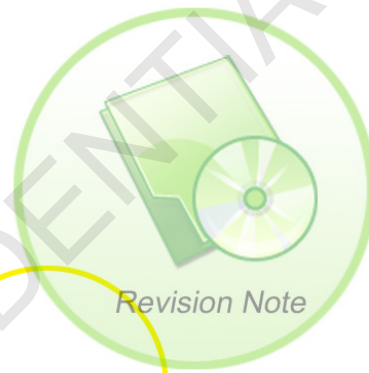




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# **SIM7000 Series\_TCPIP\_Application Note\_V1.00**



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## Version History

Date	Version	What is new	Author
2017-07-03	1.00	New version	Ping.zhang

## Scope

This document presents the AT command of TCPIP stack and application examples.

This document can apply to SIM7000 series modules with TCPIP function.

# 1 Structure

There are two modes of connection for SIM7000 series TCP/IP application: Single connection and Multi connection. When in single connection mode, SIM7000 series can work at both transparent mode and non-transparent mode; and under these two transmission modes, SIM7000 series can be configured as either TCP/UDP client or TCP server. When in multi connection mode, SIM7000 series can only work at non-transparent mode. In this mode, SIM7000 series can work as an absolute TCP/UDP client, which can establish 8 connections in total. In this mode, it can also be configured as one TCP server, which allows 7 TCP/UDP clients to be connected; and the TCP server also can act as a client, establishing 7 connections to one remote server. The structure of the TCP/IP application is given as below.

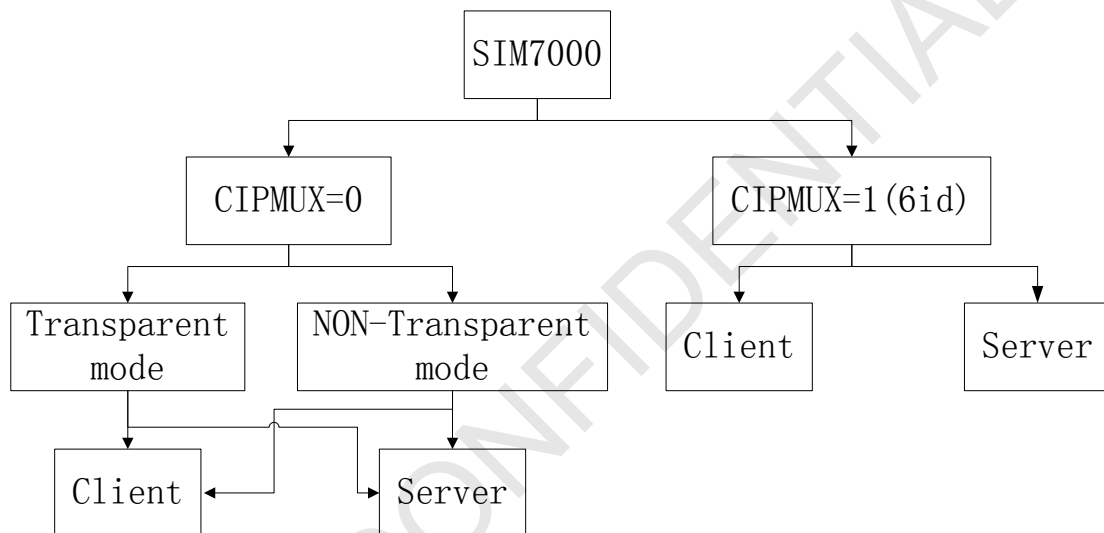


Figure1: SIM7000 series TCPIP Structure

## 2 Single Connection

Command AT+CIPMUX=<n> is used for selecting TCPIP connection mode, when n=0, it is single connection; when n=1, it is multi connection. The default configuration is single connection mode. For single connection, SIM7000 series supports both transparent mode and non-transparent mode.

### 2.1 Non-transparent mode

Command AT+CIPMODE=<n> is used for selecting TCPIP application mode, when n=0, it is non-transparent mode (normal mode); when n=1, it is transparent mode. The default configuration is non-transparent mode. There are three working modes for SIM7000 series under this mode: TCP client, UDP client and TCP server.

#### 2.1.1 How to Establish a TCP Client Connection

Firstly, before any TCP/UDP related operation is set up, the module should be connected to GSM or GPRS network. User can use the commands “AT+CREG?” and “AT+CGATT?” to query the GSM network registration status whether the module has been attached to GPRS service.

Grammar	Description
AT+CPIN? +CPIN: READY  OK	whether some password is required or not
AT+CSQ +CSQ: 20,0  OK	received signal strength
AT+CREG? +CREG: 0,1  OK	the registration of the ME.
AT+CGATT? +CGATT: 1  OK	GPRS Service's status

Secondly, user should use the command group AT+CSTT, AT+CIICR and AT+CIFSR to start the task and activate the wireless connection. Lastly, user can establish TCP connection between SIM7000 series and the server by AT command (AT+CIPSTART=”TCP”, ”IP Address of server”, ”port number of server”). If the connection is established successfully, response “CONNECT OK” will come up from the module. Now user can send data to the server with “AT+CIPSEND”. “AT+CIPSEND” will return promoting mark “>”, user should write data after “>” then issue CTRL+Z (0x1a) to send. If sending is successful, it will respond “SEND OK”. And if there is data

coming from the server, the module will receive the data automatically from the serial port. User can close the TCP connection with “AT+CIPCLOSE” command. Below is an example of TCP connection to remote server.

Grammar	Description
AT+CGATT? +CGATT: 1 OK	GPRS Service’s status
AT+CSSTT=”CMNET” OK	Start task and set APN. The default APN is “CMNET”, with no username or password. Check with local GSM provider to get the APN.
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.78.245.128	Get local IP address
AT+CIPSTART=”TCP”,”116.228.221.51”,”8500” OK CONNECT OK	Start up the connection  The TCP connection has been established successfully
AT+CIPSEND > hello TCP serve  SEND OK  hello SIM7000 CLOSED	Send data to remote server, CTRL+Z (0x1a) to send. User should write data only after the promoting mark “>” , and then use CTRL+Z to send. User can use command “AT+CIPSPRT” to set whether echo promote “>” after issuing “AT+CIPSEND”.  Remote server receives data. For TCP, “SEND OK” means data has been sent out and received successfully by the remote server, due to the TCP connection-oriented protocol.  Received data from remote server  Remote server closed the connection

### 2.1.2 How to Establish a UDP Client Connection

The process of establishing UDP connection is similar to TCP.

Grammar	Description
AT+CGATT? +CGATT: 1  OK	GPRS Service’s status

AT+CSSTT="CMNET" OK	Start task and set APN.
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.78.245.128	Get local IP address
AT+CIPSTART="UDP", "116.228.221.51", "9600" OK CONNECT OK	Start up "UDP" the connection  The UDP connection has been established successfully
AT+CIPSEND > SIM7000 UDP test SEND OK	Send data to remote server, CTRL+Z (0x1a) to send. Data has been sent out from the serial port, but it is unknown if the data reaches the UDP server. for UDP, "SEND OK" just means data has been sent out from the serial port of module, not meaning data reaching the server, due to the UDP simpler message-based connectionless protocol.
UDP test	Receive data from remote server
AT+CIPCLOSE OK	Close the UDP connection
CLOSED OK	Connection is closed

### 2.1.3 How to Establish a TCP Server Connection

In single connection mode, when configured as TCP server, SIM7000 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.

Grammar	Description
AT+CGATT? +CGATT: 1	GPRS Service's status



OK	
AT+CIPSERVER=1,1234 OK SERVER OK	Start the TCP server, listening port:1234  TCP server is established successfully
AT+CIFSR 10.78.33.227	Get local IP address
AT+CIPSTATUS OK STATE: SERVER LISTENING  REMOTE IP: 10.78.103.220 hello server	Query current status  TCP server : listening Remote client 10.78.103.220 connected in  Receive data from remote client
AT+CIPSEND > hello client SEND OK	Send data to remote client  Remote client receives data
AT+CIPSERVER=0 OK SERVER CLOSE hello SIM7000	Just close the listening status, the current connection is still active. TCP server is closed Receive data from remote client
AT+CIPCLOSE CLOSE OK	Close TCP connection

#### 2.1.4 UDP Extended Mode

In UDP extended mode, SIM7000 series can receive UDP data from any IP address and port, meanwhile it can send UDP data to any IP address and port.

Grammar	Description
AT+CGATT? +CGATT: 1  OK	GPRS Service's status
AT+CSST="CMNET" OK	Start task and set APN.
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.78.245.128	Get local IP address
AT+CLPORT="UDP",8888 OK	Set local UDP port
AT+CIPSRIP=1 OK	Display IP address and Port of sender
AT+CIPHEAD=1 OK	Add IP head in receiving data

AT+CIPUDPMODE=1 OK	Enable the UDP Extended Mode
AT+CIPSTART="UDP","116.228.221.51","9600" OK CONNECT OK	Start up UDP connection to remote server  UDP connection has been established successfully.
AT+CIPUDPMODE? +CIPUDPMODE: 1,"116.228.221.51",9600  OK RECV FROM: 116.228.221.51:9600  +IPD,5:test1 RECV FROM: 116.228.221.51:1234  +IPD,5:test2 RECV FROM: 10.78.103.220: 5678  +IPD,5:test3	Check UDP mode's status  Receiving data from 116.228.221.51:9600  Receiving data from 116.228.221.51:1234  Receiving data from 10.78.103.220: 5678
AT+CIPSEND > Hello 9600 SEND OK	Send data to 116.228.221.51:9600
AT+CIPUDPMODE=2,"211.136.131.65",4500 OK	Re-set UDP address to be sent data to.
AT+CIPUDPMODE? +CIPUDPMODE: 1,"211.136.131.65",4500  OK	The destination UDP address has been Updated, and UDP extended mode is still on.
AT+CIPSEND > Hello 4500 SEND OK	Send data to 211.136.131.65:4500

## 2.2 Transparent Mode

### 2.2.1 What is Transparent Mode

SIM7000 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.

*Note: The flow control is default off. It is better to open the hardware flow control for using transparent mode, by setting AT+IFC=2,2.*

### 2.2.2 How to Configure Transparent Mode

To enable transparent mode, the command AT+CIPMODE should be set to 1. In transparent mode, the command AT+CIPCCFG is used for configuring transfer mode, which has 7 parameters NmRetry, WaitTm, SendSz, Esc, Rxmode, RxSize, Rxtimer.

- NmRetry: Number of retries to be made for an IP packet.
- WaitTm: Number of 200ms intervals to wait for serial input before sending the packet
- SendSz: Size in bytes of data block to be received from serial port before sending.
- Esc: Whether turn on the escape sequence, default is TRUE.
- Rxmode: Whether to set time interval during output data from serial port.
- RxSize: Output data length for each time, default value is 1460.
- Rxtimer: Time interval (ms) to wait for serial port to output data again. Default value: 50ms

### 2.2.3 How to Establish Connection under Transparent Mode

The transparent mode is only supported under single connection. In transparent mode, SIM7000 series can work as three modes too: TCP client, UDP client and TCP server. Once the connection is established, CONNECT will be returned in the serial port and the module will be in data mode. At the same time, DCD pin will be active low. Below is an example of TCP client connection.

Grammar	Description
AT+CGATT? +CGATT: 1  OK	GPRS Service's status
AT+CIPMODE=1 OK	Enable transparent mode
AT+CSTT="CMNET" OK	Start task and set APN.
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.78.245.128	Get local IP address
AT+CIPSTART="TCP","116.228.221.51","8500" OK CONNECT ..... OK	Start up TCP connection to remote server  Connected successfully, enter into data mode Input data to serial port, no echo, so can't see input data Quit data mode by pulling DTR or using "+++"
ATO CONNECT SIM7000 channel test	Return to data mode  Data received from remote server

CLOSED

Closed by remote server, quit data mode

### 2.2.4 How to Switch Between Data Mode and Command Mode

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

- (1) The escape sequence can be used if the fourth parameter of AT+CIPCCFG is TRUE. 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) DTR line of serial port can also be used. To use this method, AT&D1 should be set firstly. Pull DTR line to ground for at least 1 second and then pull up, the module will be switched from data mode to command mode and OK will be returned indicating the module is in command mode.
- (3) For TCP client connection, if the remote server closes the connection, the module will be switched back to command mode automatically.
- (4) For TCP server connection, if the remote client closes the connection, the module will be switched back to command mode automatically.
- (5) 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 if the connection is active, and CONNECT will be returned again.

### 2.2.5 How to handle incoming call and short message in data mode

RI pin of serial port will give a 50ms low pulse when a call is coming during data mode. RI pin will give a 120ms low pulse when a short message is received.

To handle the incoming call or SMS, the module need to enter command mode first (using DTR or +\_\_), and then the module will give the normal unsolicited responses as following:

Grammar	Description
RING	Incoming call
+CMTI: "SM", 10	New short message

And then it is able to answer the call or read the short message.

### 2.3 Fix Local Port of TCP/UDP Client

Normally, if client SIM7000 series establishes TCP/UDP connection to remote server, the TCP/UDP connection will be dynamically allocated a local port when AT+CLPORT is set to 0. If AT+CLPORT is set to a nonzero value, the local port will be fixed at this value. The default configuration of this command is 0. Be aware that this command will be effective only in single connection mode and when the module is as a client.

### 3 Multi Connection

To enable multi connection mode, the command AT+CIPMUX must be set to 1. Be aware that in the multi connection mode, SIM7000 series only supports non-transparent mode. Due to this matter, the command AT+CIPMODE is invalid under multi connection mode.

In multi connection mode, SIM7000 series can work as a TCP/UDP client or a TCP server. As a client, it can establish 8 connections to remote server in total, both TCP and UDP.

As a TCP server, it allows remote clients to connect in; at the same time, it can establish TCP/UDP connections to upper remote servers. Total 7 available connections are supported, with the server itself occupying one connection.

#### 3.1 As a Client

Being a client, SIM7000 series can establish both TCP and UDP connection to remote server. Total 8 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+CIPSNED=<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. User can use command AT+CIPCLOSE=<n> to close one specific connection with number <n>. Also user can send AT+CIPSHUT to close all connections.

Grammar	Description
AT+CGATT? +CGATT: 1  OK	GPRS Service's status
AT+CIPMUX=1 OK	Enable multi connection
AT+CSTT="CMNET" OK	Start task and set APN.
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.78.245.128	Get local IP address
AT+CIPSTART=0,"TCP","116.228.221.51","8500" OK  0, CONNECT OK	Establish a TCP connection, connection number 0
AT+CIPSTART=1,"UDP","116.228.221.51","9600" OK	Establish a UDP connection, connection number 1

1, CONNECT OK	
AT+CIPSEND=0 > TCP test	Send data to connection 0
0, SEND OK	
AT+CIPSEND=1 > UDP test	Send data to connection 1
1, SEND OK +RECEIVE,0,17: SIM7000 TCP test +RECEIVE,1,17: SIM7000 UDP test 0, CLOSED	Received data from connection 0, data length 17 Received data from connection 1, data length 17 Connection 0 is closed by remote server
AT+CIPSTATUS OK  STATE: IP PROCESSING  C: 0,0,"TCP","116.228.221.51","8500"," CLOSED " C: 1,0,"UDP","116.228.221.51","9600"," CONNECTED " C: 2,,",",",",",", "INITIAL" C: 3,,",",",",",", "INITIAL" C: 4,,",",",",",", "INITIAL" C: 5,,",",",",",", "INITIAL" C: 6,,",",",",",", "INITIAL" C: 7,,",",",",",", "INITIAL"	Query the current connection status

### 3.2 As a TCP Server

Being a TCP server, SIM7000 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 SIM7000 series to remote servers by TCP/UDP using command “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.

Grammar	Description
AT+CGATT? +CGATT: 1  OK	GPRS Service's status
AT+CIPMUX=1 OK	
AT+CSTT="CMNET" OK	
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.76.40.73	Get local IP address
AT+CIPSERVER=1,8888 OK  SERVER OK	Start server;listening port:8888
0, REMOTE IP: 10.76.40.73	Remote client connect in, connection number 0 allocated
+RECEIVE,0,39: SIM7000 multi connection TCP server test	/Received data from remote client, data length 39
AT+CIPSEND=0 > hello client 0, SEND OK	Send data to remote client
AT+CIPSTART=1,"TCP","116.228.221.51","8500" OK  1, CONNECT OK	Establish TCP connection to remote server
AT+CIPSTART=2,"UDP","116.228.221.51","9600" OK  2, CONNECT OK	Establish UDP connection to remote server
AT+CIPSEND=1 > data from connection 1  1, SEND OK +RECEIVE,1,20: data to connection 1	Send TCP data to remote server  Received TCP data from remote server
AT+CIPCLOSE=2	Close the UDP connection with

2, CLOSE OK	remote server
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" C: 6,,,"","","INITIAL" C: 7,,,"","","INITIAL"	Query current connection status  TCP server is in the process of listening, occupying one connection  A client is accepted TCP connection is connected UDP connection is closed
AT+CIPSERVER=0 OK  SERVER CLOSE	Close server listening
AT+CIPSHUT SHUT OK	Deactivate the PDP context &close all connections

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## 4 Two GPRS Context

SIM7000series supports the use of two different APN, that is , two different GPRS context for data connection. This mode must be used in multi connection. Customer activated GPRS in first Context , do some connection. When need second Context to data connection, use “at+cipsgtxt=1” to switch, after this, active the second Context and do data connexion.

Grammar	Description
AT+CGATT? +CGATT: 1  OK	GPRS Service’s status
AT+CIPMUX=1 OK	Set multi connection mode
AT+CSST=”CMNET” OK	Start task and set APN.”CMNET”
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.126.186.232	Get local IP address
AT+CIPSTART=0,"TCP","116.236.221.75",5555 OK  0, CONNECT OK	Establish TCP connection at 0 channel in first Context
AT+CIPSGTXT=1 OK	Switch to second Context
AT+CSST="CMWAP" OK	Start task and set APN.” CMWAP”
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.204.70.11	Get local IP address
AT+CIPSTART=1,"TCP","116.236.221.75",5555 OK  1, CONNECT OK +RECEIVE,0,15: Hello world 000 +RECEIVE,1,15: Hello world 111	Establish TCP connection at 1 channel in second Context   Receive two channel’s data as normal multi connection

<pre>AT+CIPSEND=0 &gt; test 0 0, SEND OK</pre>	<p>Send data at two channel as normal multi connection</p>
<pre>AT+CIPSEND=1 &gt;test 2 1, SEND OK</pre>	
<pre>AT+CIPCLOSE=0 0, CLOSE OK</pre>	<p>Close data connection as normal multi connection.</p>
<pre>AT+CIPSTATUS OK  STATE: IP PROCESSING  C: 0,0,"TCP","116.236.221.75","5555","CLOSED" C: 1,1,"TCP","116.236.221.75","5555","CONNECTED" C: 2,,,"",,"","INITIAL" C: 3,,,"",,"","INITIAL" C: 4,,,"",,"","INITIAL" C: 5,,,"",,"","INITIAL" C: 6,,,"",,"","INITIAL" C: 7,,,"",,"","INITIAL"</pre>	<p>Query Connection's status</p> <p>0 channel's connection is closed 1 channel's connection is connected</p>
<pre>AT+CIPSHUT SHUT OK</pre>	<p>Shut up second Context, but first Context is active..</p>
<pre>AT+CIPSGTXT=0 OK</pre>	<p>Switch to first Context</p>
<pre>AT+CIPSHUT SHUT OK</pre>	<p>Shut up first Context</p>

## 5 DNS Function

SIM7000 series supports DNS auto parsing, so user can establish TCP/UDP connection to remote sever using domain name directly by the command “AT+CIPSTART=<mode>, <domain name>, <port>”. And then user can send data to remote server by AT+CIPSEND. In multi connection, the connection number <n> is needed.

User also can use command AT+CDNSGIP=<domain name > to query the IP address of given domain name.

Grammar	Description
AT+CGATT? +CGATT: 1  OK	Query GPRS Service's status
AT+CSTT="CMNET" OK	Start up task and set APN
AT+CIICR OK	Bring up wireless connection (GPRS or CSD)
AT+CIFSR 10.126.186.232	Get local IP address
AT+CDNSGIP=www.baidu.com OK +CDNSGIP: 1,"www.baidu.com","119.75.218.77","119.75.217.56"	Query IP address of www.baidu.com Parsing succeed, the IP address has two results.
AT+CDNSGIP="abctest" OK	Query "abctest"
+CDNSGIP: 0,8	Parsing error.
AT+CIPSTART="TCP","WWW.SIM.COM",80 OK  CONNECT OK	Establish TCP connection.
AT+CIPSNED > DNS test SEND OK	Send data

## 6 Data Sending Related

SIM7000 series provides three ways to send data: changeable data length sending, fixed data length sending and timed sending. SIM7000 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.

### 6.1 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 do not need the terminal symbol CTRL+Z (0x1a) in this case. For multi connection mode, the command is “AT+CIPSEND=<n>,<LENGTH>”.

### 6.2 Timed Sending

There is another way to send data automatically. First, set the timer of sending data automatically by the command “AT+CIPATS=<mode>,<time>”, then issue “AT+CIPSEND” (“AT+CIPSEND=<n>” for multi connection) and lastly input the data after getting promoting mark “>”. Data will be sent automatically when the set timer expires.

### 6.3 Query Available Data Length to be Sent

User can use the command “AT+CIPSEND?” to query the current maximum data length available to be sent, which is determined by the network. In fact, the maximum data length is variable, depending on the actual network. The maximum data length can be up to 1460 bytes. In multi connection, the command “AT+CIPSEND?” will tell current available maximum data length for all active connections.

Grammar	Description
AT+CIPSEND? +CIPSEND: 1460  OK	Current maximum value 1460
AT+CIPSEND=1461 ERROR	The fixed length exceeds maximum value
AT+CIPSEND >123....999 ERROR	The input data exceeds maximum value

### 6.4 Select Data Transmitting Mode

SIM7000 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:**

Grammar	Description
AT+CIPQSEND=1 OK	Enable quick sending mode
AT+CIPSEND > hello  DATA ACCEPT:5	Data has been sent, not sure whether to be accepted

**Multi connection:**

Grammar	Description
AT+CIPSTART=0,"TCP","116.236.221.75",5107 OK	Establish TCP connection
0, CONNECT OK	
AT+CIPQSEND=1 OK	Enable quick sending mode
AT+CIPSEND=0 > 1234567890  DATA ACCEPT:0,10	Data has been sent, not sure whether to be accepted

**6.5 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 first parameter <txlen> is the data amount which has been sent; the second parameter <acklen> is the data amount confirmed successfully by the server; and the third 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.

Grammar	Description
AT+CIPQSEND=1 OK	Enable quick sending mode
AT+CIPSTART="TCP","116.236.221.75",5107 OK  CONNECT OK	Establish TCP connection
AT+CIPSTATUS OK	Query connection's status

STATE: CONNECT OK	
AT+CIPSEND > 012345678912 DATA ACCEPT:12	
AT+CIPACK +CIPACK: 12,12,0  OK	Query status of data send 12 be Send , 12 be confirmed

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

Grammar	Description
AT+CIPSTATUS OK  STATE: IP PROCESSING  C: 0,,,"",,"", "INITIAL" C: 1,0,"TCP", "116.228.221.51", "8500", "CONNECTED" C: 2,0,"UDP", "116.228.221.51", "9600", "CONNECTED" C: 3,,,"",,"", "INITIAL" C: 4,,,"",,"", "INITIAL" C: 5,,,"",,"", "INITIAL" C: 6,,,"",,"", "INITIAL" C: 7,,,"",,"", "INITIAL"	Query connection's status
AT+CIPQSEND=1 OK	Enable quick sending mode
AT+CIPSEND=1 > TCP DATA ACCEPT:1,3	Send data at 1 channel
AT+CIPACK=1 +CIPACK: 3, 3, 0  OK	Query status about 1 channel 3 be send, 3 be confirm
AT+CIPSEND=1 > TCP again DATA ACCEPT:1,9	Send data at 1 channel
AT+CIPACK=1 +CIPACK: 12, 12, 0  OK	

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

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## 7 Data Receiving Related

### 7.1 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+CIPSRIP=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 these 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.

### 7.2 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” enables getting data from network manually, which should be set before connection. If it is set to 0 (default value if not set), data will be pushed to TE directly.

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

Grammar	Description
AT+CIPRXGET=1 OK	Enables getting data from network manually
AT+CIPSTART="TCP","116.228.221.51",5555 OK  CONNECT OK +CIPRXGET: 1	Data incoming from server
AT+CIPRXGET=2,1460 +CIPRXGET: 2,11,0 HELLO WORLD OK +CIPRXGET: 1	The mode is set to 2, the output data will be in normal mode, not exceeding 1460 bytes at a time.  Data incoming from server
AT+CIPRXGET=3,730 +CIPRXGET: 3,11,0 48454C4C4F20574F524C44 OK	The mode is set to 3, user can get data in HEX mode with the length not exceeding 730 bytes at a time.



## 8 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:

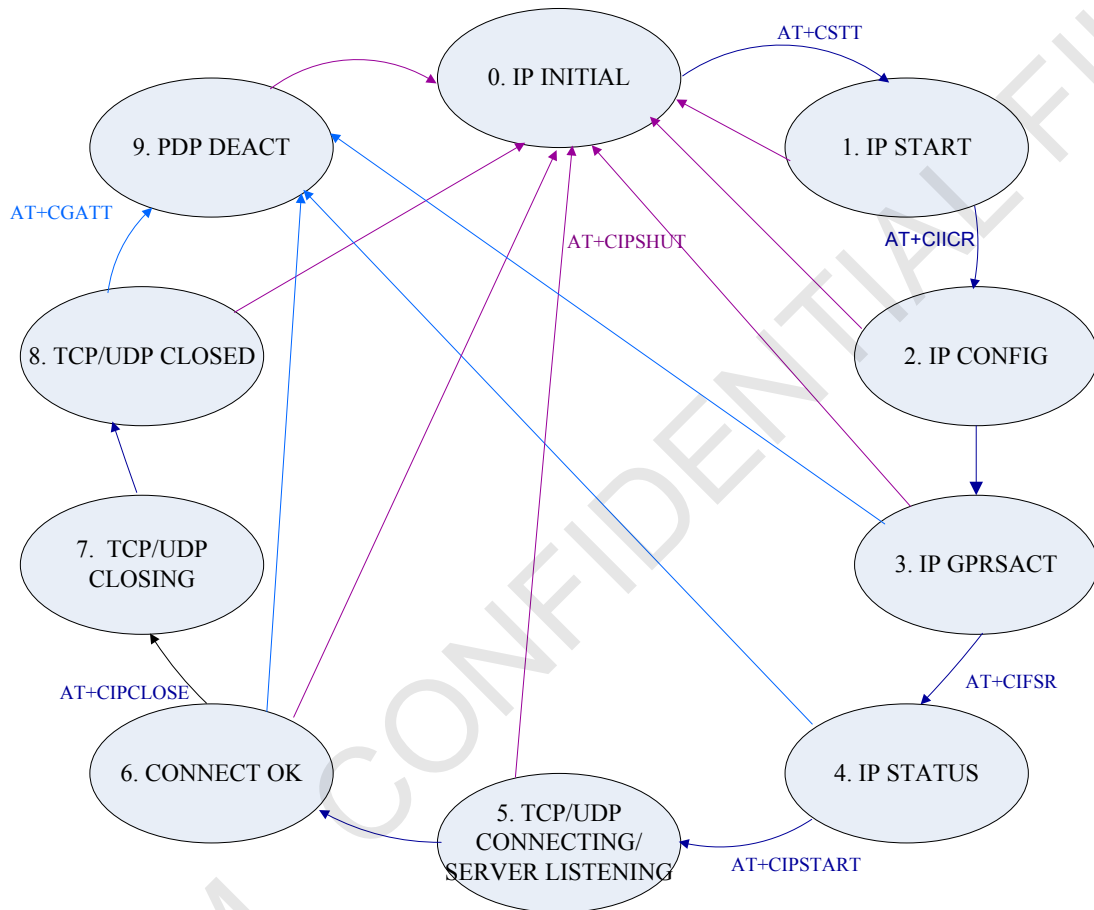
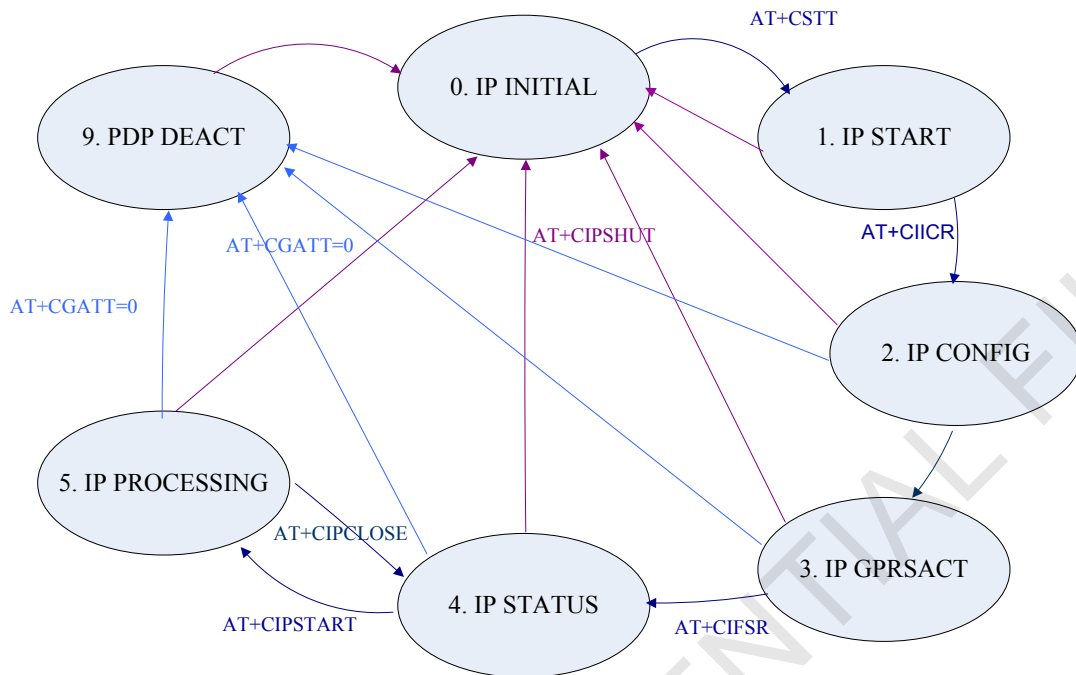


Figure2: GPRS States Diagram for single connection



**Figure3: GPRS States Diagram for multi connection**

- IP INTIAL: GPRS initial status
- IP START: Start a TCP/UDP task
- IP CONFIG: Configure PDP context
- IP GPRSACT: Context active already
- IP STATUS: Get local IP address
- TCP/UDP CONNECTING: Connecting to server now
- SERVER LISTENING: Listening to server port now
- IP PROCESSING: Processing the existing connection now
- CONNECT OK: Connection to the server is successful
- TCP/UDP CLOSING: Closing connection now
- TCP/UDP CLOSED: Connection closed (local IP/PDP context still there)
- PDP DEACT: context deactivated

## 9 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.

## 10 Connection Activity Checking Related

User can use the command AT+CIPSTATUS to query current connection status.

In transparent mode, DCD pin can be used for this purpose. If TCP/UDP connection exists, the DCD pin will be active (low). At any time if the connection is dropped, DCD pin will go inactive (high).

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## 11 Power Consumption with Existing Connection

The module can enter sleep mode to save power consumption with existing connection, in which the current consumption is reduced to only several mA. The sleep mode function is enabled by setting “AT+CSCLK=1”. With this setting, if the DTR maintains HIGH and there is no interruption on either H/W or S/W or event over-the-air, module will go into sleep. In the sleep mode, the serial port stops working, which means no AT command can be issued any more. During the sleep mode with existing connection, the incoming data from the remote end can wake up the module. Any event over-the-air, such as incoming call or SMS etc, will wake up the module too. But At command is not be respond now, If need input AT command, must pull low DTR 50ms or more, after this, the serial port can receive data again. More detail please refer to HD document.

## 12 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, please use AT+CIPSHUT 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.

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## Appendix

### A Related Documents

SN	Document name	Remark
[1]	SIM7000 Series_AT Command Manual	

### B Terms and Abbreviations

Abbreviation	Description
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
APN	Access Point Name
GPRS	General Packet Radio Service
PDP	Packet Data Protocol
DNS	Domain Name System

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