BC20 TCP/IP
AT Commands Manual

NB-IoT/GNSS Module Series

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About the Document

History

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Contents

1 Introduction

Quectel BC20 module features embedded TCP/IP stack, which enables the host to access the Internet directly over AT commands. This greatly reduces the dependence on PPP and TCP/IP protocol stacks and thus minimizes the cost.

Quectel BC20 module provides the following socket services: TCP client and UDP client.

1.1. The Process of Using TCP/IP AT Commands

Through TCP/IP AT commands, the host can start/close socket service and send/receive data via socket service.

1.2. Description of Data Access Modes

BC20 module supports the following two kinds of data access modes:

- Buffer access mode
- Direct push mode

When opening a socket service via AT+QIOPEN, the data access mode can be specified by the parameter <access_mode>. After a socket service is opened, AT+QISWTMD could be used to change the data access mode.

1. In buffer access mode, the data can be sent via AT+QISEND/AT+QISENDEX command. When the data is received, the module will buffer the data and report an URC as "+QIURC: "recv",<connectID>". The host can read data by AT+QIRD.

NOTE

In buffer access mode, if the buffer is not empty, the module will not report a new URC until all the received data has been read via AT+QIRD from buffer.

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2. In direct push mode, the data can be sent via AT+QISEND/AT+QISENDEX command. The received data will be outputted directly in the following format:

"+QIURC: "recv",<connectID>,<currentrecvlength><CR><LF><data>".

2 Description of TCP/IP AT Commands

2.1. Description of AT Commands

2.1.1. AT+QIOPEN   Open a Socket Service

This command is used to open a socket service. The service type can be specified by <service_type>, and the data access mode can be specified by <access_mode>. The URC "+QIOPEN: <connectID>,<err>" indicates whether the socket service has been opened successfully.

AT+QIOPEN Open a Socket Service	
Test Command **AT+QIOPEN=?**	Response **+QIOPEN: (1-3),(0-4),"TCP/UDP","<IP_address>/<domain _name>",<remote_port>,<local_port>,(0-1)[,(0-1)]** **OK**
Write Command **AT+QIOPEN=<contextID>,<connectID>,<service_type>,<IP_address>/<domain_name>,<remote_port>[,<local_port>[,<access_mode>][,<protocol_type>]]**	Response **OK** **+QIOPEN: <connectID>,<err>** If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<contextID>	Integer type. Context ID. The range is 1-3.
<connectID>	Integer type. Socket service index. The range is 0-4.
<service_type>	String type. Socket service type.
	"TCP" Start a TCP connection as a client
	"UDP" Start a UDP connection as a client
<IP_address>	String type. IP address of remote server, such as "220.18.23.22".
<domain_name>	String type. Domain name address of the remote server.
<remote_port>	The port of the remote server, only valid when <service_type> is "TCP" or "UDP".

	The range is 1-65535.
<local_port>	Local port number. The range is 1-65535. When <service_type> is "TCP" or "UDP", if <local_port> is 0, then the local port will be assigned automatically, otherwise the local port is assigned as specified.
<access_mode>	Integer type. Data access mode of socket services.
	<u>0</u> Buffer access mode
	1 Direct push mode
<protocol_type>	Integer type. Protocol type.
	<u>0</u> IPv4
	1 IPv6 (Not supported currently)

NOTES

1. Currently only <contextID>=1 is supported.
2. It is recommended to wait for 60 seconds for URC response "+QIOPEN: <connectID>,<err>".
3. If connection failed, the host must execute AT+QICLOSE=<connectID> to close the socket.

2.1.2.   AT+QICLOSE   Close a Socket Service

The command is used to close the specified socket service.

AT+QICLOSE Close a Socket Service	
Test Command **AT+QICLOSE=?**	Response **+QICLOSE: (0-4)** **OK**
Write Command **AT+QICLOSE=<connectID>**	Response If closed successfully: **OK** **CLOSE OK** If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<connectID>	Integer type. Socket service index. The range is 0-4.

2.1.3. AT+QISTATE   Query Socket Service Status

This command is used to query the socket service status.

AT+QISTATE Query Socket Service Status	
Test Command **AT+QISTATE=?**	Response **OK**
Read Command **AT+QISTATE?**	Response Return the status of all existing connections: List of **(+QISTATE: <connectID>,<service_type>,<IP_address>,<remote_port>,<local_port>,<socket_state>,<contextID>,<access_mode>)** **OK** If there is an error related to ME functionality: **ERROR**
Write Command If <query_type> is 0, query connection status of the specified context **AT+QISTATE=<query_type>,<contextID>**	Response Return the status of all existing connections: List of **(+QISTATE: <connectID>,<service_type>,<IP_address>,<remote_port>,<local_port>,<socket_state>,<contextID>,<access_mode>)** **OK** If there is an error related to ME functionality: **ERROR**
Write Command If <query_type> is 1, query connection status of the specified socket service **AT+QISTATE=<query_type>,<connectID>**	Response **+QISTATE: <connectID>,<service_type>,<IP_address>,<remote_port>,<local_port>,<socket_state>,<contextID>,<access_mode>** **OK** If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<query_type>	Integer type. Query type.
	0 Query connection status by <conetxtID>
	1 Query connection status by <connectID>
<contextID>	Integer type. Context ID. The range is 1-3.
<connectID>	Integer type. Socket service index. The range is 0-4.
<service_type>	String type. Service type.
	"TCP" TCP connection as a client
	"UDP" UDP connection as a client
<IP_address>	String type. IP address of remote client.
<remote_port>	Integer type. Port number of remote server.
<local_port>	Integer type. Local port number assigned.
<socket_state>	Integer type. Socket service state.
	0 "Initial": client connection has not been established
	1 "Opening": client is connecting
	2 "Connected": client connection has been established
	3 "Closing": client connection is closing
<access_mode>	Data access mode.
	0 Buffer access mode
	1 Direct push mode

NOTE

Currently only <contextID>=1 is supported.

2.1.4. AT+QISEND   Send Text String Data

The command is used to send socket data in text string format via specified connection.

AT+QISEND Send Text String Data	
Test Command **AT+QISEND=?**	Response **+QISEND: (0-4),(1-1024),<data>** **OK**
Write Command **AT+QISEND=<connectID>,<send_length>,<data>**	Response If data is sent successfully: **OK** **SEND OK** Otherwise:

	OK
	SEND FAIL
	If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<connectID>	Integer type. Socket service index. The range is 0-4.
<send_length>	Integer type. The length of data to be sent. The max length is 1024 bytes.
<data>	The text string data to be sent.

NOTE

"SEND OK" only indicates that the data has arrived the protocol stack.

2.1.5. AT+QIRD   Retrieve the Received TCP/IP Data

This command is used to read the received socket data from a specified connection.

In buffer access mode, after receiving data, the module will buffer it and then report URC "+QIURC: "recv",<connectID>[,<current_recv_length>]" to external MCU.

AT+QIRD Retrieve the Received TCP/IP Data	
Test Command **AT+QIRD=?**	Response **+QIRD: (0-4),(1-512)** **OK**
Write Command **AT+QIRD=<connectID><read_length>**	Response **+QIRD: <actual_read_length>[,<remaining_length>]** **<data>** **OK** If there is no data: **+QIRD: 0** **OK**

	If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<connectID>	Integer type. Socket service index. The range is 0-4.
<read_length>	Integer type. The maximum length of data to be retrieved. The range is 1-512. Unit: byte.
<actual_read_length>	Integer type. The actual length of received data. Unit: byte.
<remaining_length>	The remaining length of last received data. Unit: byte.
<data>	The retrieved data.

NOTES

1. If the module receives data again when the receive buffer is not empty, then it will not report a new URC until all the received data has been retrieved from the buffer.
2. If AT+QICFG="showlength",1 is configured, then <current_recv_length> and <remaining_length> will be prompted.
3. The remaining length is not the total received bytes in buffer, which only indicates the current remaining data stored in one node.

2.1.6. AT+QISENDEX   Send Hex String Data

This command can be used to send socket data in hex string format via specified connection.

AT+QISENDEX Send Hex String Data	
Test Command **AT+QISENDEX=?**	Response **+QISENDEX: (0-4),(1-512),<hex_string>** **OK**
Write Command **AT+QISENDEX=<connectID>,<send_length>,<hex_string>**	Response If the hex string data is sent successfully: **OK** **SEND OK** Otherwise: **OK** **SEND FAIL**

	If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<connectID>	Integer type. Socket service index. The range is 0-4.
<send_length>	Integer type. The length of data to be sent, and the max length is 512 bytes.
<hex_string>	The hex string data to be sent.

NOTE

"SEND OK" only indicates that the data arrives the protocol stack.

2.1.7. AT+QISWTMD Switch Data Access Modes

This command can be used to switch the data access modes: buffer access mode or direct push mode. When starting a new socket service, the host can specify the data access mode by the parameter <access_mode> via AT+QIOPEN.

AT+QISWTMD Switch Data Access Modes	
Test Command **AT+QISWTMD=?**	Response **+QISWTMD: (0-4),(0-1)** **OK**
Read Command **AT+QISWTMD?**	Response **OK**
Write Command **AT+QISWTMD=<connectID>,<access _mode>**	Response **OK** If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<connectID>	Integer type. Socket service index. The range is 0-4.
<access_mode>	Integer type. The data access modes of the socket service.
	0 Buffer access mode

1		Direct push mode

NOTES

1. The switch of data access mode will take effect immediately.
2. The configuration of <access_mode> will be saved to NVRAM automatically.

2.1.8. AT+QPING   Ping a Remote Server

This command is used to test the Internet Protocol reachability of a host device.

AT+QPING Ping a Remote Server	
Test Command **AT+QPING=?**	Response **+QPING: (1-3),"<host>"[,(1-255)[,(1-10)[,(32-200)]]]** **OK**
Write Command **AT+QPING=<contextID>,<host>[,<time_out>[,<ping_num>[,<ping_size>]]]**	Response If ping a remote server successfully: **OK** **+QPING: <result>[,<IP_address>,<bytes>,<time>,<ttl>]** **[…]** **+QPING: <finresult>[,<sent>,<rcvd>,<lost>,<min>,<max>,<avg>]** If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<contextID>	Integer type. Context ID. The range is 1-3.
<host>	The host address in string type. The format is a domain name or a dotted decimal IP address
<time_out>	Integer type. The maximum time to wait for the response of each ping request. Unit: second. Range: 1-255. Default: 4.
<ping_num>	Integer type. The maximum time of ping request. Range: 1-10. Default: 4.
<ping_size>	Integer type. The ping size. Range: 32-200. Default: 32.
<result>	Integer type. The result of each ping request.

	0 Received the ping response from the server.
	Others Refer to *Chapter 3* for specified error codes.
<IP_address>	String type. The IP address of the remote server formatted as a dotted decimal IP.
<bytes>	Integer type. The length of each sending ping request. Unit: byte.
<time>	Integer type. The time consuming of the ping request. Unit: ms.
<ttl>	Integer type. The time to live value of the ping request.
<finresult>	Integer type. The final result of the ping operation.
	0 Ping successful.
	Others Refer to *Chapter 3* for specified error codes.
<sent>	Integer type. The total number of bytes sent by the ping requests.
<rcvd>	Integer type. The total number of bytes received in the ping response.
<lost>	Integer type. The total number of bytes lost in the ping requests.
<min>	Integer type. The minimum response time. Unit: ms.
<max>	Integer type. The maximum response time. Unit: ms.
<avg>	Integer type. The average response time. Unit: ms.

NOTE

Currently only <contextID>=1 is supported.

2.1.9.   AT+QNTP   Synchronize Local Time with NTP Server

This command is used to synchronize the local time with the Coordinated Universal Time (UTC) via the NTP server.

Please refer to *Chapter 3* for specified <err> codes.

AT+QNTP Synchronize Local Time with NTP Server	
Test Command **AT+QNTP=?**	Response **+QNTP: (1-3),"<server>"[,<port>[,(0-1)]]** **OK**
Write Command **AT+QNTP=<contextID>,<server>[,<port>][,<autosettime>]**	Response If successfully synchronized: **OK** **+QNTP: <err>,<time>** If there is an error related to ME functionality: **ERROR**

Maximum Response Time	300ms

Parameter

<contextID>	Integer type. Context ID. The range is 1-3.
<server>	String type. The address of NTP server.
<port>	Integer type. The port of NTP server.
<autosettime>	Integer type. Whether to automatically set synchronized time to local time
	0 Not set
	<u>1</u> Set
<time>	String type. The time synchronized from NTP server.
	The format is "YY/MM/DD,hh:mm:ss±zz".
	The range of "zz" is -48 ~ 56.

> **NOTES**

1. Currently only <contextID>=1 is supported
2. When <autosettime> is set to 1 , RTC will be updated by the synchronized time automatically.

2.1.10. AT+QIDNSGIP   Get IP Address by Domain Name

This command is used to covert the specified domain name to IP address format.

Please refer to *Chapter 3* for specified <err> codes.

AT+QIDNSGIP Get IP Address by Domain Name	
Test Command **AT+QIDNSGIP=?**	Response **+QIDNSGIP: (1-3),"<hostname>"** **OK**
Write Command **AT+QIDNSGIP=<contextID>,<hostname>**	Response **OK** **+QIURC: "dnsgip",<err>,<IP_count>,<DNS_ttl>** **[+QIURC: "dnsgip",<hostIPaddr>]** **[…]** If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<contextID>	Integer type. Context ID. The range is 1-3.
<hostname>	String type. Domain name.
<IP_count>	Integer type. The number of the IP addresses corresponding to the <hostname>.
<DNS_ttl>	Integer type. The time to live of the DNS.
<hostIPaddr>	String type. The IP address of <hostname>.

NOTE

Currently only <contextID>=1 is supported

2.1.11. AT+QICFG   Configure Optional Parameters

The command is used to configure optional parameters for TCP/IP functionalities.

AT+QICFG Configure Optional Parameters	
Test Command **AT+QICFG=?**	Response **+QICFG: "dataformat",(0,1),(0,1)** **+QICFG: "viewmode",(0,1)** **+QICFG: "showlength",(0,1)** **OK**
Write Command Set the data format for sending and receiving **AT+QICFG="dataformat"[,<send_data _format>,<recv_data_format>]**	Response **+QICFG: "dataformat",<send_data_format>,<recv_data_ format>** **OK** If there is an error related to ME functionality: **ERROR**
Write Command Set the received data output format **AT+QICFG="viewmode"[,<view_mod e>]**	Response **+QICFG: "viewmode",<view_mode>** **OK** If there is an error related to ME functionality: **ERROR**
Write Command Set the optional length viewable in buff access mode **AT+QICFG="showlength"[,<show_len**	Response **+QICFG: "showlength",<show_length_mode>** **OK**

gth_mode>]	
	If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<send_data_format>	Integer type. Sending data format.
	<u>0</u> Text mode
	1 Hex mode
<recv_data_format>	Integer type. Receiving data format.
	<u>0</u> Text mode
	1 Hex mode
<view_mode>	Integer type. Received data output format.
	<u>0</u> Received data output format: data header\r\ndata
	1 Received data output format: data header,data
<show_length_mode>	Integer type. Whether to show the optional length in buffer access mode.
	<u>0</u> Do not show the optional length in buffer access mode
	1 Show the optional length in buffer access mode

NOTES

1. The configuration of the parameters will take effect immediately.
2. The configuration of "send_data_format", "recv_data_format", "view_mode", "show_length_mode" will be saved to NVRAM automatically.
3. Currently <send_data_format> is invalid for configuration.
4. Please refer to AT+QIRD command for <show_length_mode> configuration.

2.1.12. AT+QIGETERROR   Query the Last Error Code

This command is used to query the <err> code and specific description of the <err> code returned by the last TCP/IP command.

AT+QIGETERROR Query the Last Error Code	
Test Command **AT+QIGETERROR=?**	Response **OK**
Execution Command **AT+QIGETERROR**	Response **+QIGETERROR: <err>,<errcode_description>** **OK**

	If there is an error related to ME functionality: **ERROR**
Maximum Response Time	300ms

Parameter

<errcode_description>	A string parameter indicates the details of error information. Please refer to *Chapter 3* for details of <err> codes and corresponding description.

2.2. Description of URC

The URC of TCP/IP AT commands will be reported as the format "<CR><LF>+QIURC:<type>[…]<CR><LF>". For convenience, <CR><LF> is omitted intentionally.

2.2.1. URC Indicating Connection Closed

When TCP socket service is closed by remote peer or due to network error, the URC "+QIURC: "closed",<connectID>" will be outputted, and the <socket_state> (indicating the status of the socket service) will be changed to "closing". The host must execute AT+QICLOSE=<connectID> to change the <socket_state> to "initial".

In buffer access mode, the host can also execute AT+QIRD=<connextID>,<read_length> to read the buffer data.

URC of Connection Closed	
+QIURC: "closed",<connectID>	Socket service connection is closed.

Parameter

<connectID>	Integer type. The socket service index. The range is 0-4.

2.2.2. URC Indicating Incoming Data

In buffer access mode or direct push mode, the module will report URC to the host when data is received from the server.

In buffer access mode, the URC format is:
+QIURC: "recv",<connectID>[,<currentrecvlength>]

In direct push mode, the URC format is:

+QIURC: "recv",<connectID>,<current_recv_length><CR><LF><data>

URC of Incoming Data	
+QIURC: "recv",<connectID>,[<current_recv_length>]	The URC indicating incoming data in buffer access mode.
+QIURC: "recv",<connectID>,<current_recv_length><CR><LF><data>	The URC indicating incoming data in direct push mode.

Parameter

<connectID>	Integer type. The socket service index. The range is 0-4.
<current_recv_length>	Integer type. The length of actual received data.
<data>	The received data.

2.2.3. URC Indicating Incoming Data Buffer Full

In buffer access mode, if there is no resources can be allocated for incoming data, then the module will report the following URC.

URC of Incoming Data Buffer Full	
+QIURC: "recv",<connectID>,"buff full"	The URC of incoming data is full.

Parameter

<connectID>	Integer type. The socket service index. The range is 0-4.

3 Summary of <err> Codes

If <err> is returned after executing TCP/IP AT commands, the details of error can be queried via AT+QIGETERROR. Please note that AT+QIGETERROR just returns the <err> code of the last TCP/IP AT command.

Table 1: Summary of Error Codes

<err> Code	Description of Error Code
0	Operation successful
550	Unknown error
551	Operation blocked
552	Invalid parameters
553	Memory not enough
554	Create socket failed
555	Operation not supported
556	Socket bind failed
557	Socket listen failed
558	Socket write failed
559	Socket read failed
560	Socket accept failed
561	Open PDP context failed
562	Close PDP context failed
563	Socket identity has been used
564	DNS busy

565	DNS parse failed
566	Socket connect failed
567	Socket has been closed
568	Operation busy
569	Operation timeout
570	PDP context broken down
571	Cancel send
572	Operation not allowed
573	APN not configured
574	Port busy

4 Examples

4.1. TCP Client Works in Buffer Access Mode

4.1.1. Set up a TCP Client Connection and Enter into Buffer Access Mode

AT+QIOPEN=1,0,"TCP","220.180.239.212",8062,1234,0   //Context is 1 and <connectID> is 0.
OK

+QIOPEN: 0,0   //Connected successfully. It is suggested to wait for 60 seconds for the URC to be reported.

AT+QISTATE=1,0   //Query the connection status of Context ID 0.
+QISTATE: 0,"TCP","220.180.239.212",8062,1234,2,1,0

OK

4.1.2. Send Data in Buffer Access Mode

AT+QISEND=0,10,1234567890   //Send data, and the data length is 10 bytes.
OK

SEND OK

AT+QISENDEX=0,5,3031323334   //Send hex string data.
OK

SEND OK

AT+QISEND=0,10,1234567890   //Send data, and the data length is 10 bytes.
OK

AT+QISEND=0,10,1234567890   //"SEND OK" of the previous command has not been returned, so when new data is sent, "ERROR" is returned.

ERROR

SEND OK

4.1.3. Receive Data from Remote Server in Buffer Access Mode

```
+QIURC: "recv",0              //The <connectID> 0 received data.


AT+QIRD=0,512                 //Read data, and the data length is 512 bytes.
+QIRD: 10
1234567890


OK


AT+QIRD=0,512                 //Read data, and the data length is 512 bytes.
+QIRD: 0                      //No data in buffer.


OK


AT+QICFG="showlength",1          //Enable to show optional length viewable in buff access mode.
OK


+QIURC: "recv",0,12      //The <connectID> 0 has received data, and the data length is 12 bytes.


AT+QIRD=0,10                  //Read data, and the data length is 10 bytes.
+QIRD: 10,2                   //Read 10 bytes, and remains 2 bytes.
1234567890


OK


+QIURC: "recv",0,"buff full"         //The <connectID> 0 indicates that the buffer is full, and the host
                                     has to use AT+QIRD to read the buffer data.


AT+QICFG="viewmode",1            //Received data output format: data header,data
OK


AT+QISEND=0,12,"012345678901"
OK


SEND OK


+QIURC: "recv",0,12


AT+QIRD=0,10
+QIRD: 10,2,0123456789


OK
```

4.1.4. Close a Connection

```
AT+QICLOSE=0        //Close a connection whose <connectID> is 0.
OK


CLOSE OK
```

4.2. TCP Client Works in Direct Push Mode

4.2.1. Set up a TCP Client Connection and Enter into Direct Push Mode

```
AT+QIOPEN=1,0,"TCP","220.180.239.212",8062,0,1      //Context is 1 and <connectID> is 0.
OK


+QIOPEN: 0,0                    //Connected successfully. It is suggested to wait for 60 seconds for the
                                URC to be reported.


AT+QISTATE=1,0                  // Query the connection status of Context ID 0.
+QISTATE: 0,"TCP","220.180.239.212",8062,0,2,1,1


OK
```

4.2.2. Send Data in Direct Push Mode

```
AT+QISEND=0,10,1234567890               //Send data, and the data length is 10 bytes.
OK

SEND OK


AT+QISENDEX=0,5,3031323334              //Send hex string data.
OK

SEND OK
```

4.2.3. Receive Data from Remote Server in Direct Push Mode

```
+QIURC: "recv",0,5                      //Receive data from remote server.
12345


AT+QICFG="viewmode",1                   //Received data output format: data header,data
OK
```

AT+QISEND=0,12,"012345678901"
OK

SEND OK

+QIURC: "recv",0,12,012345678901

4.2.4. Close TCP Client

AT+QICLOSE=0   //Close a connection whose <connectID> is 0.
OK

CLOSE OK

4.3. Ping a Remote Server

AT+QPING=1,"hf.quectel,com"   //Ping hf.quectel.com in context 1.
OK

+QPING: 0,"220.180.239.212",32,192,255

+QPING: 0,"220.180.239.212",32,240,255

+QPING: 0,"220.180.239.212",32,241,255

+QPING: 0,"220.180.239.212",32,479,255

+QPING: 0,4,4,0,192,479,287

4.4. Synchronize Local Time

AT+QNTP=1,"ntp5.aliyun.com"   //Synchronize local time with NTP server ntp5.aliyun.com.
OK

+QNTP: 0,"18/04/20,11:08:20:35+32"

4.5. Getting Last Error Code

AT+QIOPEN=1,"UDP","220.180.239.212",8063,0,1 //Start socket service and omit \<connectID>.
ERROR

AT+QIGETERROR
+QIGETERROR: 552,invalid parameters

OK