SIM7020 Series_ TCPIP_Application Note

LPWA Module
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About Document

Version History

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<th>Date</th>
<th>Owner</th>
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<tr>
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Scope

This document applies to the following products

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<tr>
<th>Name</th>
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<tr>
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<td>NB1</td>
<td>17.6*15.7</td>
<td>Band 1/3/5/8</td>
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<td>SIM7020E</td>
<td>NB1</td>
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</tr>
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<td>NB2</td>
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<td>SIM7060G</td>
<td>NB2+GNSS</td>
<td>24*24</td>
<td>Band 1/2/3/4/5/8/12/13/17/18/19/20/25/26/28/66/70/71/85</td>
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1 Introduction

1.1 Purpose of the document

Based on module AT command manual, this document will give an entire and complete concept and TCPIP architecture introduction.

Developers could understand and develop application quickly and efficiently based on this Document.

1.2 Related documents


1.3 Conventions and abbreviations

In this document, the GSM engines are referred to as following term:
ME (Mobile Equipment);
MS (Mobile Station);
TA (Terminal Adapter);
DCE (Data Communication Equipment) or facsimile DCE (FAX modem, FAX board);

In application, controlling device controls the GSM engine by sending AT Command via its serial interface. The controlling device at the other end of the serial line is referred to as following term:
TE (Terminal Equipment);
DTE (Data Terminal Equipment) or plainly "the application" which is running on an embedded system;
2 AT Commands for TCPIP

2.1 AT Commands for TCPIP Application.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT+CSOC</td>
<td>Create a TCP/UDP socket</td>
</tr>
<tr>
<td>AT+CSOCON</td>
<td>Connect socket to remote address and port</td>
</tr>
<tr>
<td>AT+CSOB</td>
<td>Bind local address and local port</td>
</tr>
<tr>
<td>AT+CSOLIS</td>
<td>Open Listening Function of the Server</td>
</tr>
<tr>
<td>AT+RETENTION</td>
<td>Retention of socket scence</td>
</tr>
<tr>
<td>AT+CSOSEND</td>
<td>Send data to remote via socket</td>
</tr>
<tr>
<td>AT+CSODSEND</td>
<td>Send data to remote via socket with data mode</td>
</tr>
<tr>
<td>AT+CSOCL</td>
<td>Close socket</td>
</tr>
<tr>
<td>AT+CSOSENDFLAG</td>
<td>Set TCP send flag</td>
</tr>
<tr>
<td>AT+CSORCVFLAG</td>
<td>Set receive flag</td>
</tr>
<tr>
<td>AT+CSOSTATUS</td>
<td>Get socket status</td>
</tr>
<tr>
<td>AT+CSOACK</td>
<td>Query previous connection data transmitting state</td>
</tr>
<tr>
<td>AT+CSOALIVE</td>
<td>Set TCP keepalive parameters</td>
</tr>
<tr>
<td>AT+CSORXGET</td>
<td>Get Data from Network Manually</td>
</tr>
<tr>
<td>+CSONMI</td>
<td>Socket message arrived indicator</td>
</tr>
<tr>
<td>+CSOERR</td>
<td>Socket error indicator</td>
</tr>
</tbody>
</table>

2.2 AT Commands for TCPIP Application to Compatible with SIM800 Serials

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT+CIPMUX</td>
<td>Start up multi-IP connection</td>
</tr>
<tr>
<td>AT+CIPSTART</td>
<td>Start up TCP or UDP connection</td>
</tr>
<tr>
<td>AT+CIPSEND</td>
<td>Send data through TCP or UDP connection</td>
</tr>
<tr>
<td>AT+CIPQSEND</td>
<td>Select data transmitting mode</td>
</tr>
<tr>
<td>AT+CIPACK</td>
<td>Query previous connection data transmitting state</td>
</tr>
<tr>
<td>AT+CIPCLOSE</td>
<td>Close TCP or UDP connection</td>
</tr>
<tr>
<td>AT+CIPSHUT</td>
<td>Deactivate GPRS PDP context</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>AT+CLPORT</td>
<td>Set local port</td>
</tr>
<tr>
<td>AT+CSTT</td>
<td>Start task and set APN, user name, password</td>
</tr>
<tr>
<td>AT+CIIICR</td>
<td>Bring up wireless connection</td>
</tr>
<tr>
<td>AT+CIFSR</td>
<td>Get local IP address</td>
</tr>
<tr>
<td>AT+CIPSTATUS</td>
<td>Query current connection status</td>
</tr>
<tr>
<td>AT+CDNSCFG</td>
<td>Configure domain name server</td>
</tr>
<tr>
<td>AT+CDNSGIP</td>
<td>Query the IP address of given domain name</td>
</tr>
<tr>
<td>AT+CIPHEAD</td>
<td>Add an IP head at the beginning of a package received</td>
</tr>
<tr>
<td>AT+CIPHEXS</td>
<td>Show data in hex mode of a package received</td>
</tr>
<tr>
<td>AT+CIFSREX</td>
<td>Get local IP address</td>
</tr>
<tr>
<td>AT+CIPATS</td>
<td>Set auto sending timer</td>
</tr>
<tr>
<td>AT+CIPSPRT</td>
<td>Set prompt of ‘&gt;’ when module sends data</td>
</tr>
<tr>
<td>AT+CIPSERVER</td>
<td>Configure module as server</td>
</tr>
<tr>
<td>AT+CIPCSGP</td>
<td>Set CSD or GPRS for connection mode</td>
</tr>
<tr>
<td>AT+CIPSRIP</td>
<td>Show remote IP address and port when received data</td>
</tr>
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<td>AT+CIPSHOWTP</td>
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<td>AT+CIPUDPMODE</td>
<td>UDP extended mode</td>
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<tr>
<td>AT+CIPRXGET</td>
<td>Get data from network manually</td>
</tr>
<tr>
<td>AT+CIPTKA</td>
<td>Set TCP keep alive parameters</td>
</tr>
<tr>
<td>AT+CIPMODE</td>
<td>Open transparent mode</td>
</tr>
<tr>
<td>AT+CIPCHAN</td>
<td>Enter transparent mode</td>
</tr>
</tbody>
</table>

For detail information, please refer to “SIM7020 Series_AT Command Manual”.
3 Bearer Configuration

3.1 PDN Auto-activation

//example of PDN Auto-Activation

AT+CPIN?
+CPIN:READY
OK

AT+CSQ
+CSQ: 20,0
OK

AT+CGREG?
+CGREG: 0,1
OK

AT+CGACT?
+CGACT: 1,1
OK

AT+COPS?
+COPS: 0,0,"CHN-UNICOM",9
OK

AT+CGCONTRDP
+CGCONTRDP: 1,5,"shnbio","10.250.0.213.255.255.255.0"
OK

3.2 APN Manual Configuration
//example of APN manual configuration

AT+CFUN=0  //Disable RF
+CPIN: NOT READY
OK

AT*MCGDEFCONT="IP","3GNET"  //Configure new APN
OK

AT+CFUN=1  //Enable RF
OK

+CPIN: READY
AT+CGREG?
+CGREG: 0,1  //Inquiry PS service
OK

AT+CGCONTRDP  //Attached PS domain and got IP address automatically
+CGCONTRDP:
1,5,"3GNET","10.250.0.253.255.255.255.0"
OK
4 DNS parser and PING

4.1 DNS Parser

```
//example of DNS parser
AT+CDNSGIP=www.baidu.com
OK
+CDNSGIP:
1, "www.baidu.com", "111.13.100.92"
```

//Got Baidu host name’s IP address using DNS parser

4.2 PING

```
//example of ping
AT+CIPPING="61.135.169.121"
OK
+CIPPING: 1,61.135.169.121,11,52
+CIPPING: 2,61.135.169.121,2,52
+CIPPING: 3,61.135.169.121,3,52
+CIPPING: 4,61.135.169.121,2,52
```

//Ping this IP address
5 TCPIP Connection

5.1 TCPIP Architecture

SIM7020 TCPIP supports multi-client and one-way TCP server architecture, and supports six-way sockets, including TCP or UDP.

5.2 TCP client

//example of tcp client

```
AT+CSOC=1,1,1
+CSOC: 0
OK

AT+CSOCON=0,5245,"116.247.119.165"
OK

AT+CSOSEND=0,0,"Hello World"
OK

AT+CSOCL=0
```

//Created one TCP socket, <socket_id>=0

//Connected remote TCP server

//Send TCP data out

//Close socket
5.3 UDP Connection

//example of UDP Connection

AT+CSOC=1,2,1 //Created one UDP socket, <socket_id>=0
+CSOC: 0
OK

AT+CSOCON=0,5246,"116.247.119.165" //Connected remote UDP peer
OK

AT+CSOSEND=0,0,"Hello World" //Send UDP data out
OK

AT+CSOCL=0 //Close socket
OK

5.4 TCP Server

SIM7020 series of module can act as TCP server. Users should use the command “AT+CSOC” to create one socket for server listening, then use the command “AT+CSOB” to bind a local port and the local IP address, which will be the server IP address and port for connection from client. After successfully binding IP address and port, users should use the command “AT+CSOLIS” to open the server listening function. At this point, the server is established successfully, waiting for one client to connect.

//example of TCP server

AT+CSOC=1,1,1 //Created one TCP socket, <socket_id>=0
+CSOC: 0
OK

AT+CSOB=0,5678,"10.78.103.220" //Bind local port and local IP address
OK

AT+CSOLIS=0 //Open the server listening function, the listening port is 5678
OK

+NEW CLIENT CONNEC: 1 //Remote client access
AT+CSOSEND=1,0,"Hello World"
OK
//Send data to the client

+CSONMI: 0,6,313233
//Receive data from remote client

AT+CSOCL=0
OK
//Close the server listening function

AT+CSOCL=1
OK
//The server closes the connection

5.5 Manually get data

//example of manually get data

AT+CSOC=1,1,1
+CSOC: 0
OK
//Created one TCP socket, <socket_id>=0

AT+CSOCN=0,5555,"112.74.93.163"
OK
//Bind local port and local IP address

AT+CSORXGET=1
+CSORXGET: 1,0
//Enable getting data from network manually

AT+CSORXGET=2,0,1000
+CSORXGET: 2,0,1000,700
//The module can get data, but the length of output data does not exceed 1460 bytes at a time.
AT+CSORXGET=3,0,700
+CSORXGET: 3,0,700,0

//The module can get data, but in HEX mode, module can get 730 bytes maximum at a time.

AT+CSORXGET=3,0,700
+CSORXGET: 3,0,0,0

OK

AT+CSOCL=

//Close socket 0
5.6 Multiple Sockets

//example of multiple sockets

AT+CSOC=1,1,1 //Created one TCP socket, <socket_id>=0
+CSOC: 0
OK

AT+CSOC=1,2,1 //Created one UDP socket, <socket_id>=1
+CSOC: 1
OK

AT+CSOCON=0,5245,"116.247.119.165" //Connected remote TCP server
OK

AT+CSOCON=1,5246,"116.247.119.165" //Connected remote UDP peer
OK

AT+CSOSEND=0,0,"Hello World" //Send TCP data out
OK

AT+CSOSEND=1,10,"3132333435" //Send UDP data
OK

AT+CSOCL=0 //Close socket 0
OK

AT+CSOCL=1 //Close socket 1
OK

5.7 Hex and ASCII Message

Command AT+CSOSEND=<socket_id>,<len>,<data> supports both Hex and Ascii code message. If <data> is pure hex, the <len> parameter must be configured correct bytes and must be even number. Also Incoming message from remote socket are printed in Hex code.

5.8 TCP ACK
//example of TCP ack

AT+CSOC=1,1,1
+CSOC:0
OK

AT+CSOSENDFLAG=1
OK

AT+CSOCON=0,5245,"116.247.119.165"
OK

AT+CSOSEND=0,0,"Hello World"
OK

SEND: 0,11

AT+CSOCL=0
OK

5.9 Incoming Message Indication

//example of incoming message indication

+CSONMI: 0,6,313233

//Incoming data "123" from remote side

5.10 Retention Scene when Module is Waked from PSM Mode

After UDP connection is established, if user want to continue to use this connection when module is waked from PSM mode, the command AT+RETENTION should be set to 1.

//example of retention scene when module is waked from PSM mode

AT+RETENTION?
+RETENTION: 0
AT+RETENTION=1
OK

AT+CSOC=1,2,1
+CSOC:0
OK

//Created one TCP socket, <socket_id>=0

//Configure TCP ACK report

//Connected remote TCP server

//Send TCP data out, 11 bytes had been sent out successfully.

//Close socket
AT+CSOCON=0,5004,"117.131.85.139" //Connected remote UDP server
OK
AT+CPSMS=1 //Enable PSM mode
OK
+CPSMSTATUS: "ENTER PSM" //Enter into PSM mode
+CPSMSTATUS: "EXIT PSM" //Wake module from PSM mode
AT+CSOSEND=0,0,"Hello World!!!" //Send data to UDP server
OK
+CSONMI: 0,12,313233343536 //Receive data from UDP server

5.11 Summary of Socket Error codes

//example of socket error code
+CSOERR: 0,2 <socket id>, <error code>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>Common error</td>
</tr>
<tr>
<td>1</td>
<td>Route error (host unreachable)</td>
</tr>
<tr>
<td>2</td>
<td>Connection abort error</td>
</tr>
<tr>
<td>3</td>
<td>Connection Reset error</td>
</tr>
<tr>
<td>4</td>
<td>Connected error</td>
</tr>
<tr>
<td>5</td>
<td>Illegal error</td>
</tr>
<tr>
<td>6</td>
<td>Buffer error</td>
</tr>
<tr>
<td>7</td>
<td>Block error</td>
</tr>
<tr>
<td>8</td>
<td>Address in use error</td>
</tr>
<tr>
<td>9</td>
<td>Already connecting error</td>
</tr>
<tr>
<td>10</td>
<td>Already connected error</td>
</tr>
<tr>
<td>11</td>
<td>Bearer error</td>
</tr>
</tbody>
</table>

5.12 TCPIP Connection flow chart
6 TCPIP Application compatible with SIM800 serial module

6.1 TCPIP Architecture

SIM7020 TCPIP supports multi-client and one-way TCP server architecture, and supports six-way sockets, including TCP or UDP.

6.2 TCP Client Connection

```plaintext
//example of TCP client connection

AT+CSTT          //Start task and set APN.
OK
AT+CIICR         //Bring up wireless connection(GPRS or CSD)
OK
AT+CIFSR         //Get local IP address
10.78.245.128
```

www.simcom.com
6.3 UDP Client Connection

AT+CSTT
OK
AT+CICR
OK
AT+CIFSR
10.78.245.128
AT+CIPSTART="UDP","116.228.221.51","9600"
OK
CONNECT OK
AT+CIPSEND
> SIM7020 UDP test
SEND OK
UDP test
CLOSED

6.4 UDP Extended Mode
In UDP extended mode, SIM7020 series can receive UDP data from any IP address and port, meanwhile it can send UDP data to any IP address and port.

//example of UDP extended mode

```
AT+CSTT          //Start task and set APN.
OK
AT+CIICR        //Bring up wireless connection(GPRS or CSD)
OK
AT+CIFSR         //Get local IP address
10.78.245.128
AT+CLPORT="UDP",8888    //Set local UDP port
OK
AT+CIPSRIP=1     //Display IP address and Port of sender
OK
AT+CIPHEAD=1     //Add IP head in receiving data
OK
AT+CIPUDPMODE=1  //Enable the UDP Extended Mode
OK
AT+CIPSTART="UDP","116.228.221.51","9600"
CONNECT OK      //Startup UDP connection to remote server
//UDP connection has been established successfully.
AT+CIPUDPMODE?   //Check UDP mode's status
+CIPUDPMODE:
1,"116.228.221.51",9600
OK
AT+CIPSEND
> Hello 9600
SEND OK
RECVFROM: 116.228.221.51:9600     //Receiving data from 116.228.221.51:9600
+IPD,5:test1
AT+CIPUDPMODE=2,"116.228.221.51",1234  //Re-set UDP port to be sent data to.
OK
AT+CIPSEND
> Hello 1234
SEND OK
RECV FROM: 116.228.221.51:1234       //Receiving data from 116.228.221.51:1234
+IPD,5:test2
AT+CIPUDPMODE=2,"10.78.103.220"   //Re-set UDP address and port to be sent data to.
```
6.5 TCP Server

In single connection mode, when configured as TCP server, SIM7020 series allows one client to connect in. User should use the command “AT+CIPSERVER=1,”<port>” to start the server function and set listening port. If it is successful, response “SERVER OK” will be returned, and now the server starts to listen to the TCP port. And then, user should use command “AT+CIFSR” to get local IP address, which is the server IP address.

If the client connects to the server successfully, the IP address of remote client will be displayed at server side. And the server can receive TCP data from remote side. Also user can use command AT+CIPSEND to send data to remote client. User can use “AT+CIPSERVER=0” to close the listening status. Also, user can use AT+CIPCLOSE to close the TCP connection.

//example of TCP server

AT+CGATT? //GPRS Service’s status
+CGATT: 1

OK

AT+CIPSERVER=1,1234 //Start the TCP server, listening port:1234
OK

SERVER OK //TCP server is established successfully
### 6.6 Multi Clients Connection

Being a client, SIM7020 series can establish both TCP and UDP connection to remote server. Total 6 connections are supported. The command “AT+CIPSTART=<n>,<mode>,<IP Address>,<port>” is needed. When the connection is established successfully, “<n>, CONNECT OK” will be returned. And then user can use command AT+CIPSEND=<n> to send data to the connection <n>. User should write data after the promoting mark “>” and use CTRL+Z (0x1a) to send. If sending is successfully, “<n>, SEND OK” will be returned.

//example of multi clients connection

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT+CIPMUX=1</td>
<td>Enable multi-connection</td>
</tr>
<tr>
<td>OK</td>
<td></td>
</tr>
<tr>
<td>AT+CSTT</td>
<td>Start task and set APN.</td>
</tr>
<tr>
<td>OK</td>
<td></td>
</tr>
<tr>
<td>AT+CIICR</td>
<td>Bring up wireless connection (GPRS or CSD)</td>
</tr>
<tr>
<td>OK</td>
<td></td>
</tr>
<tr>
<td>AT+CIFSR</td>
<td>Get local IP address</td>
</tr>
<tr>
<td>10.78.245.128</td>
<td></td>
</tr>
<tr>
<td>AT+CIPSTART=0,&quot;TCP&quot;,&quot;116.228.21.51&quot;,&quot;8500&quot;</td>
<td>Establish a TCP connection, connection number 0</td>
</tr>
<tr>
<td>OK</td>
<td></td>
</tr>
</tbody>
</table>
0,CONNECT OK
AT+CIPSTART=1,"UDP","116.228.21.51","9600"
OK

1,CONNECT OK
AT+CIPSEND=0
> TCP test
0,SEND OK
AT+CIPSEND=1
> UDP test
1,SEND OK
+RECEIVE,0,16:
SIM7020 TCP test
+RECEIVE,1,16:
SIM7020 UDP test
AT+CIPSTATUS
OK

STATE: IP PROCESSING
C:
0,0,"TCP","116.228.221.51","8500","CONNECTED"
C:1,0,"UDP","116.228.221.51","960","CONNECTED"
C: 2,,",","","","INITIAL"
C: 3,,",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",",","]

6.7 Multi Mixing Connection

Being a TCP server, SIM7020 series allows remote clients to connect in; meanwhile, it can establish TCP/UDP connections to remote servers as well.

Before launching the server function, command group “AT+CSTT, AT+CIICR, AT+CIFSR” should be executed to activate the PDP context and get local IP address. Then user can send command “AT+CIPSERVER=1, <port>” to start the server function. If it is successfully, response “SERVER OK” will be returned, and now the server starts to listen to the TCP port.

If the clients connect to the server successfully, the IP addresses of remote clients together with connection numbers <n> will be displayed at server side. Then the server can receive TCP data from remote clients. Also user can use command AT+CIPSEND=<n> to send data to remote client <n>. Simultaneously, user can connect the server SIM800 series to remote servers by TCP/UDP using command

+RECEIVE,0,16:
SIM7020 TCP test
+RECEIVE,1,16:
SIM7020 UDP test
"AT+CIPSTART=<n>,<mode>,<IP Address>,<port>". Command “AT+CIPSERVER=0” can be used to close the listening status. User can use the command AT+CIPCLOSE=<n> to close one specific connection with number <n> and use AT+CIPSHUT to close all connections.

//example of multi mixing connection

AT+CIPMUX=1
OK
AT+CSTT
OK
AT+CIICR
OK
AT+CIFSR
10.78.245.128
AT+CIPSERVER=1,8888
OK

SERVER OK
0,REMOTE IP: 10.76.40.73
+RECEIVE,0,26:
connection TCP server test
AT+CIPSEND=0
>TCP test
0,SEND OK
AT+CIPSTART=1,"TCP","116.228.221.51","8500"
OK
1,CONNECT OK
AT+CIPSTART=2,"UDP","116.228.221.51","9600"
OK
2,CONNECT OK
AT+CIPCLOSE=2
2,CLOSE OK
AT+CIPSTATUS
OK

STATE: IP PROCESSING
S: 0,0,"8888","LISTENING"
C:
0,0,"TCP","10.76.40.73","2020","CONNECTED"
C: 1,0,"TCP","116.228.221.51","8500","CONNECTED"
C:
2,0,"UDP","116.228.221.51","9600","CLOSED"
C: 3,,,","INITIAL"
C: 4,,,","INITIAL"
C: 5,,,","INITIAL"
AT+CIPSERVER=0                  //Close server listening
OK
SERVER CLOSE
AT+CIPSHUT                      //Deactivate the PDP context & close all connections
SHUT OK

6.8 DNS Parser and Connection

//example of DNS parser and connection

AT+CSTT                           //Startup task and set APN
OK

AT+CIICR                          //Bring up wireless connection
OK                                (GPRS or CSD)

AT+CIFSR 10.78.245.128            //Get local IP address
AT+CDNSGIP=www.baidu.com          //Query IP address of www.baidu.com
OK

+CDNSGIP:                           //Parsing succeed, the IP address has two results.
1,"www.baidu.com","119.75.218.77","119.75.217.56"
AT+CDNSGIP="abctest"              //Query "abctest"
OK

+CDNSGIP: 0,8                      //Parsing error.
AT+CIPSTART="TCP","WWW.SIM.COM",80
OK                                  //Establish TCP connection.
CONNECT OK
AT+CIPSNET                          //Send data
6.9 Data Sending Related

SIM7020 series provides 3 ways to send data: changeable data length sending, fixed data length sending and timed sending. SIM7020 series also provides a method to let user know how much data is sent out from the module and received by remote server on an active TCP connection.

6.9.1 Data Sending Related

SIM7020 series provides 3 ways to send data: changeable data length sending, fixed data length sending and timed sending. SIM7020 series also provides a method to let user know how much data is sent out from the module and received by remote server on an active TCP connection.

6.9.2 Fixed Length Sending

User can send the fixed length of data with “AT+CIPSEND=<LENGTH>”, then input data after getting promoting mark “>”. Data will be sent automatically when the length of the input data equals to the value “LENGTH”. User does not need the terminal symbol CTRL+Z (0x1a) in this case. For multi connection mode, the command is “AT+CIPSEND=<n>,<LENGTH>”.

6.9.3 Select Data Transmitting Mode

SIM7020 series supports quick sending mode.
When command “AT+CIPQSEND=0”, it is in normal sending mode. In this mode, after user sends data by “AT+CIPSEND”, if the server receives TCP data, it will give ACK message to module, and the module will respond “SEND OK”.
When command “AT+CIPQSEND=1”, it is in quick sending mode. When the data is input to the serial port of module by “AT+CIPSEND”, it will respond “DATA ACCEPT:”, while not respond “SEND OK”. In such case, user can continuously use “AT+CIPSEND” to send data to the server.

Single connection:

//example of single connection

```plaintext
AT+CIPQSEND=1  //Enable quick sending mode
```
### 6.9.4 Query Data Transmitting Amount

The command "AT+CIPACK" is used to query previous connection data transmitting state. In single connection, the execution command "AT+CIPACK" will return "+CIPACK: <txlen>,<acklen>, <nacklen>".

- The 1st parameter <txlen> is the data amount which has been sent;
- The 2nd parameter <acklen> is the data amount confirmed successfully by the server;
- The 3rd parameter <nacklen> is the data amount without confirmed by the server.

As long as the connection is still active, user can know how much TCP data user sent to server and how much is received successfully by the server in total. By this means, user can get the total data transmitting amount.

//example of query data transmitting amount

```
AT+CIPQSEND=1 //Enable quick sending mode
OK
AT+CIPSTART="TCP","116.236.221.75",5107
OK
CONNECT OK
AT+CIPSTATUS
OK
STATE: CONNECT OK
```
AT+CIPSEND
> 012345678912
DATA ACCEPT: 12
AT+CIPACK
+CIPACK: 12,12,0

OK

For multi connection, the correct command type is “AT+CIPACK=<n>”.
<n> is the connection number.

//example of query data transmitting amount for multi connection

AT+CIPQSEND=1 //Enable quick sending mode
OK
AT+CIPSTATUS
OK

STATE: IP PROCESSING
C: 0,,,,,"INITIAL"
C: 1,"TCP","116.228.221.51","8500","CONNE CTED"
C: 2,"UDP","116.228.221.51","9600","CONNE CTED"
C: 3,,,,,"INITIAL"
C: 4,,,,,"INITIAL"
C: 5,,,,,"INITIAL"
AT+CIPSEND=1 //Send data at 1 channel
>TCP
DATA ACCEPT: 1,3
AT+CIPACK=1 //3 be send, 3 be confirm
+CIPACK: 3,3,0

OK
AT+CIPSEND=2 //Send data at 2 channel
>UDP
DATA ACCEPT: 2,3
AT+CIPACK=2 //3 be send, 3 be unconfirmed.
+CIPACK: 3,0,3

OK
6.10 Data Receiving Related

6.10.1 Receive Data Automatically

The module will receive data automatically if there is data coming from remote server. Several commands can help to get the information header.

- “AT+CIPHEAD=1” helps to add IP header in the format “+IPD (data length): payload”.
- “AT+CIPSRI=1” helps to show the data source information in the format “RECV FROM: <IP ADDRESS>:<PORT>”.
- “AT+CIPSHOWTP” helps to show the protocol (TCP/UDP) in the IP header. It takes effect only if “CIPHEAD” is enabled.

With this information, user can easily know the source of the data frame, the amount of the payload and the protocol. It can also help user to distinguish the received data from AT command responses.

6.10.2 Receive Data Manually

The module provides user a way to get data from the network manually instead of pushing data to the TE automatically.

“AT+CIPRXGET=1” is used to enable getting data from network manually, which should be set before connection. If it is set to “0” (default value), data will be pushed to TE directly.

“AT+CIPRXGET=<mode>[,<len>]” is used to get data with a given length. If it is multi IP connection, the connection ID should be given. E.g.: “AT+CIPRXGET=<mode>,<id>[,<len>]”

```
AT+CIPRXGET=1 //Enable getting data from network manually
OK
AT+CIPSTART="TCP","116.228.221.51",5555 //Establish TCP connection
OK

CONNECT OK
+CIPRXGET:1 //Data incoming from server

AT+CIPRXGET=2,1460 //The mode is set to 2, the output data will be in normal mode, with the length not exceeding1460 bytes at a time.

+CIPRXGET:2,11,0
HELLO WORLD
OK
```
6.11 GPRS States Exchange Related

For single connection, there are 10 GPRS states in total; for multi connection, there are 7 GPRS states. After some AT commands are executed, the corresponding state will be changed. User can get a general idea from the following diagrams:

![GPRS States Diagram for single connection](image)

Figure3: GPRS States Diagram for single connection
6.12 Connection Closing Related

User can use the command "AT+CIPCLOSE=<mode>" to close the TCP or UDP connection.

If <mode> is "0", it is slow closing;
If <mode> is "1", it is quick closing.

In slow closing, the module will interactive with the server when it closes the TCP connection. Thus, the time of returning "CLOSE OK" will be a bit long. This method is suitable for steady network.
In quick closing, the module will disconnect the connection compulsorily and return "CLOSE OK"
immediately, without interaction with the server.

The default setting is slow closing, so the “<mode>=0” can be omitted. And in multi connection, the connection number <n> should be added in front of <mode>.

Be noted that command “AT+CIPCLOSE” only closes current TCP/UDP connection, but PDP context is still active. Also user can close connection by AT+CIPSHUT, with current PDP context being deactivated.

6.13 Error Handling

If an error occurs in TCP/UDP connection, for example TCP sending data error or TCP connection dropping, it is suggested to close the connection by command “AT+CIPCLOSE” and then restart the connection by “AT+CIPSTART”.

If the error still occurs, command “AT+CIPSHUT” is recommended to shut off the PDP context and then restart the connection.

If these two methods above can’t help to solve it, SIMCom recommends user to reset the module.

6.14 Transparent Mode

6.14.1 What is Transparent Mode

SIM7020 series supports transparent mode which provides a special data mode for data receiving and sending by TCP/IP application task. Once the connection is established under transparent mode, the module will be in data mode. All received data from serial port will be treated as data packet to be transferred later, similarly all data received from remote side will be sent to serial port directly. In transparent mode, all AT commands are not available. Methods are provided to switch back and forth between data mode and command mode. Once it is switched to command mode, all AT commands can be used again.

6.14.2 How to enable Transparent Mode

To enable transparent mode, the command AT+CIPMODE should be set to 1. The transparent mode is only supported under single connection.

AT+CIPMUX=0 //Enable single-connection
6.14.3 How to Establish Connection and Enter into Transparent Mode after Enable Transparent Mode

After enable transparent mode, SIM7020 series can work as two modes too: TCP client, UDP client. Once the connection is established, “CONNECT OK” will be returned in the serial port. After establish connection, executing “AT+CIPCHAN” to enter into transparent mode.

```
AT+CIPMODE=1
//Enable transparent mode
OK

AT+CIPSTART="TCP","116.228.221.51","8500"
//Start up the connection
OK
CONNECT OK
The TCP connection has been established successfully
AT+CIPCHAN
//Enter into transparent mode successfully
CONNECT
1234567890
//Receive data from server
123456
//Send data to server

6.14.4 How to Switch Between Data Mode and Command Mode

To switch from data mode to command mode, following methods are available:

(1) The default escape sequence is ++++, and to use this sequence, there should be 1000ms idle period before this sequence and 1000ms idle period after this sequence. Besides, the interval between each + should not exceed 1000ms, otherwise it will be treated as TCP/IP data.

(2) If the remote server closes the connection, the module will be switched back to command mode automatically.

(3) If the module is deactivated from PDP context (+PDP DEACT) during data transferring, module will be switched back to command mode automatically.

ATO command can be used to switch the module from command mode to data mode again if the connection is active.

+++ //switch from data mode to command mode
OK
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT+CSQ</td>
<td>//AT command work normally</td>
</tr>
<tr>
<td>+CSQ: 25,0</td>
<td></td>
</tr>
<tr>
<td>OK</td>
<td></td>
</tr>
<tr>
<td>ATO</td>
<td>//switch the module to data mode</td>
</tr>
<tr>
<td>CONNECT</td>
<td></td>
</tr>
<tr>
<td>123456</td>
<td>//Send data to server</td>
</tr>
<tr>
<td>1234567890</td>
<td>//Receive data from server</td>
</tr>
</tbody>
</table>