BG96 QuecLocator Application Note

LTE Module Series

Rev. BG96_QuecLocator_Application_Note_V1.0

Date: 2018-10-25

Status: Released

Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our company headquarters:

Quectel Wireless Solutions Co., Ltd.

7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

Tel: +86 21 5108 6236

Email: info@quectel.com

Or our local office. For more information, please visit:

http://www.quectel.com/support/sales.htm

For technical support, or to report documentation errors, please visit:

http://www.quectel.com/support/technical.htm

Or email to: support@quectel.com

GENERAL NOTES

QUECTEL OFFERS THE INFORMATION AS A SERVICE TO ITS CUSTOMERS. THE INFORMATION PROVIDED IS BASED UPON CUSTOMERS' REQUIREMENTS. QUECTEL MAKES EVERY EFFORT TO ENSURE THE QUALITY OF THE INFORMATION IT MAKES AVAILABLE. QUECTEL DOES NOT MAKE ANY WARRANTY AS TO THE INFORMATION CONTAINED HEREIN, AND DOES NOT ACCEPT ANY LIABILITY FOR ANY INJURY, LOSS OR DAMAGE OF ANY KIND INCURRED BY USE OF OR RELIANCE UPON THE INFORMATION. ALL INFORMATION SUPPLIED HEREIN IS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

About the Document

History

Revision	Date	Author	Description
1.0	2018-10-25	Lane Hao	Initial

Contents

Table Index

1 Introduction

QuecLocator is a cellular location service developed by Quectel. It allows Quectel modules to get location information through base station (Cell ID) information. The service enhances the positioning and compensates for the unsatisfactory GNSS positioning performance in GNSS-signal-challenging environments such as street canyons, indoor circumstances or when GNSS signal is blocked or jammed.

Positioning can be calculated by QuecLocator server in case of weak and intermittent GNSS signal and the server will return the location information to Quectel modules, which can be easily achieved with simply AT commands. Then, the location will be reported to the customer.

This application note mainly describes how to enable and use this function via AT commands.

NOTE

QuecLocator is a value-added function provided by Quectel. For more details about the service, please contact Quectel sales representatives or Technical Supports.

2 QuecLocator Overview

2.1. General Overview

Global Navigation Satellite System (GNSS) has been widely used for its fast, accurate and stable positioning performance. But it is not always available due to its limitation in signal environments, such as indoor circumstances, street canyons, under overpasses and any environment where the GNSS signal is weakened, blocked or jammed.

As cells of cellular network are widely available in urban and rural environments, QuecLocator service can be enabled for the positioning based on surrounding cellular network information.
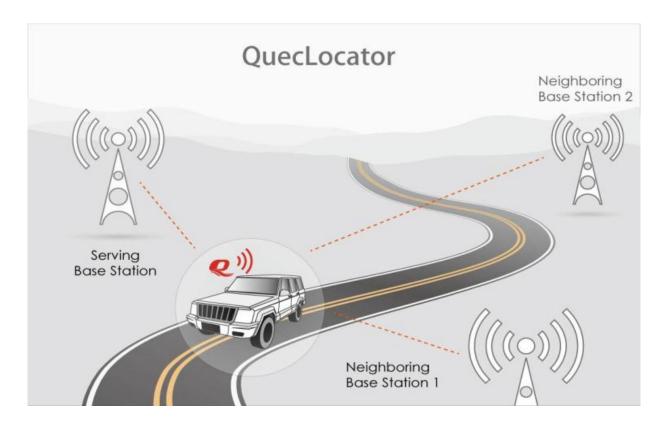

Figure 1: QuecLocator

2.2. Benefits of QuecLocator

The benefits of using QuecLocator are as follows:

- **Worldwide Outdoor and Indoor Positioning:** QuecLocator partners with first tier positioning service providers on the market provide both outdoor and indoor positioning service worldwide.

- **Easy to Use:** Pre-built AT commands for easy location request. The current location can be easily displayed via QuecLocator.

- **Compensation for GNSS Limitations:** QuecLocator cellular positioning is based on cellular network cells. Assisted by QuecLocator, Quectel modules will still show their locations when GNSS signal is weak and intermittent, or even without GNSS signal.

- **Cost-saving:** For specific applications, only location estimate of the position is needed. In this case, GNSS modules can be retrenched to save the cost.

2.3. General Process of QuecLocator

Step 1: Configure and activate a PDP context (for more details about configuration and activation commands of PDP context, please refer to *Quectel_BG96_TCP(IP)_AT_Commands_Manual*).

1) Configure <APN>, <username>, <password> and other parameters of a PDP context with AT+QICSGP command;
   If the context needs to be used in multiple ways or multiple PDNs with the same APN profile need to be established, configure them with AT+QCFG="PDP/DuplicateChk",1. For more details about this command, please refer to *Quectel_BG96_AT_Commands_Manual*.
2) Activate the PDP context with AT+QIACT.
3) Configure the PDP context ID for QuecLocator with AT+QLOCCFG="contextid",<contextID>.

Step 2: Get the location information with AT+QCELLLOC.

> **NOTE**
>
> Step 2 can be repeated when location information needs to be updated.

3 Description of QuecLocator AT Commands

3.1. AT Command Syntax

Table 1: Types of AT Commands and Responses

Test Command	AT+<x>=?	This command returns the list of parameters and value ranges set by the corresponding write commands or internal processes.
Read Command	AT+<x>?	This command returns the currently set value of the parameter or parameters.
Write Command	AT+<x>=<…>	This command sets the user-definable parameter values.
Execution Command	AT+<x>	This command reads non-variable parameters affected by internal processes in the UE.

3.2. AT+QLOCCFG Configure Parameters for QuecLocator

AT+QLOCCFG Configure Parameters for QuecLocator	
Test Command **AT+QLOCCFG=?**	Response **+QLOCCFG: "contextid",(1-16)** **+QLOCCFG: "timeout",(1-300)** **+QLOCCFG: "token",<token_value>** **+QLOCCFG: "server",<address>** **OK**
Read Command **AT+QLOCCFG?**	Response **+QLOCCFG: "contextid",<contextID>** **+QLOCCFG: "timeout",<timeout>** **+QLOCCFG: "token",<token_state>** **+QLOCCFG: "server",<address>**

	OK
Write Command **AT+QLOCCFG="contextid"[,<contextID>]**	Response If **<contextID>** is not omitted: **OK** Or **+CME ERROR: <err>** If **<contextID>** is omitted, query the current context ID: **+QLOCCFG : "contextid",<contextID>** **OK**
Write Command **AT+QLOCCFG="timeout"[,<timeout>]**	Response If **<timeout>** is not omitted: **OK** Or **+CME ERROR: <err>** If **<timeout>** is omitted, query the current timeout value: **+QLOCCFG: "timeout",<timeout>** **OK**
Write Command **AT+QLOCCFG="token"[,<token_value>]**	Response If **<token_value>** is not omitted: **OK** Or **+CME ERROR: <err>** If **<token_value>** is omitted, query the current token state: **+QLOCCFG: "token",<token_state>** **OK**
Write Command **AT+QLOCCFG="server"[,<address>]**	Response If **<address>** is not omitted: **OK** Or **+CME ERROR: <err>** If **<address>** is omitted, query the server address and port information. **+QLOCCFG: "server",<address>** **OK**

Parameter

<token_value>	String type. Access token. The string length should be 16 numbers.
<address>	The customer-defined address and port of a server for QuecLocator service. The server address can be an IP address or a domain name. The range of the port is 1-65535. And if the port number is not entered, the default port will be 80.
<contextID>	Numeric type. PDP context ID. The range is 1-16 and the default value is 1.
<timeout>	After executing the AT+QLOCCFG command, the maximum time waiting for data to be returned from the server. If there is no data returned from the server within the timeout value, the command will time out and "+CME ERROR: 732" will be returned. The value range is 1-300, and the default value is 60. Unit: second.
<token_state>	Current token state.
	"exist" <token_value> has been set.
	"empty" <token_value> has not been set.

3.3. AT+QCELLLOC   Get Location Information by QuecLocator

AT+QCELLLOC Get Location Information by QuecLocator	
Test Command **AT+QCELLLOC=?**	Response **OK**
Execution Command **AT+QCELLLOC**	Response **+QCELLLOC: <longitude>,<latitude>** **OK** Or **+CME ERROR: <err>**

Parameter

<longitude>	Float type. The longitude of the location information. The range is from -180.000000 to 180.000000.
<latitude>	Float type. The latitude of the location information. The range is from -90.000000 to 90.000000.
<err>	Integer type. It indicates the operation error code. It is the type of error (please refer to *Chapter 6* for details).

4 Example

//Step 1: Configure and activate the PDP context.

AT+QICSGP=1,1,"UNINET","","",1 //Configure PDP context 1, APN is "UNINET" for
OK China Unicom.

AT+QIACT=1 //Activate PDP context 1.
OK //Activated successfully.

AT+QIACT? //Query the state of PDP context.
+QIACT: 1,1,1,"10.7.157.1"

OK

AT+QLOCCFG="contextid",1 //Set the PDP context ID as 1. The PDP context
OK must be activated first.

AT+QLOCCFG="contextid" //Query the PDP context ID.
+QLOCCFG: "contextid",1

OK

AT+QLOCCFG="timeout",10 //Configure the timeout value.
OK

AT+QLOCCFG="timeout" //Query the current timeout value.
+QLOCCFG: "timeout",10

OK

AT+QLOCCFG="token","1234567812345678" //Configure the token value.
OK

AT+QLOCCFG="token" //Query the current token state.
+QLOCCFG: "token",exist

OK

```
AT+QLOCCFG="server","47.74.213.211:80"    //Configure the server address and port
OK                                          information.

AT+QLOCCFG="server"                        //Query the current server address and port
+QLOCCFG: "server",47.74.213.211:80        information.

OK


//Step 2: Get the location information by QuecLocator.

AT+QCELLLOC                                //Get the location information.
+QCELLLOC: 117.206001,31.847601

OK
```

5 Error Handling

5.1. Executing QuecLocator AT Command Fails

When executing QuecLocator AT commands, if "ERROR" response is received from the module, please check whether the SIM/USIM card has been inserted, and whether it is "+CPIN: READY" that is returned when executing AT+CPIN?.

5.2. PDP Activation Fails

If it is failed to activate a PDP context with AT+QIACT command, please check the following configurations:

1. Query whether the PS domain is attached or not with AT+CGATT? command. If not, please execute AT+CGATT=1 command to attach the PS domain.

2. Query GERAN packet service domain registration status with AT + CGREG? command, query EPS packet service domain registration status with AT + CEREG? command and make sure the PS domain has been registered.

3. Query the PDP context parameters with AT+QICSGP command and make sure the APN of specified PDP context has been set.

4. Make sure the specified PDP context ID is neither used by PPP nor activated by AT+CGACT command.

If all above configurations are correct but the activation of PDP context with AT+QIACT command still fails, please reboot the module. After booting, please check the configurations mentioned above at least three times and each time at an interval of 10 minutes to avoid frequently rebooting the module.

5.3. Error Response of AT+QCELLLOC

If "+CME ERROR: <err>" is returned after executing AT+QCELLLOC, please re-execute the command. If it fails again, deactivate the PDP context with AT+QIDEACT command, then, reactivate it and try again (Please refer to *Chapter 5.2*).

6 Summary of Error Codes

<err> indicates an error related to mobile equipment or network. The details about <err> are described in the following table.

Table 2: Summary of Error Codes

<err>	Meaning
701	HTTP unknown error
703	HTTP busy
706	HTTP network busy
707	HTTP network open failed
708	HTTP network no configuration
709	HTTP network deactivated
710	HTTP network error
714	HTTP DNS error
715	HTTP socket create error
716	HTTP socket connect error
717	HTTP socket read error
718	HTTP socket write error
719	HTTP socket close
720	HTTP data encode error
721	HTTP data decode error
722	HTTP read timeout
723	HTTP response fail
727	Wait data timeout
728	Wait HTTP response timeout

729	Fail to allocate memory
730	Invalid parameter
731	Fail to get location
732	Timeout

7 Appendix A Reference

Table 3: Related Documents

SN	Document Name	Remark
[1]	Quectel_BG96_TCP(IP)_AT_Commands_Manual	BG96 TCP(IP) AT Commands Manual
[2]	Quectel_BG96_AT_Commands_Manual	BG96 AT Commands Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
HTTP	Hyper Text Transfer Protocol
GNSS	Global Navigation Satellite System
PDP	Packet Data Protocol
PPP	Point-to-Point Protocol
RTC	Real-Time Clock