",(**list of supported **<autoGPS>**s**)** **+QGPSCDF: "apflash",(**list of supported **<AP_flash_mode>**s**)** **OK**

2.3.1.1. AT+QGPSCFG="outport"   Configure Output Port of NMEA Sentences

This command configures the output port of NMEA sentences.

AT+QGPSCFG="outport" Configure Output Port of NMEA Sentences	
Write Command **AT+QGPSCFG="outport"[,<out_port>]**	Response If the optional parameter is omitted, query the current setting: **+QGPSCFG: "outport",<out_port>** **OK** If the optional parameter is specified, configure the output

	port of NMEA sentences:
	OK
	Or
	ERROR
	If there is any error related to ME functionality:
	+CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately.
	The configuration is saved to NVRAM automatically.

Parameter

<out_port>	String type. Configure the output port of NMEA sentences.
	"none" Close NMEA sentence output
	"usbnmea" Output through USB NMEA port
	"uartdebug" Output through Debug UART port
<errcode>	Error codes. See *Chapter 4* for details.

NOTE

NMEA sentences are output through USB NMEA port by default when USB NMEA port is turned on. If USB NMEA port is not turned on, NMEA sentences will not be output. If NMEA sentences need to be output through Debug UART port3.1, you need to configure it manually through **AT+QGPSCFG="outport", <out_port>**.

2.3.1.2. AT+QGPSCFG="nmeasrc"   Enable/Disable Acquisition of NMEA Sentences Through AT+QGPSGNMEA

This command enables or disables acquisition of NMEA sentences through **AT+QGPSGNMEA**.

AT+QGPSCFG="nmeasrc" Enable/Disable Acquisition of NMEA Sentences Through AT+QGPSGNMEA	
Write Command **AT+QGPSCFG="nmeasrc"[,<NMEA_src>]**	Response If the optional parameter is omitted, query the current setting: **+QGPSCFG: "nmeasrc",<NMEA_src>** **OK** If the optional parameter is specified, configure whether to

	enable acquisition of NMEA sentences through **AT+QGPSGNMEA**: **OK** Or **ERROR** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved automatically.

Parameter

<NMEA_src>	Integer type. Enable or disable the acquisition of NMEA sentences through **AT+QGPSGNMEA**. If enabled, after **AT+QGPSGNMEA** is executed, NMEA sentences are output through the AT port as a return value. 0 Disable 1 Enable
<errcode>	Error codes. See *Chapter 4* for details.

2.3.1.3. AT+QGPSCFG="gpsnmeatype"   Configure Output Type of NMEA Sentences

This command configures the output type of GPS, BeiDou, Galileo, GLONASS or GNSS multi-constellations NMEA sentences.

AT+QGPSCFG="gpsnmeatype"	Configure Output Type of NMEA Sentences
Write Command **AT+QGPSCFG="gpsnmeatype"[,<GPS_NMEA_type>]**	Response If the optional parameter is omitted, query the current setting: **+QGPSCFG: "gpsnmeatype",<GPS_NMEA_type>** **OK** If the optional parameter is specified, configure the output type of GPS, BeiDou, Galileo, GLONASS or GNSS multi-constellations NMEA sentences: **OK** Or **ERROR** If there is any error related to ME functionality:

	+CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<GPS_NMEA_type>	Integer type. Configure output type of NMEA sentences by XOR operation. Range: 0–63. Default value: 31.
	0 Disable
	1 GGA
	2 RMC
	4 GSV
	8 GSA
	16 VTG
	32 GLL
	63 All the five types of sentences
<errcode>	Error codes. See *Chapter 4* for details.

NOTE

This command can be executed to configure the output type of NMEA sentences even if GNSS is turned off. And the configuration takes effect after the module is rebooted.

2.3.1.4. AT+QGPSCFG="gnssconfig"   Configure Enabled GNSS Constellations

This command configures the enabled GNSS constellations of the module.

AT+QGPSCFG="gnssconfig" Configure Enabled GNSS Constellations	
Write Command **AT+QGPSCFG="gnssconfig"[,<GNSS_config>]**	Response If the optional parameter is omitted, query the current setting: **+QGPSCFG: "gnssconfig",<GNSS_config>** **OK** If the optional parameter is specified, configure the enabled GNSS constellations: **OK** Or **ERROR**

	If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved automatically.

Parameter

<GNSS_config>	Integer type. Configure enabled GNSS constellations. EC200N-CN module only supports the following configuration. If **<GNSS_config>** is set to other values, the command does not take effect. 0 GPS 5 GPS + BeiDou 7 BeiDou EC800M-CN series module: 0 GPS 1 GPS + BeiDou 3 GPS + GLONASS + Galileo 4 GPS + GLONASS 5 GPS + BeiDou + Galileo 6 GPS + Galileo 7 BeiDou
<errcode>	Error codes. See ***Chapter 4*** for details.

> **NOTE**
>
> When GNSS is not turned on and the relevant configuration has never been made, the configuration information read by this command is 0, which is of no significance.

2.3.1.5. AT+QGPSCFG="autogps"   Enable/Disable GNSS to Run Automatically

This command enables/disables the automatic running of GNSS after the module is powered on.

AT+QGPSCFG="autogps" Enable/Disable GNSS to Run Automatically	
Write Command **AT+QGPSCFG="autogps"[,<autoGPS>]**	Response If the optional parameter is omitted, query the current setting: **+QGPSCFG: "autogps",<autoGPS>** **OK**

	If the optional parameter is specified, enable or disable the automatic running of GNSS: **OK** Or **ERROR** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved automatically.

Parameter

<autoGPS>	Integer type. Enable/disable GNSS to run automatically. <u>0</u> Disable 1 Enable
<errcode>	Error codes. See *Chapter 4* for details.

2.3.1.6. AT+QGPSCFG="apflash"   Enable/Disable AP-Flash Quick Hot Start Solution

This command enables or disables the solution of AP-Flash quick hot start. After GNSS is turned on, the positioning time can be accelerated by importing ephemeris data into GNSS module.

AT+QGPSCFG="apflash" Enable/Disable AP-Flash Quick Hot Start Solution	
Write Command **AT+QGPSCFG="apflash"[,<AP_flash _mode>]**	Response If the optional parameter is omitted, query the current setting: **+QGPSCFG: "apflash",<AP_flash_mode>** **OK** If the optional parameter is specified, enable or disable the solution of AP-Flash quick hot start: **OK** Or **ERROR** If there is any error related to ME functionality: **+CME ERROR: <errcode>**

Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved automatically.

Parameter

<AP_flash_mode>	Integer type. Enable or disable the solution of AP-Flash quick hot start.
	0 Disable
	1 Enable
<errcode>	Error codes. See *Chapter 4* for details.

2.3.2. AT+QGPSDEL   Delete Assistance Data

The command deletes assistance data so as to perform cold start, hot start and warm start of GNSS. The command can only be executed when GNSS is turned on.

AT+QGPSDEL Delete Assistance Data	
Test Command **AT+QGPSDEL=?**	Response **+QGPSDEL: (**range of supported **<delete_type>**s**)** **OK**
Write Command **AT+QGPSDEL=<delete_type>**	Response **OK** Or **ERROR** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	/

Parameter

<delete_type>	Integer type. The type of GNSS assistance data to be deleted.
	0 Delete all assistance data. Enforce cold start after starting GNSS
	1 Do not delete any data. Perform hot start if the conditions are satisfied after starting GNSS
	2 Delete some related data. Perform warm start if the conditions are satisfied after starting GNSS
<errcode>	Error codes. See *Chapter 4* for details.

2.3.3. AT+QGPS   Turn on GNSS

This command turns on GNSS function.

AT+QGPS Turn on GNSS	
Test Command **AT+QGPS=?**	Response **+QGPS: (**list of supported **<GNSS_state>**s**)** **OK**
Read Comamnd **AT+QGPS?**	Response **+QGPS: <GNSS_state>** **OK**
Write Command **AT+QGPS=<GNSS_state>**	Response **OK** Or **ERROR** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is not saved.

Parameter

<GNSS_state>	Integer type. Turn on or off GNSS. 0 Turn off GNSS 1 Turn on GNSS
<errcode>	Error codes. See **Chapter 4** for details.

2.3.4. AT+QGPSEND   Turn off GNSS

This command takes off GNSS function.

AT+QGPSEND Turn off GNSS	
Test Command **AT+QGPSEND=?**	Response **OK** Or **ERROR**

Read Command **AT+QGPSEND?**	Response **OK** Or **ERROR**
Execution Command **AT+QGPSEND**	Response **OK** Or **ERROR** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	/

Parameter

<errcode>	Error codes. See *Chapter 4* for details.

2.3.5. AT+QGPSLOC   Acquire Positioning Information

This command acquires positioning information. Before executing this command, GNSS should be turned on through **AT+QGPS**. If GNSS fails in position fix, **+CME ERROR: <errcode>** is returned to indicate the corresponding situation.

AT+QGPSLOC Acquire Positioning Information	
Test Command **AT+QGPSLOC=?**	Response **+QGPSLOC: <UTC>,<latitude>,<longitude>,<HDOP>,<altitude>,(**range of supported **<fix>**s**),<COG>,<spkm>,<spkn>,<date>,<nsat** **OK**
Write Command **AT+QGPSLOC=<mode>**	Response **+QGPSLOC: <UTC>,<latitude>,<longitude>,<HDOP>,<altitude>,<fix>,<COG>,<spkm>,<spkn>,<date>,<nsat>** **OK** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms

Characteristics	/

Parameter

<mode>	Integer type. Latitude and longitude display format.
	0 **<latitude>,<longitude>** format: ddmm.mmmmN/S,dddmm.mmmmE/W
	1 **<latitude>,<longitude>** format: ddmm.mmmmmN/S,dddmm.mmmmmE/W
	2 **<latitude>,<longitude>** format: (-)dd.ddddd,(-)ddd.ddddd
<UTC>	String type. UTC time. Format: hhmmss.ss (Quoted from GNRMC sentence).
<latitude>	String type. Latitude.

If **<mode>** is 0:

Format: ddmm.mmmmN/S (Quoted from GNRMC sentence).

dd	Degree. Range: 00–89
mm.mmmm	Minute. Range: 00.0000–59.9999
N/S	North latitude/South latitude

If **<mode>** is 1:

Format: ddmm.mmmmmN/S.

dd	Degree. Range: 00–89
mm.mmmmm	Minute. Range: 00.000000–59.999999
N/S	North latitude/South latitude

If **<mode>** is 2:

Format: (-)dd.ddddd.

dd.ddddd	Degree. Range: -89.99999 to 89.99999
-	South latitude

<longitude>	String type. Longitude.

If **<mode>** is 0:

Format: dddmm.mmmmE/W (Quoted from GNRMC sentence).

ddd	Degree. Range: 000–179
mm.mmmm	Minute. Range: 00.0000–59.9999
E/W	East longitude/West longitude

If **<mode>** is 1:

Format: dddmm.mmmmmE/W (Quoted from GNRMC sentence).

ddd	Degree. Range: 000–179
mm.mmmmm	Minute. Range: 00.000000–59.999999
E/W	East longitude/West longitude

If **<mode>** is 2:

Format: (-)ddd.ddddd (Quoted from GNRMC sentence).

ddd.ddddd	Degree. Range: -179.99999 to 179.99999
-	West longitude

<HDOP>	Horizontal dilution of precision.
<altitude>	The altitude of the antenna away from the sea level. Unit: meter (Quoted from GNGGA sentence).
<fix>	Integer type. GNSS positioning mode (Quoted from GPGSA sentence). 1 No positioning 2 2D positioning 3 3D positioning
<COG>	String type. Course Over Ground based on true north. The output is null if the speed measurement fails or the speed in static scene is extremely low (Quoted from GNRMC sentence).
<spkm>	Speed over ground. Accurate to one decimal place. Unit: km/h (Quoted from GNRMC sentence).
<spkn>	Speed over ground. Accurate to one decimal place. Unit: knots (Quoted from GNRMC sentence).
<date>	UTC date. Format: ddmmyy (Quoted from GNRMC sentence). dd Day mm Month yy Year
<nsat>	Number of satellites in view. The value should be kept two digits, and add 0 If the leading digit is insufficient (Quoted from GNGGA sentence).
<errcode>	Error codes. See *Chapter 4* for details.

2.3.6. AT+QGPSGNMEA   Acquire Specified NMEA Sentences

This command acquires specified NMEA sentences. Before using this command, turn on GNSS through **AT+QGPS**, and set **<NMEA_src>** to 1 to enable acquisition of NMEA sentences through **AT+QGPSGNMEA**.

The sentence output can be disabled through **AT+QGPSCFG="gpsnmeatype",0**. If sentence output is disabled, the updated sentence is no longer output, and the NMEA sentence acquired before the sentence output is disabled after the GNSS is activated is saved. If the saved NMEA sentence contains the sentence type specified by **AT+QGPSGNMEA**, the specified NMEA sentence can still be acquired through **AT+QGPSGNMEA**.

AT+QGPSGNMEA Acquire Specified NMEA Sentences	
Test Command **AT+QGPSGNMEA=?**	Response **+QGPSGNMEA: (**list of supported **<NMEA_type>**s**)** **OK**
Write Command Query GGA sentence **AT+QGPSGNMEA="GGA"**	Response **[+QGPSGNMEA: <GGA_sentence>]** **[…]**

	OK If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Write Command Query RMC sentence **AT+QGPSGNMEA="RMC"**	Response **[+QGPSGNMEA: <RMC_sentence>]** **[…]** **OK** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Write Command Query GSV sentence **AT+QGPSGNMEA="GSV"**	Response **[+QGPSGNMEA: <GSV_sentence>]** **[…]** **OK** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Write Command Query GSA sentence **AT+QGPSGNMEA="GSA"**	Response **[+QGPSGNMEA: <GSA_sentence>]** **[…]** **OK** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Write Command Query VTG sentence **AT+QGPSGNMEA="VTG"**	Response **[+QGPSGNMEA: <VTG_sentence>]** **[…]** **OK** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Write Command Query GLL sentence **AT+QGPSGNMEA="GLL"**	Response **[+QGPSGNMEA: <GLL_sentence>]** **[…]** **OK**

	If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	/

Parameter

<NMEA_type>	String type. NMEA sentence type.
	"GGA" GGA sentence
	"RMC" RMC sentence
	"GSV" GSV sentence
	"GSA" GSA sentence
	"VTG" VTG sentence
	"GLL" GLL sentence
<GGA_sentence>	String type. GGA sentences.
<RMC_sentence>	String type. RMC sentences.
<GSV_sentence>	String type. GSV sentences.
<GSA_sentence>	String type. GSA sentences.
<VTG_sentence>	String type. VTG sentences.
<GLL_sentence>	String type. GLL sentences.
<errcode>	Error codes. See *Chapter 4* for details.

2.3.7. AT+QAGPS   Enable/Disable AGPS

This command enables or disables AGPS feature of GNSS.

AT+QAGPS Enable/Disable AGPS	
Read Command **AT+QAGPS?**	Response **+QAGPS: <enable>** **OK**
Write Command **AT+QAGPS=<enable>**	Response **OK** If there is any error related to ME functionality: **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved automatically.

Parameter

\<enable\>	Integer type. Enable or disable AGPS feature of GNSS.
	<u>0</u> Disable
	1 Enable
\<errcode\>	Error codes. See *Chapter 4* for details.

3 Example

3.1. Turn on NMEA Port to Output NMEA Sentences
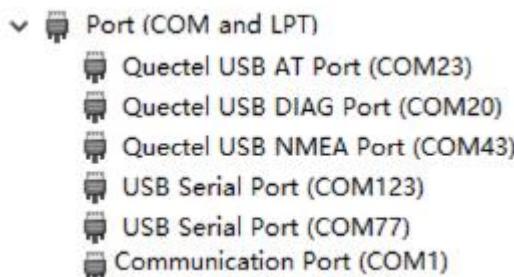
Configure the output port of NMEA sentences as UAB NMEA port through **AT+QGPSCFG="outport","usbnmea"**, as shown below:

```
AT+QGPSCFG="outport","usbnmea"        // Configure the output port of NMEA sentences as UAB
                                         NMEA port.
OK
AT+QGPS=1                             //Open GNSS.
OK
```
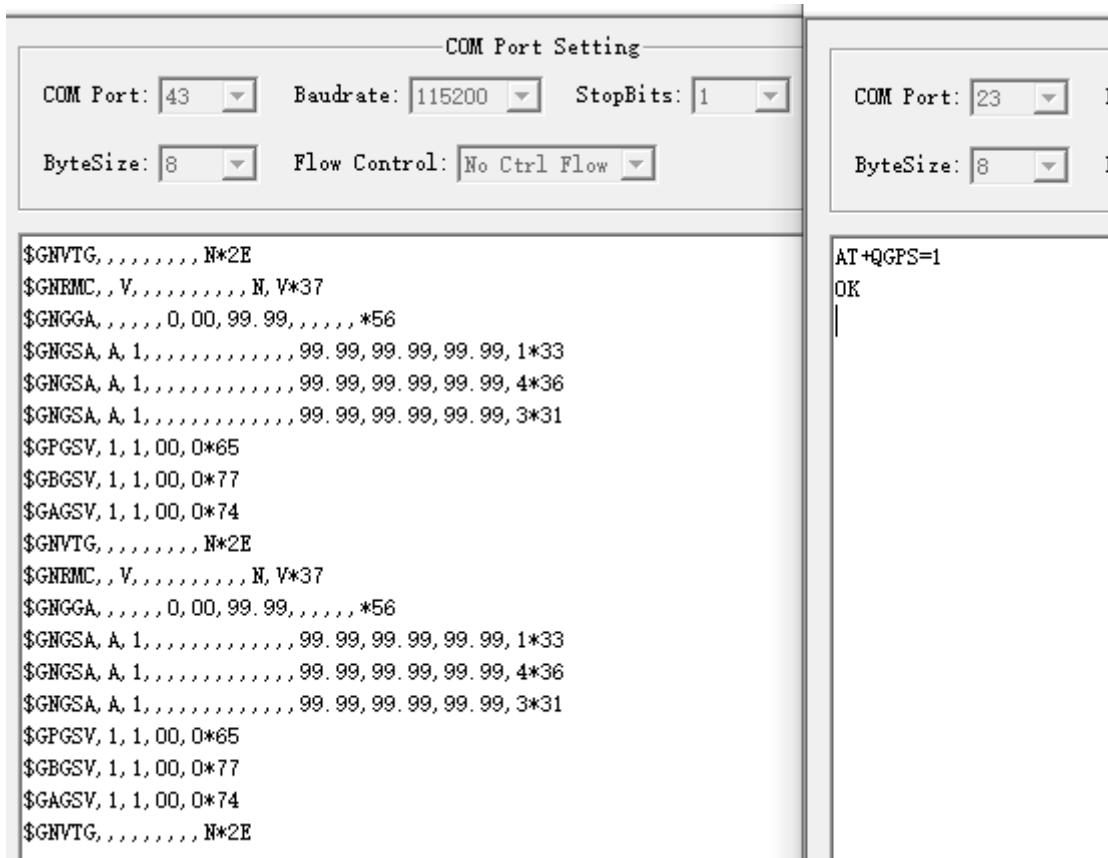
The enumeration and configuration of USB NMEA ports in Windows and Linux are described in detail as follows.

● Windows

Step 1: After USB is inserted, Quectel USB NMEA Port (COM43) appears in Windows Device Manager.

Step 2: Use the serial port tool to open COM43, and send **AT+QGPS=1** via USB AT port or the main serial port to turn on GNSS, then NMEA sentence is output by default.

```
─COM Port Setting─
COM Port: 43 ▼    Baudrate: 115200 ▼    StopBits: 1 ▼
ByteSize: 8 ▼     Flow Control: No Ctrl Flow ▼

$GNVTG,,,,,,,,,N*2E
$GNRMC,,V,,,,,,,,,N,V*37
$GNGGA,,,,,0,00,99.99,,,,,,*56
$GNGSA,A,1,,,,,,,,,,,,99.99,99.99,99.99,1*33
$GNGSA,A,1,,,,,,,,,,,,99.99,99.99,99.99,4*36
$GNGSA,A,1,,,,,,,,,,,,99.99,99.99,99.99,3*31
$GPGSV,1,1,00,0*65
$GBGSV,1,1,00,0*77
$GAGSV,1,1,00,0*74
$GNVTG,,,,,,,,,N*2E
$GNRMC,,V,,,,,,,,,N,V*37
$GNGGA,,,,,0,00,99.99,,,,,,*56
$GNGSA,A,1,,,,,,,,,,,,99.99,99.99,99.99,1*33
$GNGSA,A,1,,,,,,,,,,,,99.99,99.99,99.99,4*36
$GNGSA,A,1,,,,,,,,,,,,99.99,99.99,99.99,3*31
$GPGSV,1,1,00,0*65
$GBGSV,1,1,00,0*77
$GAGSV,1,1,00,0*74
$GNVTG,,,,,,,,,N*2E
```

```
COM Port: 23 ▼
ByteSize: 8 ▼

AT+QGPS=1
OK
```

- Linux

Step 1: After the USB is inserted into the host, execute **dmesg**. There are 4 serial devices, and *ttyUSB3* is USB NMEA port. *InterfaceNumber* of the two endpoints of NMEA both are 6.


```
[49011.062809] usb 1-1: New USB device found, idVendor=2c7c, idProduct=6002, bcdDevice= 3.18
[49011.062850] usb 1-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[49011.062862] usb 1-1: Product: Android
[49011.062867] usb 1-1: Manufacturer: Android
[49011.062869] usb 1-1: SerialNumber: 0000
[49011.082443] cdc_ether 1-1:1.0 usb0: register 'cdc_ether' at usb-0000:02:03.0-1, CDC Ethernet D
evice, ae:0c:29:a3:9b:6d
[49011.093858] option 1-1:1.2: GSM modem (1-port) converter detected
[49011.094280] usb 1-1: GSM modem (1-port) converter now attached to ttyUSB0
[49011.096939] option 1-1:1.3: GSM modem (1-port) converter detected
[49011.101396] usb 1-1: GSM modem (1-port) converter now attached to ttyUSB1
[49011.103742] option 1-1:1.4: GSM modem (1-port) converter detected
[49011.104559] usb 1-1: GSM modem (1-port) converter now attached to ttyUSB2
[49011.107604] option 1-1:1.6: GSM modem (1-port) converter detected
[49011.108554] usb 1-1: GSM modem (1-port) converter now attached to ttyUSB3
[49011.258726] cdc_ether 1-1:1.0 enxae0c29a39b6d: renamed from usb0
[49011.623926] IPv6: ADDRCONF(NETDEV_CHANGE): enxae0c29a39b6d: link becomes ready
```

```
root@ubuntu:/home/evin/Desktop# cat /sys/bus/usb/devices/1-1:1.6/interface
Mobile NMEA Interface
root@ubuntu:/home/evin/Desktop# cat /sys/bus/usb/devices/1-1:1.6/bInterfaceNumber
06
```

Step 2: Use minicom to open *ttyUSB3*, and NMEA sentence is output.

```
root@ubuntu:/home/evin/Desktop# minicom -D /dev/ttyUSB3

Welcome to minicom 2.7.1

OPTIONS: I18n
Compiled on Dec 23 2019, 02:06:26.
Port /dev/ttyUSB3, 10:53:36

Press CTRL-A Z for help on special keys

$GNRMC,,V,,,,,,,,,,N,V*37
$GNGGA,,,,,,0,00,99.99,,,,,*56
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,1*33
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,4*36
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,3*31
$GPGSV,1,1,00,0*65
$GBGSV,1,1,00,0*77
$GAGSV,1,1,00,0*74
$GNVTG,,,,,,,,,N*2E
$GNRMC,,V,,,,,,,,,,N,V*37
$GNGGA,,,,,,0,00,99.99,,,,,*56
```

3.2. Turn on/off GNSS

Default parameters are used in this example to turn on GNSS. After turning on GNSS, GNSS can be turned off through **AT+QGPSEND**.

```
AT+QGPS=1                    //Turn on GNSS.
OK
AT+QGPSLOC=0                 //Obtain positioning information.
+QGPSLOC: 063416.40,3143.2951N,11713.0655E,0.6,224.9,2,162.57,17.6,9.5,110620,07


OK
AT+QGPSEND                   //Turn off GNSS.
OK
```

3.3. Application of <NMEA_src>

When GNSS is turned on and **<NMEA_src>** is set to 1, NMEA sentences can be acquired directly through **AT+QGPSGNMEA**.

AT+QGPSCFG="nmeasrc",1	//Set **<NMEA_src>** to 1 to enable acquisition of NMEA sentences through **AT+QGPSGNMEA**.
OK	
AT+QGPSGNMEA="GGA"	//Obtain GGA sentence.
+QGPSGNMEA: $GPGGA,103647.000,3150.721154,N,11711.925873,E,1,02,4.7,59.8,M,-2.0,M,,*77	
OK	
AT+QGPSCFG="nmeasrc",0	//Set **<NMEA_src>** to 0 to disable acquisition of NMEA sentences through **AT+QGPSGNMEA**.
OK	
AT+QGPSGNMEA="GGA"	//Obtain GGA sentence.
+CME ERROR: 507	//Acquisition of NMEA sentences through **AT+QGPSGNMEA** was disabled, and thus GGA sentences cannot be obtained.

3.4. Application of AGPS Feature

AT+QAGPS=1 is executed to enable AGPS feature. Ephemeris data can be acquired automatically every time when the module is powered on and the GNSS is turned on under the premise that the network is normal to achieve a quick positioning.

AT+QAGPS=1	//Enable AGPS feature.
OK	
AT+QGPS=1	//Turn on GNSS.
OK	

4 Summary of Error Codes

The **<errcode>** indicates an error related to GNSS operation. The details about **<errcode>** are described in the following table.

Table 2: Summary of Error Codes

<errcode>	Meaning
501	Invalid parameter(S)
502	Operation not supported
503	GNSS subsystem busy
504	Session is ongoing
505	Session not active
506	Operation timeout
507	Function not enabled
508	Time information error
512	Validity time is out of range
513	Internal resource error
514	GNSS locked
515	End by E911
516	Not fixed now
517	CMUX port is not opened
549	Unknown error

5 Appendix References

Table 3: Terms and Abbreviations

Abbreviation	Description
AGPS	Assisted GPS (Global Positioning System)
BeiDou	BeiDou Navigation Satellite System
DOP	Dilution of Precision
Galileo	Galileo Satellite Navigation System
GGA	Global Positioning System Fix Data
GLONASS	Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GPS DOP and Active Satellites
GSV	Satellites in View
ME	Mobile Equipment
MS	Mobile Station
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
NVRAM	Non-Volatile Random Access Memory
RAM	Random Access Memory
RMC	Recommended Minimum Specific GNSS Data
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
UTC	Universal Time Code

VTG	Course Over Ground and Ground Speed