BG95-S5 NIDD Application Note

Satellite Communication Module Series

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About the Document

Revision History

Version	Date	Author	Description
-	2024-07-25	Water WANG	Creation of the document
1.0	2024-09-19	Water WANG	First official release

Contents

Table Index

1 Introduction

The support for NIDD (Non-IP Data Delivery) is introduced from 3GPP Release 13 and later releases. Functions for NIDD may be used to handle MO and MT communication with UE, where the data used for the communication is considered unstructured from the EPS standpoint (which is referred to as Non-IP).

Quectel BG95-S5 module supports not only NIDD in NB-IoT and NTN NB-IoT RAT but also tethered and embedded Non-IP data calls. This document introduces how to use the NIDD function of the module through AT commands.

2 AT Command Introduction

2.1. AT Command Syntax

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.

2.1.3. 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. The URLs, domain names, IP addresses, usernames/accounts, and passwords (if any) in the AT command examples are provided for illustrative and explanatory purposes only, and they should be modified to reflect your actual usage and specific needs.

2.2. Description of NIDD Related AT Commands

2.2.1. AT+QCFGEXT="nipdcfg" Configure NIDD Connection

This command configures an NIDD connection.

AT+QCFGEXT="nipdcfg" Configure NIDD Connection	
Write Command **AT+QCFGEXT="nipdcfg"[,<type>[,<apn>[,<username>,<password>]]]**	Response If the optional parameters are omitted, the command queries the current setting. **+QCFGEXT: "nipdcfg",<type>,<APN>** **OK** If any of the optional parameters is specified, the command configures the NIDD connection. **OK** If there is any error: **ERROR**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configurations are not saved.

Parameter

<type>	Integer type. Non-IP outgoing data type.
	<u>0</u> MO Non-IP data type
	1 MO Exception Non-IP data type

<apn>	String type. Access point name.
<username>	String type. Username of the selected APN.
<password>	String type. Password of the selected APN.

NOTE

Before using the selected APN for starting up a Non-IP data call, set the PDP type of the APN into "Non-IP" with **AT+CGDCONT**. See *document [1]* for details of **AT+CGDCONT**.

2.2.2. AT+QCFGEXT="nipd"   Open or Close NIDD Connection

This command opens or closes an NIDD connection.

AT+QCFGEXT="nipd" Open or Close NIDD Connection	
Write Command **AT+QCFGEXT="nipd",<mode>[,<time out>]**	Response If **<mode>**=0, the command closes the NIDD connection. **OK** If **<mode>**=1, the command opens an NIDD connection. **OK** **+QIND: "nipd","open",<errcode>** If there is an error related to ME functionality: **+CME ERROR: <errcode>** If there is any other error: **ERROR**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configurations are not saved.

Parameter

<mode>	Integer type. Close or open an NIDD connection.
	0 Close an NIDD connection
	1 Open an NIDD connection
<timeout>	Integer type. The timeout when opening the NIDD connection. This parameter is valid only when **<mode>**=1. Range: 30–90. Default value: 30. Unit: second.
<errcode>	Integer type. Error code of operation. See *Chapter 3* for details.

1. NIDD function is disabled by default. **AT+QCFG="nccconf",115** can be used to enable the function.
2. Non-IP data calls are supported for AP embedded and tethered RmNet calls only.
3. Non-IP data calls are not supported for modem embedded calls.

2.2.3. AT+QCFGEXT="nipds"　Send MO Non-IP Data

This command sends MO Non-IP data to a server.

AT+QCFGEXT="nipds"　Send MO Non-IP Data	
Write Command **AT+QCFGEXT="nipds",<mode>,<data>[,<data_length>]**	Response **OK** If there is an error related to ME functionality: **+CME ERROR: <errcode>** If there is any other error: **ERROR**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configurations are not saved.

Parameter

<mode>	Integer type. Data format. 　0　　ASCII format string 　1　　HEX format string
<data>	String type. The data to be sent.
<data_length>	Integer type. The length of the data to be sent. If this parameter is omitted, **<data>** can be specified at any length within 1358 bytes of ASCII format. Range: 1–1358. **<data>** can be specified at any length within 679 bytes of HEX format. Range: 1–679. Unit: byte.
<errcode>	String type. Error code of operation. See **Chapter 3** for details.

2.2.4. AT+QCFGEXT="nipdr" Retrieve MT Non-IP Data

This command retrieves the data reported by the URC **+QIND: "nipd","recv"**.

AT+QCFGEXT="nipdr" Retrieve MT Non-IP Data	
Write Command **AT+QCFGEXT="nipdr"[,<read_length>[,<read_mode>]]**	Response **+QCFGEXT: "nipdr",<read_actual_length>,<data>** **OK** If there is no data that can be retrieved: **+QCFGEXT: "nipdr",0** **OK** If there is an error related to ME functionality: **+CME ERROR: <errcode>** If there is any other error: **ERROR**
Write Command When **<read_length>** is 0, query the read status of the retrieved data: **AT+QCFGEXT="nipdr",0**	Response If the connection has existed: **+QCFGEXT: "nipdr",<total_receive_length>,<have_rea d_length>,<unread_length>** **OK** If there is an error related to ME functionality: **+CME ERROR: <errcode>** If there is any other error: **ERROR**
Maximum Response Time	300 ms
Characteristics	-

Parameter

<read_length>	Integer type. The length of the data to be retrieved. Retrieve all available data if this parameter is omitted. Unit: byte.
<read_mode>	Integer type. Data format. This parameter is valid only when **<read_length>** is not 0. <u>0</u> String type

	1 Hex type
<read_actual_length>	Integer type. The actual length of retrieved data. Unit: byte.
<data>	String type. Retrieved data.
<total_receive_length>	Integer type. The total length of received data. Unit: byte.
<have_read_length>	Integer type. The length of retrieved data. Unit: byte.
<unread_length>	Integer type. The length of unread data. Unit: byte.
<errcode>	Integer type. The error code of the operation. See *Chapter 3* for details.

2.3. Description of NIDD Related URCs

2.3.1. +QIND: "nipd","recv"   Indicate the Incoming Data

After receiving the non-IP data from the MT, the module reports the URC **+QIND: "nipd","recv"** to notify the host that there is incoming data. Then host can retrieve data via **AT+QCFGEXT="nipdr"**. Be note that if the buffer is not empty, and the module receives data again, it will not report a new URC until all the received data has been retrieved via **AT+QCFGEXT="nipdr"** from the buffer. The size of the buffer is 2048 bytes. If the data received exceeds the buffer size, the subsequent data will be discarded.

+QIND: "nipd","recv" Indicate the Incoming Data	
+QIND: "nipd","recv"	The URC notifies the host that there is incoming data from the network. Then the host can retrieve the data via **AT+QCFGEXT="nipdr"**.

2.3.2. +QIND: "nipd","close"   Indicate the Connection is Closed

+QIND: "nipd","close" Indicate the Connection is Closed	
+QIND: "nipd","close"	The URC notifies that the connection is accidentally closed. If the connection is closed normally via the **AT+QCFGEXT="nipd",0**, this URC will not be reported.

2.4. Example

AT+CGDCONT=1,"Non-IP","cmcc"	//Set the PDP type of selected APN into "Non-IP".
OK	
AT+CEREG?	
+CEREG: 0,1	
OK	
AT+QCFGEXT="nipdcfg",0,"cmcc"	//Set the Non-IP data type and APN.
OK	
AT+QCFGEXT="nipdcfg"	
+QCFGEXT: "nipdcfg",0,"cmcc"	
OK	
AT+QCFGEXT="nipd",1,30	//Open an NIDD connection.
OK	
+QIND: "nipd","open",0	
AT+QCFGEXT="nipds",0,"quectel",7	//Send "quectel" in ASCII format via NIDD connection.
OK	
AT+QCFGEXT="nipds",1,"6162636465",10	//Send "abcde" in hex format via NIDD connection.
OK	
//When there is any incoming data from the network, the following URC will be reported.	
+QIND: "nipd","recv"	
AT+QCFGEXT="nipdr",0	//Query the retrieved data length.
+QCFGEXT: "nipdr",10,0,10	//There are 10 bytes data to be retrieved.
OK	
AT+QCFGEXT="nipdr",10	//Read 10 bytes of the incoming data.
+QCFGEXT: "nipdr",10,0123456789	
OK	
AT+QCFGEXT="nipdr",0	//Query the retrieved data length.
+QCFGEXT: "nipdr",10,10,0	//All incoming data has been retrieved.
OK	
AT+QCFGEXT="nipd",0	//Close the NIDD connection.
OK	

3 Summary of <errcode>

The error code **<errcode>** indicates an error related to mobile equipment or network. The table below describes the details about **<errcode>**.

Table 2: Summary of <errcode>

<errcode>	Meaning
0	Operation successful
651	Invalid input value
652	Send error
653	Network error
654	NIDD busy
655	Timeout error
656	Connection not open
657	Connection already opened
658	Connection accidentally closed

4 Appendix References

Table 3: Related Documents

Document Name
[1]   Quectel_BG95-S5_AT_Commands_Manual
[2]   Quectel_BG95-S5_QCFGEXT_AT_Commands_Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
3GPP	3rd Generation Partnership Project
AP	Application Processor
APN	Access Point Name
ASCII	American Standard Code for Information Interchange
EPS	Evolved Packet System
HEX	Hexadecimal
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ME	Mobile Equipment
MO	Mobile Originated
MT	Mobile Terminated
NB-IoT	Narrowband-Internet of Things

NIDD	Non-IP Data Delivery
NTN	Non-Terrestrial Network
RAT	Radio Access Technology
UE	User Equipment
URC	Unsolicited Result Code