

UC200T Series TCP/IP Application Note

UMTS/HSPA+ Module Series

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About the Document

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1 Introduction

Quectel UC200T series feature embedded TCP/IP stack, which enables the host to access the Internet directly via AT commands. This greatly reduces the dependence on external PPP and TCP/IP protocol stacks and thus minimizes the cost.

UC200T series provide the following socket services: TCP client, UDP client, TCP server and UDP server.

1.1. The Process of Using TCP/IP AT Commands

Through TCP/IP AT commands, the host can configure a PDP context, activate/deactivate the PDP context, start/close socket service and send/receive data via socket service. The following figure illustrates how to use TCP/IP AT commands.

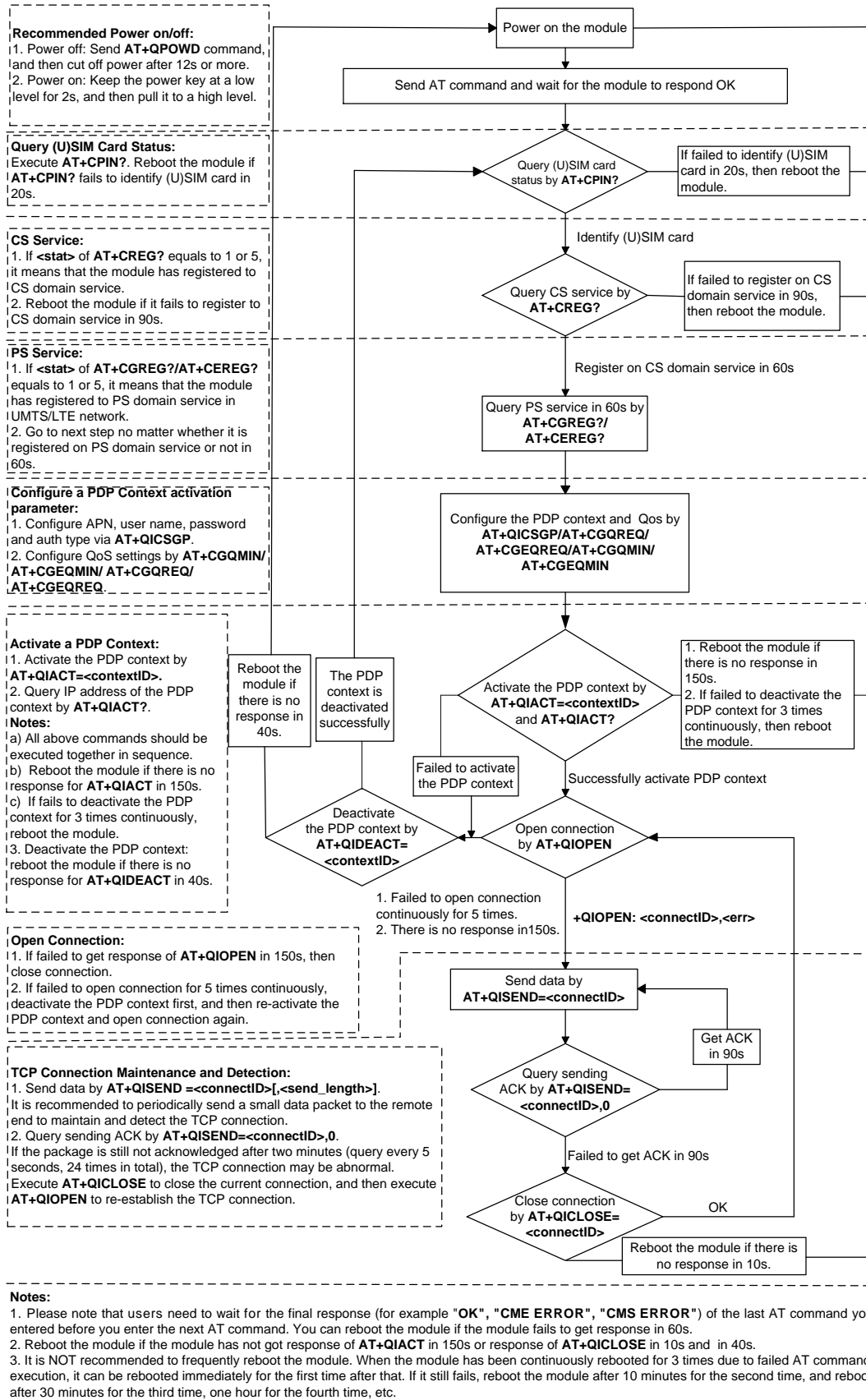


Figure 1: Flow Chart of Using TCP/IP AT Commands

1.2. Description of Data Access Modes

UC200T series support the following three kinds of data access modes:

- Buffer access mode
- Direct push mode
- Transparent access 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, customers can switch the access mode via **AT+QISWTMD**.

1. In buffer access mode, data can be sent via **AT+QISEND** command, and if the module has received the data from the Internet, it will buffer the data and report a URC as **+QIURC: "recv",<connectID>**. Data can be read via **AT+QIRD** command.
2. In direct push mode, data can be sent via **AT+QISEND** command, and if the module has received the data from the Internet, the data will be outputted to COM port directly in the following format:
+QIURC: "recv",<connectID>,<currentrecvlength><CR><LF><data>.
3. In transparent access mode, the corresponding port (such as UART, USB modem port, etc.) enters into the exclusive mode. The data received from COM port will be sent to the Internet directly, and the data received from the Internet will be outputted via COM port directly. **+++** can be used to exit from transparent access mode. When **OK** is returned, the module will be switched to buffer access mode. **AT+QISWTMD** can be used to switch the data access mode back to transparent access mode.

- **Exit from transparent access mode**

To exit from the transparent access mode, **+++** or DTR (**AT&D1** should be set first) can be used. To prevent the **+++** from being misinterpreted as data, the following sequence should be followed:

- 1) Do not input any character within 1s or longer before inputting **+++**.
- 2) Input **+++** within 1 s and no other characters can be inputted during the time.
- 3) Do not input any character within 1s after **+++** has been inputted.
- 4) Use **+++** or DTR (**AT&D1** should be set first) to make the module exit from transparent access mode, and wait until **OK** is returned.

- **Return to transparent access mode**

- 1) By **AT+QISWTMD**. Specify the **<access_mode>** as 2 when executing this command. When transparent access mode has been entered successfully, **CONNECT** will be returned.
- 2) By **ATO**. After a connection exits from transparent access mode, executing **ATO** will switch the data access mode back to transparent access mode again. When transparent access mode has been entered successfully, **CONNECT** will be returned. If no connection has entered transparent

access mode before, **ATO** will return **NO CARRIER**.

NOTES

1. In the 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 the buffer.
2. In transparent access mode, AT commands cannot be executed. If the socket connection is closed because of network error or other errors, the module will report **NO CARRIER** and exit from the transparent access mode. In this case, **AT+QICLOSE** should be executed to close the socket service.

2 Description of TCP/IP AT Commands

2.1. Description of AT Commands

2.1.1. AT+QICSGP Configure Parameters of a TCP/IP Context

The command can be used to configure the <APN>, <username>, <password> and other parameters of a TCP/IP context. The QoS settings can be configured by AT+CGQMIN, AT+CGEQMIN, AT+CGQREQ, and AT+CGEQREQ.

AT+QICSGP Configure Parameters of a TCP/IP Context	
Test Command AT+QICSGP=?	Response +QICSGP: (range of supported <contextID>s),(range of supported <context_type>s),<APN>,<username>,<password>,(range of supported <authentication>s),(list of supported <CDMA_pwd>s) OK
Write Command Configure the context AT+QICSGP=<contextID>[,<context_type>,<APN>[,<username>,<password>][,<authentication>][,<CDMA_pwd>]]]	Response If the parameters <context_type>, <APN>, <username>, <password>, <authentication> and <CDMA_pwd> are omitted, query the current configuration of a specified context: +QICSGP: <context_type>,<APN>,<username>,<password>,<authentication> OK If the parameters <context_type>, <APN>, <username>, <password>, <authentication> and <CDMA_pwd> are entered, configure parameters of a TCP/IP context: OK If there is any error: ERROR
Characteristics	The command takes effect immediately.

The configuration will not be saved.

Parameter

<contextID>	Integer type. The context ID. The range is 1-15.
<context_type>	Integer type. The protocol type. <u>1</u> IPv4 2 IPv6 3 IPv4v6
<APN>	String type. The access point name. The maximum length is 40 bytes.
<username>	String type. The username. The maximum length is 127 bytes.
<password>	String type. The password. The maximum length is 127 bytes.
<authentication>	Integer type. The authentication methods. <u>0</u> None 1 PAP 2 CHAP
<CDMA_pwd>	Integer type. To configure whether to save <username> and <password> over CDMA network. <u>0</u> Disable 1 Enable

Example

```

AT+QICSGP=1 //Query the configuration of context 1.
+QICSGP: 1,"","",",",0

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

2.1.2. AT+QIACT Activate a PDP Context

Before activating a PDP context via **AT+QIACT**, the context should be configured by **AT+QICSGP**. After activation, the IP address can be queried via **AT+QIACT?**.

Although the range of **<contextID>** is 1-15, the module supports maximum three PDP contexts activated simultaneously. Depending on the network, it may take at most 150 seconds to return **OK** or **ERROR** after executing **AT+QIACT**. Before the response is returned, other AT commands cannot be executed.

AT+QIACT Activate a PDP Context	
Test Command AT+QIACT=?	Response +QIACT: (range of supported <contextID> s) OK
Read command AT+QIACT?	Response Return the list of the currently activated contexts and their IP addresses: +QIACT: 1,<context_state>,<context_type>,<IP_address> ... +QIACT: 15,<context_state>,<context_type>,<IP_address> OK
Write Command Activate a specified PDP context AT+QIACT=<contextID>	Response Activate the specified context: OK If there is any error: ERROR
Maximum Response Time	150 seconds, determined by the network.
Characteristics	/

Parameter

<contextID>	Integer type. The context ID. The range is 1-15.
<context_state>	Integer type. The context state. 0 Deactivated 1 Activated
<context_type>	Integer type. The protocol type. 1 IPv4 2 IPv6 3 IPv4v6

<IP_address> String type. The local IP address after the context is activated.

2.1.3. AT+QIDEACT Deactivate a PDP Context

The command is used to deactivate a specific context and close all TCP/IP connections set up in this context. Depending on the network, it may take at most 40 seconds to return **OK** or **ERROR** after executing **AT+QIDEACT**. Before the response is returned, other AT commands cannot be executed.

AT+QIDEACT Deactivate a PDP Context

Test Command AT+QIDEACT=?	Response +QIDEACT: (range of supported <contextID>s) OK
Write Command AT+QIDEACT=<contextID>	Response OK If there is any error: ERROR
Maximum Response Time	40 seconds, determined by the network.
Characteristics	/

Parameter

<contextID> Integer type. The context ID. The range is 1-15.

2.1.4. AT+QIOPEN Open a Socket Service

The command is used to open a socket service. The service type can be specified by **<service_type>** parameter. The data access mode (buffer access mode, direct push mode and transparent access mode) can be specified by **<access_mode>** parameter. The URC **+QIOPEN** indicates whether the socket service has been opened successfully.

1. If **<service_type>** is "TCP LISTENER", the module works as TCP server. After accepting a new TCP connection, the module will automatically specify a **<connectID>** and report a URC as **+QIURC: "incoming",<connectID>,<serverID>,<remoteIP>,<remote_port>**. The range of **<connectID>** is 0-11. The type of this new incoming connection is "TCP INCOMING" and the **<access_mode>** of "TCP INCOMING" is the same with that of "TCP LISTENER".
2. If **<service_type>** is "UDP SERVICE", UDP data can be sent to or received from the remote IP via **<local_port>**.

- Send data: execute **AT+QISEND=<connectID>,<send_length>,<remoteIP>,<remote_port>**.
 - Receive data in direct push mode: the module reports the URC as **+QIURC: "rcv",<connectID>,<currentrecvlength>,<remoteIP>,<remote_port><CR><LF><data>**.
 - Receive data in buffer access mode: the module reports the URC as **+QIURC: "rcv",<connectID>**, and then data can be retrieved via **AT+QIRD=<connectID>**.
3. It is suggested to wait for 150 seconds for **+QIOPEN: <connectID>,<err>** to be outputted. If the URC cannot be received in 150 seconds after executing the Write Command, **AT+QICLOSE** should be used to close the socket.

AT+QIOPEN Open a Socket Service

Test Command AT+QIOPEN=?	Response +QIOPEN: (range of supported <contextID>s),(range of supported <connectID>s),"TCP/UDP/TCP LISTENER/UDP SERVICE", "<IP_address>/<domain_name>",<remote_port>,<local_port>,(range of supported <access_mode>s) OK
Write Command AT+QIOPEN=<contextID>,<connectID>,<service_type>,<IP_address>/<domain_name>,<remote_port>[,<local_port>[,<access_mode>]]	Response If the service is in transparent access mode (<access_mode>=2) and is opened successfully: CONNECT If there is any error: ERROR Error description can be got via AT+QIGETERROR . If the service is in buffer access mode (<access_mode>=0) or direct push mode (<access_mode>=1): OK +QIOPEN: <connectID>,<err> <err> is 0 when the service is opened successfully. In other cases, <err> is not 0.
Maximum Response Time	150 seconds, determined by the network.
Characteristics	/

Parameter

<contextID>	Integer type. Context ID. The range is 1-15.
<connectID>	Integer type. Socket service index. The range is 0-11.

<service_type>	String type. Socket service type. "TCP" Start a TCP connection as a client "UDP" Start a UDP connection as a client "TCP LISTENER" Start a TCP server to listen to TCP connection "UDP SERVICE" Start a UDP service "UDP LISTENER" Start a UDP server to listen to UDP connection
<IP_address>	String type. If <service_type> is "TCP" or "UDP", it indicates the IP address of remote server, such as 220.180.239.212. If <service_type> is "TCP LISTENER" or "UDP SERVICE", please enter 127.0.0.1.
<domain_name>	String type. The domain name address of the remote server.
<remote_port>	The port of the remote server. The range is 0-65535. It must be specified when <service_type> is "TCP" or "UDP".
<local_port>	The local port. The range is 0-65535. If <service_type> is "TCP LISTENER" or "UDP SERVICE", this parameter must be specified. If <service_type> is "TCP" or "UDP", the local port will be assigned automatically if <local_port> is 0. Otherwise the local port is assigned as specified.
<access_mode>	Integer type. The data access mode of the socket service. 0 Buffer access mode 1 Direct push mode 2 Transparent access mode
<err>	Integer type. Error codes of the operation. Please refer to Chapter 4 .

2.1.5. AT+QICLOSE Close a Socket Service

The command is used to close a specified socket service. Depending on the network, it will take at most 10 seconds (default value, can be modified by **<timeout>**) to return **OK** or **ERROR** after executing **AT+QICLOSE**. Before the response is returned, other AT commands cannot be executed.

AT+QICLOSE Close a Socket Service

Test Command AT+QICLOSE=?	Response +QICLOSE: (range of supported <connectID> s),(range of supported <timeout> s) OK
Write Command AT+QICLOSE=<connectID>[,<timeout>]	Response If the socket service is closed successfully: OK If it is failed to close the socket service: ERROR

Characteristics

/

Parameter

<connectID>	Integer type. The socket service index. The range is 0-11.
<timeout>	Integer type. The timeout value for the response to be outputted. If the FIN ACK of the other peer is not received within <timeout> , the module will be forced to close the socket. The range is 0-65535, and the default value is 10. Unit: second.

2.1.6. AT+QISTATE Query Socket Service Status

The command is used to query the socket service status. If the **<query_type>** is 0, it will return the status of all existing socket services in the specified context. If the **<query_type>** is 1, it will return the status of a specified socket service.

AT+QISTATE Query Socket Service Status

Test Command AT+QISTATE=?	Response OK
Read/Execution Command AT+QISTATE? or AT+QISTATE	Response Return the status of all existing connections: +QISTATE: <connectID>,<service_type>,<IP_address>,<remote_port>,<local_port>,<socket_state>,<contextID>,<serverID>,<access_mode>,<AT_port> ... OK
Write Command If <query_type> is 0, query the connection status of a specified context AT+QISTATE=<query_type>,<contextID>	Response Return the status of all existing connections in a specified context: +QISTATE: <connectID>,<service_type>,<IP_address>,<remote_port>,<local_port>,<socket_state>,<contextID>,<serverID>,<access_mode>,<AT_port> ... OK
Write Command If <query_type> is 1, query the connection status of a specified socket service AT+QISTATE=<query_type>,<connectID>	Response +QISTATE: <connectID>,<service_type>,<IP_address>,<remote_port>,<local_port>,<socket_state>,<contextID>,<serverID>,<access_mode>,<AT_port> OK

Characteristics

/

Parameter

<query_type>	Integer type. The query type. 0 Query connection status of all socket services in a specified context 1 Query connection status of a specified socket service
<contextID>	Integer type. The context ID. The range is 1-15.
<connectID>	Integer type. The socket service index. The range is 0-11.
<service_type>	String type. The socket service type. "TCP" Start a TCP connection as a client "UDP" Start a UDP connection as a client "TCP LISTENER" Start a TCP server to listen to TCP connection "TCP INCOMING" Start a TCP connection accepted by a TCP server "UDP SERVICE" Start a UDP service "UDP LISTENER" Start a UDP server to listen to UDP connection "UDP INCOMING" Start a UDP connection accepted by a UDP server
<IP_address>	String type. IP address. If <service_type> ="TCP" or "UDP", it is the IP address of remote server. If <service_type> ="TCP LISTENER" or "UDP SERVICE", it is the local IP address. If <service_type> ="TCP INCOMING" or "UDP INCOMING", it is the IP address of remote client.
<remote_port>	Integer type. Remote port number. If <service_type> ="TCP" or "UDP", it is the port of remote server. If <service_type> ="TCP LISTENER" or "UDP SERVICE", the port is invalid. If <service_type> ="TCP INCOMING" or "UDP INCOMING", it is the port of remote client.
<local_port>	Integer type. Local port number. If <local_port> is 0, then the local port is assigned automatically.
<socket_state>	Integer type. The socket service status. 0 "Initial": connection has not been established 1 "Opening": client is connecting or server is trying to listen 2 "Connected": client/incoming connection has been established 3 "Listening": server is listening 4 "Closing": connection is closing
<serverID>	Integer type. It is valid only when <service_type> is "TCP INCOMING". <serverID> represents which server accepts this TCP incoming connection, and the value is the same as <connectID> of this server's "TCP LISTENER".
<access_mode>	Integer type. Data access mode. 0 Buffer access mode 1 Direct push mode 2 Transparent access mode
<AT_port>	String type. COM port of socket service.

"usbmodem"	USB modem port
"usbat"	USB AT port
"uart1"	UART port1
"cmux1"	MUX port 1
"cmux2"	MUX port 2
"cmux3"	MUX port 3
"cmux4"	MUX port 4

2.1.7. AT+QISEND Send Data

If the data access mode of a specified socket service is buffer access mode (<access_mode>=0) or direct push mode (<access_mode>=1), then the data can be sent via this command. When the data is sent to the module successfully, **SEND OK** will be returned. Otherwise, it will return **SEND FAIL** or **ERROR**. **SEND FAIL** indicates the sending buffer is full and customers can try to resend the data. **ERROR** indicates it encounters an error in the process of sending data. The data should be delayed for some time to be sent. The maximum data length is 1460 bytes. **SEND OK** does not mean the data has been sent to the server successfully. Customers can query whether the data has reached the server by **AT+QISEND=<connectID>,0** command.

AT+QISEND Send Data

Test Command AT+QISEND=?	Response +QISEND: (range of supported <connectID>s),(range of supported <send_length>s) OK
Write Command Send variable-length data when <service_type> is "TCP", "UDP" or "TCP INCOMING" AT+QISEND=<connectID>	Response > After the response >, input the data to be sent. Tap CTRL+Z to send, and tap Esc to cancel the operation If the connection has been established and the data is sent successfully: SEND OK If the connection has been established and the data is sent successfully: SEND FAIL If the connection has been established but the sending buffer is full: ERROR
Write Command	Response

<p>Send fixed-length data when <service_type> is "TCP", "UDP" or "TCP INCOMING" AT+QISEND=<connectID>,<send_length></p>	<p>> After the response >, input the data until the data length equals to <send_length>.</p> <p>If the connection has been established and the data is sent successfully: SEND OK</p> <p>If the connection has been established but the sending buffer is full: SEND FAIL</p> <p>If the connection has not been established, abnormally closed, or any parameter is incorrect: ERROR</p>
<p>Write Command If <service_type> is "UDP SERVICE" AT+QISEND=<connectID>,<send_length>,<remoteIP>,<remote_port></p>	<p>Response This command is used to send fixed-length data to a specified remote IP address and a remote port. The <service_type> must be "UDP SERVICE".</p> <p>> After responding >, input the data until the data length equals to <send_length></p> <p>If the connection has been established and the data is sent successfully: SEND OK</p> <p>If the connection has been established but the sending buffer is full: SEND FAIL</p> <p>If the connection has not been established, abnormally closed, or any parameter is incorrect: ERROR</p>
<p>Write Command When <send_length> is 0, query the sent data AT+QISEND=<connectID>,0</p>	<p>Response If the specified connection exists: +QISEND: <total_send_length>,<ackedbytes>,<unacked bytes></p> <p>OK</p> <p>If there is any error: ERROR</p>

Characteristics /

Parameter

<connectID>	Integer type. Socket service index. The range is 0-11.
<send_length>	Integer type. The length of data to be sent, which cannot exceed 1460 bytes.
<remoteIP>	String type. The remote IP address (must be dot format). It is valid only when <service_type> is "UDP SERVICE".
<remote_port>	Integer type. Remote port. It is only valid when <service_type> is "UDP SERVICE".
<total_send_length>	Integer type. The total length of sent data. Unit: byte.
<ackedbytes>	Integer type. The total length of acknowledged data. Unit: byte.
<unackedbytes>	Integer type. The total length of unacknowledged data. Unit: byte.
<err>	Integer type. Error codes of the operation. Please refer to Chapter 4 .

2.1.8. AT+QIRD Read the Received TCP/IP Data

In buffer access mode, after receiving data, the module will buffer it and report **+QIURC: "recv",<connectID>**, then the data can be read by **AT+QIRD**.

AT+QIRD Read the Received TCP/IP Data

Test Command AT+QIRD=?	Response +QIRD: (range of supported <connectID>s),(range of supported <read_length>s) OK
Write Command When <service_type> is "TCP", "UDP", "TCP INCOMING" or "UDP INCOMING" AT+QIRD=<connectID>[,<read_length>]	Response If the specified connection has received the data, response: +QIRD: <read_actual_length><CR><LF><data> OK If there is no data: +QIRD: 0 OK If the connection does not exist: ERROR
Write Command When <service_type> is "UDP"	Response If data exists:

<p>SERVICE" AT+QIRD=<connectID></p>	<p>+QIRD: <read_actual_length>,<remoteIP>,<remote_port><CR><LF><data></p> <p>OK</p> <p>If there is no data: +QIRD: 0</p> <p>OK</p> <p>If the connection does not exist: ERROR</p>
<p>Write Command When <read_length> is 0, query the retrieved data length AT+QIRD=<connectID>,0</p>	<p>Response If the specified connection exists: +QIRD: <total_receive_length>,<have_read_length>,<unread_length></p> <p>OK</p> <p>If there is any error: ERROR</p>
<p>Characteristics</p>	<p>/</p>

Parameter

<connectID>	Integer type. The socket service index. The range is 0-11.
<read_length>	The maximum length of data to be read. The range is 0-1500. Unit: byte.
<read_actual_length>	The length of data that has been actually read. Unit: byte.
<remoteIP>	String type. The remote IP address. It is valid only when <service_type> is "UDP SERVICE".
<remote_port>	Integer type. Remote port. It is valid only when <service_type> is "UDP SERVICE".
<data>	The data that has been read.
<total_receive_length>	The total length of the read data. Unit: byte.
<have_read_length>	The length of data that has been read. Unit: byte.
<unread_length>	The length of data that has not been read. Unit: byte.

NOTE

Please 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 read via **AT+QIRD** from the buffer.

2.1.9. AT+QISENDEX Send Hex String Data

This command is used to send hex string data and cannot be applied for "UDP SERVICE" and "TCP LISTENER" sockets.

AT+QISENDEX Send Hex String Data	
Test Command AT+QISENDEX=?	Response +QISENDEX: (range of supported <connectID>s),<hex_string> OK
Write Command AT+QISENDEX=<connectID>,<hex_string>	Response If the hex string is sent successfully: SEND OK If the sending buffer is full: SEND FAIL If the connection does not exist: ERROR
Characteristics	/

Parameter

<connectID>	Integer type. The socket service index. The range is 0-11.
<hex_string>	String type. Hex string data. The max length is 512 bytes.

2.1.10. AT+QISWTMD Switch Data Access Mode

The command can be used to switch the data access mode which includes buffer access mode, direct push mode, and transparent access mode. When starting a socket service, the data access mode can be specified via the <access_mode> parameter of **AT+QIOPEN**. After a socket has been opened, the data access mode can be changed via **AT+QISWTMD**.

AT+QISWTMD Switch Data Access Mode	
Test Command AT+QISWTMD=?	Response +QISWTMD: (range of supported <connectID>s),(range of supported <access_mode>s) OK
Write Command	Response

AT+QISWTMD=<connectID>,<access_mode>	<p>If data access mode is switched successfully and <access_mode> is 0 or 1: OK</p> <p>If data access mode is switched successfully and <access_mode> is 2, the module will enter data mode: CONNECT</p> <p>If there is any error: ERROR</p>
Characteristics	<p>The command takes effect immediately. The configuration will not be saved.</p>

Parameter

<connectID>	Integer type. The socket service index. The range is 0-11.
<access_mode>	Integer type. The data access modes of the connection.
	0 Buffer access mode
	1 Direct push mode
	2 Transparent access mode

2.1.11. AT+QPING Ping a Remote Server

The command is used to test the Internet protocol reachability of a host. Before using ping tools, the host should activate the context corresponding to <contextID> via **AT+QIACT** first. It will return the result within <timeout> and the default value of <timeout> is 4 seconds.

AT+QPING Ping a Remote Server

<p>Test Command AT+QPING=?</p>	<p>Response +QPING: (range of supported <contextID>s),<host>,(range of supported <timeout>s),(range of supported <pingnum>s)</p> <p>OK</p>
<p>Write Command AT+QPING=<contextID>,<host>[,<timeout>[,<pingnum>]]</p>	<p>Response If a remote server is pinged successfully: OK</p> <p>+QPING: <result>,<IP_address>,<bytes>,<time>,<tTL><CR><LF>...</p> <p>+QPING: <finresult>,<sent>,<rcvd>,<lost>,<min>,<max>,<avg></p>

	If there is any error: ERROR
Characteristics	/

Parameter

<contextID>	Integer type. The context ID. The range is 1-15.
<host>	The host address in string type. The format is a domain name or a dotted-decimal IP address.
<timeout>	Integer type. Set the maximum time to wait for the response of each ping request. The range is 1-255, and the default value is 4. Unit: second. If this parameter is omitted in Write Command, the default value will be used.
<pingnum>	Integer type. Set the maximum number of times for sending ping request. The range is 1-10, and the default value is 4. If this parameter is omitted in Write Command, the default value will be used.
<result>	The result of each ping request. 0 Received the ping response from the server. In this case, it is followed by <IP_address>,<bytes>,<time>,<tTl> . Others Please refer to Chapter 4 .
<IP_address>	The IP address of the remote server formatted as a dotted-decimal IP.
<bytes>	The length of each sent ping request. Unit: byte.
<time>	The time wait for the response of the ping request. Unit: ms.
<tTl>	Time to live value of the response packet for the ping request.
<finresult>	The final result of the command. 0 It is finished normally. It is successful to activate the context and find the host. In this case, it is followed by <sent>,<rcvd>,<lost>,<min>,<max>,<avg> . Others Error codes. Please refer to Chapter 4 for details.
<sent>	Total number of the ping requests that have been sent.
<rcvd>	Total number of the ping requests that received the response.
<lost>	Total number of the ping requests that are time out.
<min>	The minimum response time. Unit: ms.
<max>	The maximum response time. Unit: ms.
<avg>	The average response time. Unit: ms.

2.1.12. AT+QNTF Synchronize Local Time with NTP Server

This command is used to synchronize the local time with Universal Time Coordinated (UTC) through the NTP server. Before time synchronization, the host should activate the context corresponding to **<contextID>** via **AT+QIACT** first. Depending on the network, it will take at most 125 seconds to return the result.

AT+QNTF Synchronize Local Time with NTP Server	
Test command AT+QNTF=?	Response +QNTF: (range of supported <contextID> s), <server> ,(range of supported <port> s),(list of supported <autosettime> s) OK
Read command AT+QNTF?	Response If in the process of local time synchronization: +QNTF: <server> , <port> OK
Write command AT+QNTF=<contextID> , <server> [,<port>] [,<autosettime>]	Response If the local time is synchronized with NTP server successfully: OK +QNTF: <err> , <time> If there is any error: ERROR
Maximum Response Time	125 s, determined by the network.
Characteristics	The command takes effect immediately. The configuration will not be saved.

Parameter

<contextID>	Integer type. The context ID. The range is 1-15.
<server>	String type. The address of NTP server.
<port>	Integer type. The port of NTP server. The range is 1-65535.
<autosettime>	Integer type. Whether to automatically set synchronized time as local time. 0 Not set 1 Set
<err>	Integer type. Error codes of the operation. Please refer to Chapter 4 for details.
<time>	String type. The time synchronized from NTP server. The format is YYYY/MM/DD,hh:mm:ss±zz. The range of zz is -48~+56.

2.1.13. AT+QIDNSCFG Configure Address of DNS Server

Before setting the DNS address, the host must activate the context corresponding to **<contextID>** via **AT+QIACT** first.

AT+QIDNSCFG Configure Address of DNS Server	
Test command AT+QIDNSCFG=?	Response +QIDNSCFG: (range of supported <contextID>s),<pridnsaddr>,<secdnsaddr> OK
Write Command AT+QIDNSCFG=<contextID>[,<pridnsaddr>[,<secdnsaddr>]]	Response If <pridnsaddr> and <secdnsaddr> are omitted, query the current DNS server addresses of a specified PDP context: +QIDNSCFG: <contextID>,<pridnsaddr>,<secdnsaddr> OK If <pridnsaddr> and <secdnsaddr> are entered, configure the primary and secondary DNS server addresses of a specified PDP context: OK If there is any error: ERROR
Characteristics	The command takes effect immediately. The configuration will not be saved.

Parameter

<contextID>	Integer type. The PDP context ID. The range is 1-15.
<pridnsaddr>	String type. The primary DNS server address.
<secdnsaddr>	String type. The secondary DNS server address.

2.1.14. AT+QIDNSGIP Get IP Address by Domain Name

Before querying the DNS, the host should activate the context corresponding to **<contextID>** via **AT+QIACT** first. Depending on the network, it will take at most 60 seconds to return the result.

AT+QIDNSGIP Get IP Address by Domain Name	
Test Command AT+QIDNSGIP=?	Response +QIDNSGIP: (range of supported <contextID>s),<hostname> OK
Write Command AT+QIDNSGIP=<contextID>,<hostname>	Response OK If there is any error: ERROR The result will be returned as URC. +QIURC: "dnsgip",<err>,<IP_count>,<DNS_ttl> +QIURC: "dnsgip",<hostIPAddr>
Maximum Response Time	60 s, determined by the network.
Characteristics	/

Parameter

<contextID>	Integer type. The PDP context ID. The range is 1-15.
<hostname>	String type. The domain name.
<err>	Integer type. Error codes of the operation. Please refer to Chapter 4 .
<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> .

2.1.15. AT+QICFG Configure Optional Parameters

The command is used to configure optional parameters.

AT+QICFG Configure Optional Parameters	
<p>Test Command AT+QICFG=?</p>	<p>Response</p> <p>+QICFG: "transpktsize",(range of supported <transpktsize>s) +QICFG: "transwaittm",(range of supported <transwaittm>s) +QICFG: "dataformat",(list of supported <send_data_format>s),(list of supported <recv_data_format>s) +QICFG: "viewmode",(list of supported <view_mode>s) +QICFG: "passiveclosed",(list of supported <closed>s) +QICFG: "udp/readmode",(list of supported <mode>s) +QICFG: "udp/sendmode",(list of supported <mode>s) +QICFG: "tcp/keepalive",(list of supported <enable>s),(range of supported <idle_time>s),(range of supported <interval_time>s),(range of supported <probe_cnt>s)</p> <p>OK</p>
<p>Write Command Configure the packet size for transparent access mode AT+QICFG="transpktsize"[,<transpktsize>]</p>	<p>Response</p> <p>If the parameter <transpktsize> is omitted, query the current configuration: +QICFG: "transpktsize",<transpktsize></p> <p>OK</p> <p>If the parameter <transpktsize> is entered, configure the max length of the data packet to be sent: OK</p> <p>If there is any error: ERROR</p>
<p>Write Command Configure the waiting time for transparent access mode AT+QICFG="transwaittm"[,<transwaittm>]</p>	<p>Response</p> <p>If the parameter <transwaittm> is omitted, query the current configuration: +QICFG: "transwaittm",<transwaittm></p> <p>OK</p> <p>If the parameter <transwaittm> is entered, configure the waiting time: OK</p> <p>If there is any error: ERROR</p>

<p>Write Command</p> <p>Configure the format of the data to be sent or received (only for non-transparent mode)</p> <p>AT+QICFG="dataformat",<send_data_format>,<recv_data_format>]</p>	<p>Response</p> <p>If the parameters <send_data_format> and <recv_data_format> are omitted, query the current configuration:</p> <p>+QICFG: "dataformat",<send_data_format>,<recv_data_format></p> <p>OK</p> <p>If the parameters <send_data_format> and <recv_data_format> are entered, configure the format of the data to be sent or received:</p> <p>OK</p> <p>If there is any error:</p> <p>ERROR</p>
<p>Write Command</p> <p>Configure the output format of received data (only for non-transparent mode)</p> <p>AT+QICFG="viewmode",<view_mode>]</p>	<p>Response</p> <p>If the parameter <view_mode> is omitted, query the current configuration:</p> <p>+QICFG: "viewmode",<view_mode></p> <p>OK</p> <p>If the parameter <view_mode> is entered, configure the output format of received data:</p> <p>OK</p> <p>If there is any error:</p> <p>ERROR</p>
<p>Write Command</p> <p>Enable or disable the passive close of TCP connection when the server is closed</p> <p>AT+QICFG="passiveclosed",<closed>]</p>	<p>Response</p> <p>If the parameter <closed> is omitted, query the current configuration:</p> <p>+QICFG: "passiveclosed",<closed></p> <p>OK</p> <p>If the parameter <closed> is entered, configure whether to enable the passive close of TCP connection when the server is closed:</p> <p>OK</p> <p>If there is any error:</p> <p>ERROR</p>
<p>Write Command</p> <p>Read UDP data mode</p> <p>AT+QICFG="udp/readmode",<mode>]</p>	<p>Response</p> <p>If the parameter <mode> is omitted, query the current configuration:</p>

<p>de]</p>	<p>+QICFG: "udp/readmode",<mode></p> <p>OK</p> <p>If the parameter <mode> is entered, configure the read mode: OK</p> <p>If there is any error: ERROR</p>
<p>Write Command Send UDP data mode AT+QICFG="udp/sendmode"[,mode]</p>	<p>Response</p> <p>If the parameter <mode> is omitted, query the current configuration: +QICFG: "udp/sendmode",<mode></p> <p>OK</p> <p>If the parameter <mode> is entered, configure the sending mode: OK</p> <p>If there is any error: ERROR</p>
<p>Write Command Send TCP keepalive AT+QICFG="tcp/keepalive",<enable>[,<idle_time>,<interval_time>,<probe_cnt>]</p>	<p>Response</p> <p>If the parameters <idle_time>, <interval_time> and <probe_cnt> are omitted, query the current configuration: "tcp/keepalive",<enable><idle_time>,<interval_time>,<probe_cnt></p> <p>OK</p> <p>If the parameters <idle_time>, <interval_time> and <probe_cnt> are entered, configure the cycle time of keepalive triggered, the interval of sending a packet in cycle time and the cnt of packet send in a cycle time: OK</p> <p>If there is any error: ERROR</p>
<p>Characteristics</p>	<p>The command takes effect immediately. The configuration will not be saved.</p>

Parameter

<transpktsize>	Integer type. The max length of the data packet to be sent. The range is 1-1460. The default value is 1024. Unit: byte.
<transwaittm>	Integer type. In transparent access mode, if the length of data received from the port is less than the specified value of <transpktsize> , after exceeding the time of <transwaittm> , data will be sent directly. The range is 0-20, and the default value is 2. Unit: 100 ms.
<send_data_format>	Integer type. The format of the data to be sent. The suffix "0x" is not needed when the mode is set as Hex mode as the module will automatically form two bytes to one ASCII code. <u>0</u> Text mode 1 Hex mode
<recv_data_format>	Integer type. The format of the data to be received. The suffix "0x" is not needed when the mode is set as Hex mode as the module will automatically form two bytes to one ASCII code. <u>0</u> Text mode 1 Hex mode
<view_mode>	Integer type. The output format of received data. <u>0</u> Output format of received data: data header\r\n\data. 1 Output format of received data: data header,data.
<closed>	Integer type. <u>0</u> Disable the passive close of TCP connection when the server is closed. 1 Enable the passive close of TCP connection when the server is closed.
<mode>	Integer type. <u>0</u> Block mode. 1 Stream mode.
<state>	Integer type. <u>0</u> Disable auto accepting incoming TCP connection from the client. <u>1</u> Enable auto accepting incoming TCP connection from the client.
<enable>	Integer type. it means whether to send TCP keepalive <u>0</u> Disable corresponding function 1 Enable corresponding function
<idle_time>	Integer type. Indicates the cycle time of keepalive triggered, the range is 1-1800, unit: seconds
<interval_time>	Integer type. Indicates the interval of send a packet in a cycle time, the range is 25-100, unit: seconds.
<probe_cnt>	Integer type. Indicates the cnt of packet send in a cycle time, the range is 3-10, unit: seconds

2.1.16. AT+QISDE Control Whether to Echo the Data for AT+QISEND

This command is used to control whether to echo the data for **AT+QISEND**.

AT+QISDE Control Whether to Echo the Data for AT+QISEND	
Test command AT+QISDE=?	Response +QISDE: (list of supported <echo> s) OK
Read command AT+QISDE?	Response +QISDE: <echo> OK
Write Command AT+QISDE=<echo>	Response OK If there is any error: ERROR
Characteristics	The command takes effect immediately. The configuration will not be saved.

Parameter

<echo>	Numeric type. Whether to echo the data for AT+QISEND .
0	Not echo the data
<u>1</u>	Echo the data

2.1.17. AT+QIGETERROR Query the Last Error Code

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

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

Characteristics	/
-----------------	---

Parameter

<err>	Integer type. Error codes of the operation. Please refer to Chapter 4 .
<errcode_description>	A string parameter indicates the details of error information. Please refer to Chapter 4 for details.

2.2. Description of URCs

The URC of TCP/IP AT commands will be reported to the host in the format of beginning with **+QIURC:**. It contains reports about incoming data, connection closed and incoming connection and so on. There is **<CR><LF>** both before and after URC, but **<CR><LF>** is not presented intentionally.

2.2.1. URC Indicating Connection Closed

When TCP socket service is closed by a remote peer or due to network error, the URC will be outputted, and the status of socket service will be "closing" (**<socket_state>=4**). **AT+QICLOSE=<connectID>** can be used to change the **<socket_state>** to "initial".

URC Indicating Connection Closed

+QIURC: "closed",<connectID>	Socket service connection is closed.
---	--------------------------------------

Characteristics	/
-----------------	---

Parameter

<connectID>	Integer type. The socket service index. The range is 0-11.
--------------------------	--

2.2.2. URC Indicating Incoming Data

In buffer access mode or direct push mode, after receiving data, the module will report a URC to the host.

In buffer access mode, after receiving data, the module will report URC as **+QIURC: "recv",<connectID>** to notify the host. Then host can retrieve data via **AT+QIRD**. Please 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+QIRD** from buffer.

In direct push mode, the received data will be outputted to COM port directly.

URC Indicating Incoming Data	
+QIURC: "recv",<connectID>	The URC indicates the incoming data in buffer access mode. The host can receive data via AT+QIRD .
+QIURC: "recv",<connectID>,<currentrecvlength><CR><LF><data>	The URC indicates the incoming data in direct push mode when the <service_type> is "TCP", "UDP", "UDP INCOMING" or "TCP INCOMING".
+QIURC: "recv",<connectID>,<currentrecvlength>,<remoteIP>,<remote_port><CR><LF><data>	The URC indicates data incoming in direct push mode when <service_type> is "UDP SERVICE".
Characteristics	/

Parameter

<connectID>	Integer type. The socket service index. The range is 0-11.
<currentrecvlength>	Integer type. The length of received data.
<remoteIP>	Remote IP address.
<remote_port>	Remote port.
<data>	The received data.

2.2.3. URC Indicating Incoming Connection Full

If the incoming connection reaches the limit, or no socket system resources can be allocated, then the module will report the URC as **+QIURC: "incoming full"** for the new incoming connection request.

URC Indicating Incoming Connection Full

+QIURC: "incoming full"	The URC indicates the incoming connection is full.
Characteristics	/

2.2.4. URC Indicating Incoming Connection

If the **<service_type>** is "TCP LISTENER" or "UDP LISTENER", when a remote client connects to this server, the host will automatically assign a free **<connectID>** for the new connection. The range of **<connectID>** is 0-11. In such a case, the module will report the URC. The **<service_type>** of the new connection will be "TCP INCOMING", and the **<access_mode>** will be buffer access mode.

URC Indicating Incoming Connection

+QIURC: "incoming",<connectID>,<serverID>,<remoteIP>,<remote_port>	When the new incoming connection is accepted by <serverID> , the allocated <connectID> , <remoteIP> and <remote_port> will be informed by this URC.
Characteristics	/

Parameter

<connectID>	Integer type. Assign this socket service for the incoming connection, which is automatically specified by the module. The range is 0-11.
<serverID>	The incoming <connectID> accepted by the server whose <service_type> is "TCP LISTENER" or "UDP LISTENER" and listening socket ID is <serverID> .
<remoteIP>	Remote IP address of the incoming <connectID> .
<remote_port>	Remote port of the incoming <connectID> .

2.2.5. URC Indicating PDP Deactivation

PDP context may be deactivated by the network. The module will report the URC to the host about PDP deactivation. In such a case, the host must execute **AT+QIDEACT** to deactivate the context and reset all connections.

URC Indicating PDP Deactivation

+QIURC: "pdpdeact",<contextID>	<contextID> context is deactivated.
Characteristics	/

Parameter

<contextID>	Integer type. The context ID. The range is 1-15.
--------------------------	--

3 Examples

3.1. Configure and Activate a Context

3.1.1. Configure a Context

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

3.1.2. Activate a Context

```
AT+QIACT=1 //Activate context 1. Depending on the network, the maximum response time is 150s.  
OK //Activated the context successfully.
```

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

```
OK
```

3.1.3. Deactivate a Context

```
AT+QIDEACT=1 //Deactivate context 1.  
OK //Deactivated the context successfully. Depending on the  
network, the maximum response time is 40 s.
```

3.2. TCP Client Works in Buffer Access Mode

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

```
AT+QIOPEN=1,0,"TCP","220.180.239.212",8009,0,0 //Context is 1 and <connectID> is 0. Before  
using AT+QIOPEN, the host should activate  
the context with AT+QIACT first.
```

```
OK
```

+QIOPEN: 0,0 //TCP client is connected successfully. It is recommended to wait for 150 seconds for the URC response as **+QIOPEN: <connectID>,<err>**. If the URC response cannot be received in 150 seconds, the host could use **AT+QICLOSE** to close the socket.

AT+QISTATE=1,0 //Query the connection status of socket service 1.
+QISTATE: 0,"TCP","220.180.239.201",8009,65514,2,1,0,0,"usbmodem"

OK

3.2.2. Send Data in Buffer Access Mode

AT+QISEND=0 //Send variable-length data.
> test1<ctrl+Z>
SEND OK //**SEND OK** does not mean the data has been sent to the server successfully. The host can query whether the data has reached the server via **AT+QISEND=0,0**.

AT+QISEND=0,4 //Send fixed-length data and the data length is 4 bytes.
> test
SEND OK

AT+QISEND=0,0 //Query the length of the sent data.
+QISEND: 9,9,0

OK
AT+QISENDEX=0,"3132333435" //Send Hex string data.
SEND OK

AT+QISEND=0,0 //Query the length of sent data, acknowledged data and unacknowledged data.
+QISEND: 14,14,0

OK

3.2.3. Receive Data from Remote Server in Buffer Access Mode

+QIURC: "recv",0 //The received data when **<connectID>=0**.
AT+QIRD=0,1500 //Read data, the maximum length of data to be retrieved is 1500 bytes.
+QIRD: 5 //The length of actually received data is 5 bytes.
test1
OK

```
AT+QICFG="recv",1
OK
+QIURC: "recv",0,5 //The <connectID>= 0 received 5 bytes data.

AT+QIRD=0,1500 //Read data, and the length is 1500 bytes.
+QIRD: 5 //The length of actual received data is 5 bytes.
test1

OK

AT+QIRD=0,1500
+QIRD: 0 //No data in the buffer.

OK

AT+QIRD=0,0 //Query the total length of received data, including read and unread data.
+QIRD: 10,10,0

OK
```

3.2.4. Close a Connection

```
AT+QICLOSE=0 //Close a connection whose <connectID> is 0. Depending on the
network, the maximum response time is 10 s.

OK
```

3.3. TCP Client Works in Transparent Access Mode

3.3.1. Set up a TCP Client Connection and Enter into Transparent Access Mode

```
AT+QIOPEN=1,0,"TCP","220.180.239.212",8009,0,2 //Context is 1 and <connectID> is 0. Before
using AT+QIOPEN, the host should activate the
context with AT+QIACT first.

CONNECT //TCP client is connected successfully. It is
suggested to wait for 150 seconds for the URC
response as CONNECT. If the URC response
cannot be received in 150 seconds, the host
could use AT+QICLOSE to close the socket.
```


3.3.2. Send Data in Transparent Access Mode

<All data got from COM port will be sent to internet directly>

3.3.3. Receive Data from Remote Server in Transparent Access Mode

Test 1 //All data received from internet will be outputted via COM port directly.

3.3.4. Close a TCP Client

AT+QICLOSE=0 //After using +++ to exit from the transparent access mode, the host could use **AT+QICLOSE** to close the TCP link. Depending on the network, the maximum response time is 10 s.

OK

3.4. TCP Client Works in Direct Push Mode

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

AT+QIOPEN=1,0,"TCP","220.180.239.212",8009,0,1 //Context is 1 and <connectID> is 0. Before using **AT+QIOPEN**, the host should activate the context via **AT+QIACT** first.

OK

+QIOPEN: 0,0

//TCP client is connected successfully. It is suggested to wait for 150 seconds for the URC response as **+QIOPEN: <connectID>,<err>**. If the URC response cannot be received in 150 seconds, the host could use **AT+QICLOSE** to close the socket.

AT+QISTATE=1,0

//Query if the connection state of <connectID> is 0.

+QISTATE: 0,"TCP","220.180.239.201",8009,65344,2,1,0,1,"usbmodem"

OK

3.4.2. Send Data in Direct Push Mode

```
AT+QISEND=0 //Send variable-length data.
> test1<ctrl+Z>
SEND OK //SEND OK does not mean the data has been sent to the server successfully. The
host can query whether the data has reached the server via AT+QISEND=0,0.

AT+QISEND=0,5 //Send fixed-length data and the data length is 5 bytes.
> test2
SEND OK

AT+QISEND=0,0 //Query the length of the sent data, acknowledged data and unacknowledged
data.
+QISEND: 10,10,0 //A total of 10 bytes data has been sent, and all the 10-byte data has been
acknowledged.

OK
```

3.4.3. Receive Data from Remote Server in Direct Push Mode

```
+QIURC: "recv",0,4 //Receive data from remote server.
test
```

3.4.4. Close a TCP Client

```
AT+QICLOSE=0 //Close the connection whose <connectID> is 0. Depending on the network, the
maximum response time is 10 s.

OK
```

3.5. TCP Server Works in Buffer Access Mode

3.5.1. Start a TCP Server

```
AT+QIOPEN=1,1,"TCP LISTENER","127.0.0.1",0,2020,0 //Context is 1 and <connectID> is 1. Before
using AT+QIOPEN, the host should
activate the context with AT+QIACT first.

OK

+QIOPEN: 1,0 //TCP server is opened successfully.
```

```
AT+QISTATE=0,1 //Query whether the connection state of
                <contextID> is 1.
+QISTATE: 1,"TCP LISTENER","10.7.157.1",0,2020,3,1,1,0,"usbmodem"
OK
```

3.5.2. Accept TCP Incoming Connection

```
+QIURC: "incoming",11,1,"172.31.242.222",54091 //Accept a TCP connection. The <service_type>
                                                is "TCP incoming", and <connectID> is 11.
```

3.5.3. Receive Data from Incoming Connection

```
+QIURC: "recv",11 //Receive data from remote incoming connection.
AT+QIRD=11,1500 //Read data received from the incoming connection.
+QIRD: 4 //Actual data length is 4 bytes.
test
OK

AT+QIRD=11,1500
+QIRD: 0 //No data in the buffer.
OK

AT+QIRD=11,0 //Query the total length of received data, including read and unread data.
+QIRD: 4,4,0
OK
```

3.5.4. Close a TCP Server

```
AT+QICLOSE=11 //Close the incoming connection. Depending on
               the network, the maximum response time is 10 s.
OK

AT+QICLOSE=1 //Close TCP server listening.
OK
```

3.6. UDP Service

3.6.1. Start a UDP Service

```
AT+QIOPEN=1,2,"UDP SERVICE","127.0.0.1",0,3030,0 //Start a UDP service. The <connectID> is 2
                                                    and <contextID> is 1. Before using
                                                    AT+QIOPEN, the host should activate the
                                                    context with AT+QIACT first.

OK

+QIOPEN: 2,0 //UDP service is opened successfully.

AT+QISTATE=0,1 //Query if the connection status of <contextID> is 1.
+QISTATE: 2,"UDP SERVICE","10.7.157.1",0,3030,2,1,2,0,"usbmodem"

OK
```

3.6.2. Send UDP Data to Remote

```
AT+QISEND=2,10,"10.7.89.10",6969 //Send 10 bytes data to remote whose IP is
10.7.89.10 and the remote port is 6969.

>1234567890
SEND OK
```

3.6.3. Receive Data from Remote

```
+QIURC: "recv",2 //Received data from the remote.

AT+QIRD=2 //Retrieve UDP data. One whole UDP packet will be outputted.
There is no need to specify the read length.

+QIRD: 4,"10.7.76.34",7687 //Data length is 4. The remote IP address is 10.7.76.34 and
remote port is 7687.

AAAA

OK

AT+QIRD=2 //Read data.
+QIRD: 0 //No data in the buffer.

OK
```

```
AT+QISEND=2,10,"10.7.76.34",7687 //Send data to the remote whose IP is 10.7.76.34 and remote
port is 7687.
>1234567890
SEND OK
```

3.6.4. Close a UDP Service

```
AT+QICLOSE=2 //Close the service.
OK
```

3.7. PING

```
AT+QPING=1,"www.baidu.com" //Ping www.baidu.com in context 1. Before pinging the destination
IP address, the host should activate the context by AT+QIACT first.
OK
+QPING: 0,"61.135.169.125",32,192,255
+QPING: 0,"61.135.169.125",32,240,255
+QPING: 0,"61.135.169.125",32,241,255
+QPING: 0,"61.135.169.125",32,479,255
+QPING: 0,4,4,0,192,479,287
```

3.8. Synchronize Local Time

```
AT+QNTP=1,"202.112.10.36",123 //Synchronize local time with NTP server "202.112.10.36:123".
Before synchronizing the time, the host should activate the context
with AT+QIACT first.
OK
+QNTP: 0,"2019/07/21,06:10:59+00"
AT+CCLK?
+CCLK: "19/07/21,06:11:05+00"
```

OK

3.9. Get Last Error Code

```
AT+QIOPEN=1,"TCP","220.180.239.212",8009,0,1 //Start a socket service, and <connectID> is not  
specified.
```

ERROR

```
AT+QIGETERROR
```

```
+QIGETERROR: 552, invalid parameters
```

OK

4 Summary of Error Codes

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

Table 1: Summary of Error Codes

<err>	Meaning
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

5 Appendix A Reference

Table 2: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
ASCII	American Standard Code for Information Interchange
CHAP	Challenge Handshake Authentication Protocol
CS	Circuit Switching
DNS	Domain Name System
IP	Internet Protocol
NTP	Network Time Protocol
PDP	Packet Data Protocol
PPP	Point-to-Point Protocol
QoS	Quality of Service
TCP	Transmission Control Protocol
IP	Internet Protocol
UART	Universal Asynchronous Receiver& Transmitter
UDP	User Datagram Protocol
URC	Unsolicited Result Code
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
UTC	Coordinated Universal Time