



# SIM7000 Series\_TCPIP \_Application Note

LPWA Module

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# About Document

## Version History

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|---------|------------|------------|------------------------------------|
| V1.00   | 2017.07.03 | Ping.Zhang | First Release                      |
| V1.01   | 2010.10.24 | Wenjie.Lai | Delete related description of GPRS |
| V1.02   | 2020.07.28 | Wenjie.Lai | All                                |

## Scope

This document applies to the following products

| Name                     | Type                | Size(mm) | Comments |
|--------------------------|---------------------|----------|----------|
| SIM7000E/C/A/G           | Cat-M1(/NB1/EGPRS ) | 24*24    |          |
| SIM7000E-N<br>SIM7000C-N | NB1                 | 24*24    |          |

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# 1 Introduction

## 1.1 Purpose of the document

Based on module AT command manual, this document will introduce TCPIP stack and application process.

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

## 1.2 Related documents

[1] SIM7000 Series\_AT Command Manual

## 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 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.

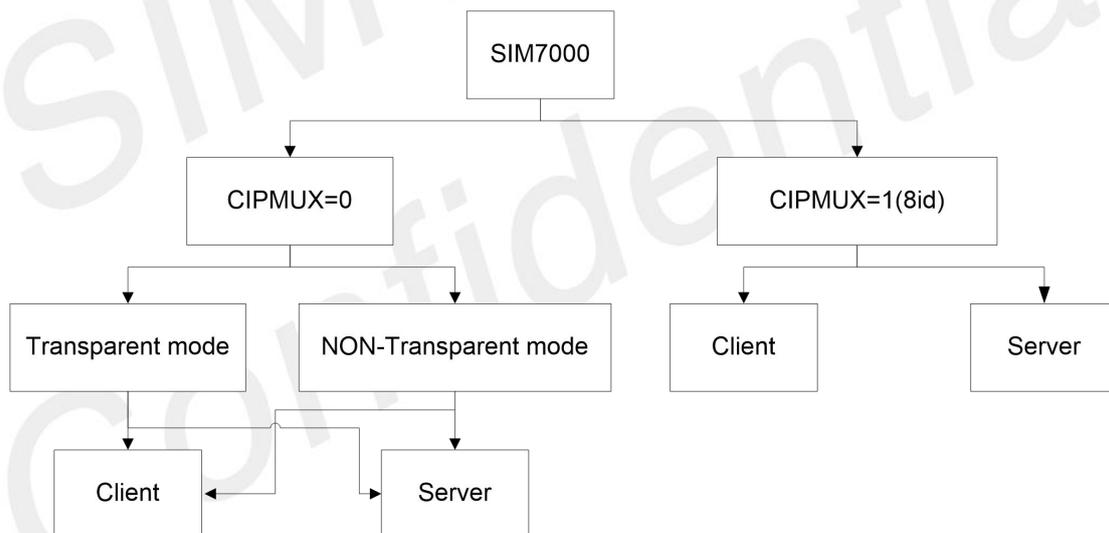


Figure1: SIM7000 series TCPIP Structure

## 3 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.

### 3.1 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.

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

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

```
AT+CPIN?  
+CPIN: READY //whether some password is required or not  
  
OK  
AT+CSQ  
+CSQ: 20,0 //Received signal strength  
  
OK  
AT+CGATT?  
+CGATT: 1 //Data Service's status  
  
OK
```

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.

**AT+CGATT?**

**+CGATT: 1**

//Data Service's status

**OK**

//Start task and set APN.

**AT+CSTT="CMNET"**

**OK**

//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

**AT+CIFSR**

**10.78.245.128**

//Get local IP address

**AT+CIPSTART="TCP","116.228.221.51","8500"**

**OK**

//Start up the connection

**CONNECT OK**

//The TCP connection has been established successfully

//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".

**AT+CIPSEND**

**> hello TCP serve**

//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.

**SEND OK**

//Received data from remote server

**hello SIM7000**

//Remote server closed the connection

**CLOSED**

### 3.1.2 How to Establish a UDP Client Connection

The process of establishing UDP connection is similar to TCP.

```

AT+CGATT?
+CGATT: 1 //Data Service's status

OK
AT+CSTT="CMNET" //Start task and set APN.
OK
AT+CIICR //Bring up wireless connection
OK
AT+CIFSR //Get local IP address
10.78.245.128
AT+CIPSTART="UDP","116.228.221.51","9600" //Start up "UDP" the connection
OK
CONNECT OK //The UDP connection has been established
successfully
AT+CIPSEND //Send data to remote server, CTRL+Z (0x1a) to
> SIM7000 UDP test send.
//Data has been sent out from the serial port, but it
SEND OK //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 //Close the UDP connection
CLOSED OK //Connection is closed

```

### 3.1.3 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.

```

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

```

### 3.1.4 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.

```

AT+CGATT?
+CGATT: 1                                           //Data Service's status

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

```

## 3.2 Transparent Mode

### 3.2.1 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.**

### 3.2.2 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

### 3.2.3 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.

```
AT+CGATT?  
+CGATT: 1 //Data Service's status  
  
OK  
AT+CIPMODE=1 //Enable transparent mode  
OK  
AT+CSTT="CMNET" //Start task and set APN.  
OK  
AT+CIICR //Bring up wireless connection  
OK
```

```

AT+CIFSR
10.78.245.128 //Get local IP address
AT+CIPSTART="TCP","116.228.221.51","8500" //Start up TCP connection to remote server
OK
CONNECT //Connected successfully, enter into data mode
..... //Input data to serial port, no echo, so can't see input data
OK //Quit data mode by pulling DTR or using "+++"
ATO //Return to data mode
CONNECT
SIM7000 channel test //Data received from remote server
CLOSED //Closed by remote server, quit data mode

```

### 3.2.4 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 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) 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.

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

RI pin will give a 120ms low pulse when a short message is received.

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

```
+CMTI: "SM",10 //New short message
```

And then it is able to read the short message.

### 3.3 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.

## 4 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.

### 4.1 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+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. 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.

#### AT+CGATT?

+CGATT: 1

//Data Service's status

OK

#### AT+CIPMUX=1

OK

//Enable multi connection

#### AT+CSTT="CMNET"

OK

//Start task and set APN.

#### AT+CIICR

OK

//Bring up wireless connection

#### AT+CIFSR

10.78.245.128

//Get local IP address

#### AT+CIPSTART=0,"TCP","116.228.221.51","8500"

OK

//Establish a TCP connection, connection number 0

```

0, CONNECT OK
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: //Received data from connection 0,
SIM7000 TCP test data length 17
+RECEIVE,1,17: //Received data from connection 1,
SIM7000 UDP test data length 17

0, CLOSED //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 " //Query the current connection status
C: 2,,"","","","INITIAL"
C: 3,,"","","","INITIAL"
C: 4,,"","","","INITIAL"
C: 5,,"","","","INITIAL"
C: 6,,"","","","INITIAL"
C: 7,,"","","","INITIAL"

```

## 4.2 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.

### AT+CGATT?

+CGATT: 1

//Data Service's status

OK

### AT+CIPMUX=1

OK

### AT+CSTT="CMNET"

OK

### AT+CIICR

OK

//Bring up wireless connection

### AT+CIFSR

10.76.40.73

//Get local IP address

### AT+CIPSERVER=1,8888

OK

//Start server;listeninig port:8888

SERVER OK

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

//Send data to remote client

0, SEND OK

### AT+CIPSTART=1,"TCP","116.228.221.51","8500"

0"

OK

//Establish TCP connection to remote server

1, CONNECT OK

### AT+CIPSTART=2,"UDP","116.228.221.51","9600"

0"

OK

//Establish UDP connection to remote server

2, CONNECT OK

### AT+CIPSEND=1

//Send TCP data to remote server

> data from connection 1

```

1, SEND OK
+RECEIVE,1,20:                                     //Received TCP data from remote serve
data to connection 1
AT+CIPCLOSE=2                                       //Close the UDP connection with remote server
2, CLOSE OK
AT+CIPSTATUS
OK

STATE: IP PROCESSING

S: 0,0,"8888","LISTENING"                           //Query current connection status

C:
0,0,"TCP","10.76.40.73","2020","CONNECTED"         //TCP server is in the process of listening,
C:                                                  occupying one connection
1,0,"TCP","116.228.221.51","8500","CONNECT
ED"
C:                                                  //A client is accepted
2,0,"UDP","116.228.221.51","9600","CLOSED"         //TCP connection is connected
C: 3,,"","","","INITIAL"                           //UDP connction is closed
C: 4,,"","","","INITIAL"
C: 5,,"","","","INITIAL"
C: 6,,"","","","INITIAL"
C: 7,,"","","","INITIAL"
AT+CIPSERVER=0
OK                                                  //Close server listening

SERVER CLOSE
AT+CIPSHUT                                         //Deactivate the PDP context &close all
SHUT OK                                           connections

```

## 5 Two PDP Context

SIM7000 series supports the use of two different APN, that is , two different PDP context for data connection. This mode must be used in multi connection. Customer activated PDP 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 connection.

```

AT+CGATT?
+CGATT: 1 //Data Service's status

OK
AT+CIPMUX=1 //Set multi connection mode
OK
AT+CSTT="CMNET" //Start task and set APN. "CMNET"
OK
AT+CIICR //Bring up wireless connection
OK
AT+CIFSR //Get local IP address
10.126.186.232
AT+CIPSTART=0,"TCP","116.236.221.75",5555
OK //Establish TCP connection at 0 channel in first
Context

0, CONNECT OK
AT+CIPSGTXT=1 //Switch to second Context
OK
AT+CSTT="CMWAP" //Start task and set APN. "CMWAP"
OK
AT+CIICR //Bring up wireless connection
OK
AT+CIFSR //Get local IP address
10.204.70.11
AT+CIPSTART=1,"TCP","116.236.221.75",5555
OK //Establish TCP connection at 1 channel in second
Context

1, CONNECT OK
+RECEIVE,0,15: //Receive two channel's data as normal multi
Hello world 000 connection
+RECEIVE,1,15:
Hello world 111
AT+CIPSEND=0 //Send data at two channel as normal multi

```

```

> test 0                                connection
0, SEND OK
AT+CIPSEND=1
>test 2
1, SEND OK
AT+CIPCLOSE=0                          //Close data connection as normal multi
0, CLOSE OK                             connection.
AT+CIPSTATUS
OK

STATE: IP PROCESSING

C:                                       //Query Connection's status
0,0,"TCP","116.236.221.75","5555","CLOSED"
C:
1,1,"TCP","116.236.221.75","5555","CONNECT
ED"
C: 2, "", "", "", "INITIAL"           //0 channel's connection is closed
C: 3, "", "", "", "INITIAL"           //1 channel's connection is connected
C: 4, "", "", "", "INITIAL"
C: 5, "", "", "", "INITIAL"
C: 6, "", "", "", "INITIAL"
C: 7, "", "", "", "INITIAL"
AT+CIPSHUT                              //Shut up second Context, but first Context is
SHUT OK                                  active.
AT+CIPSGTXT=0                            //Switch to first Context
OK
AT+CIPSHUT                              //Shut up first Context
SHUT OK

```

## 6 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.

```

AT+CGATT?
+CGATT: 1 //Query data Service's status

OK
AT+CSTT="CMNET" //Start up task and set APN
OK
AT+CIICR //Bring up wireless connection
OK
AT+CIFSR //Get local IP address
10.126.186.232
AT+CDNSGIP=www.baidu.com //Query IP address of www.baidu.com
OK
+CDNSGIP:
1,"www.baidu.com","119.75.218.77","119.75.21
7.56" //Parsing succeed, the IP address has two results.
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+CIPSNED
> DNS test //Send data
SEND OK

```

## 7 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.

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

### 7.2 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.

### 7.3 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.

```
AT+CIPSEND?
```

```
+CIPSEND: 1460
```

```
//Current maximum value 1460
```

```

OK
AT+CIPSEND=1461                                     //The fixed length exceeds maximum value
ERROR
AT+CIPSEND
>123....999                                         //The input data exceeds maximum value
ERROR
  
```

## 7.4 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:

```

AT+CIPQSEND=1                                       //Enable quick sending mode
OK
AT+CIPSEND
> hello

DATA ACCEPT:5                                       //Data has been sent, not sure whether to be
                                                    accepted
  
```

### Multi connection:

```

AT+CIPSTART=0,"TCP","116.236.221.75",5107
OK                                                    //Establish TCP connection

0, CONNECT OK
AT+CIPQSEND=1                                       //Enable quick sending mode
OK

AT+CIPSEND=0
> 1234567890

DATA ACCEPT:0,10                                    //Data has been sent, not sure whether to be
                                                    accepted
  
```

## 7.5 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.

```

AT+CIPQSEND=1                                     //Enable quick sending mode
OK
AT+CIPSTART="TCP","116.236.221.75",5107
OK                                                 //Establish TCP connection

CONNECT OK
AT+CIPSTATUS
OK                                                 //Query connection's status

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

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

```

AT+CIPSTATUS
OK

STATE: IP PROCESSING

C: 0,,"",,"",,"",,"INITIAL"                    //Query connection's status
C:
1,0,"TCP","116.228.221.51","8500","CONNECT
ED"
C:
2,0,"UDP","116.228.221.51","9600","CONNECT
  
```

```
ED"
C: 3,"","","","INITIAL"
C: 4,"","","","INITIAL"
C: 5,"","","","INITIAL"
C: 6,"","","","INITIAL"
C: 7,"","","","INITIAL"
AT+CIPQSEND=1
OK //Enable quick sending mode
AT+CIPSEND=1
> TCP //Send data at 1 channel
DATA ACCEPT:1,3
AT+CIPACK=1
+CIPACK: 3, 3, 0 //Query status about 1 channel
3 be send, 3 be confirm

OK
AT+CIPSEND=1
> TCP again //Send data at 1 channel
DATA ACCEPT:1,9
AT+CIPACK=1
+CIPACK: 12, 12, 0

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

OK
```

## 8 Data Receiving Related

### 8.1 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 "RCV 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.

### 8.2 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>]"

```

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

+CIPRXGET: 2,11,0  
HELLO WORLD

normal mode, not exceeding 1460 bytes at a time.

OK

+CIPRXGET: 1

//Data incoming from server

**AT+CIPRXGET=3,730**

+CIPRXGET: 3,11,0

//The mode is set to 3, user can get data in HEX mode with the length not exceeding 730 bytes at a time.

48454C4C4F20574F524C44

OK

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## 9 APPTCP States Exchange Related

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

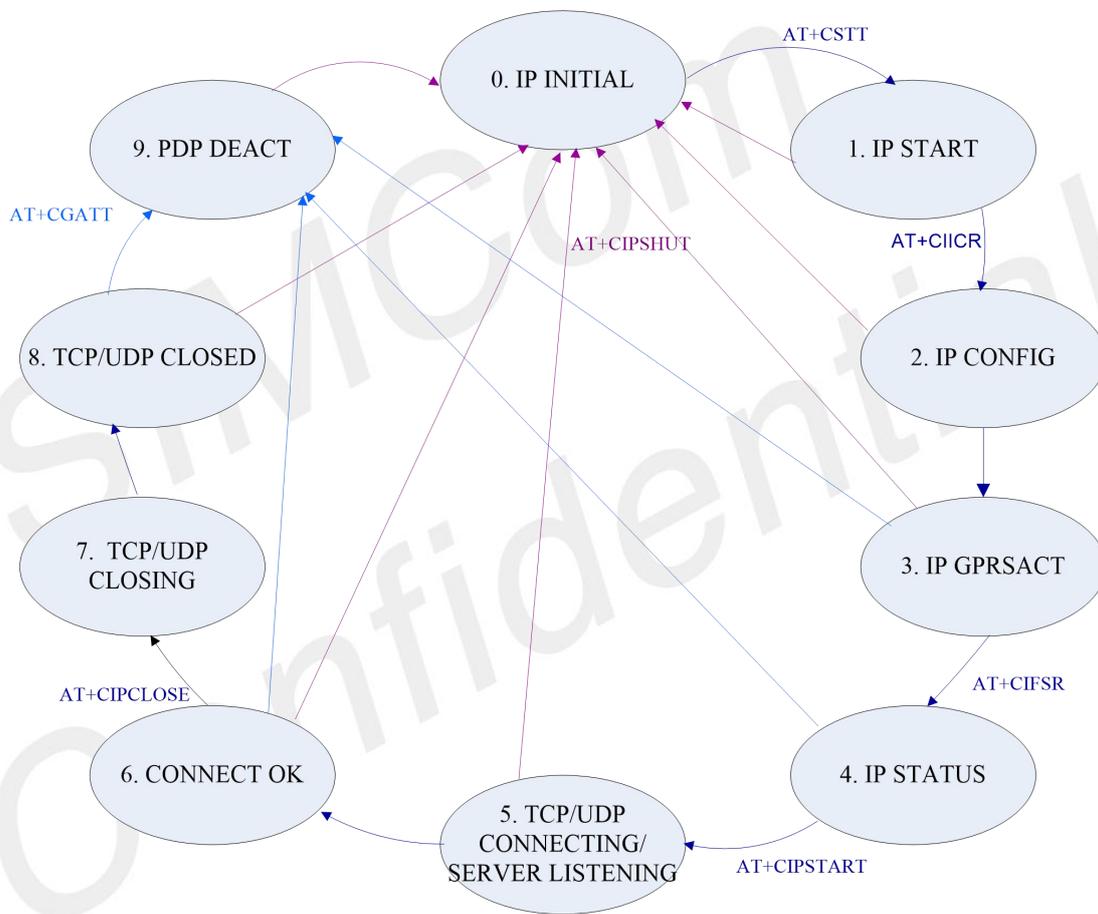
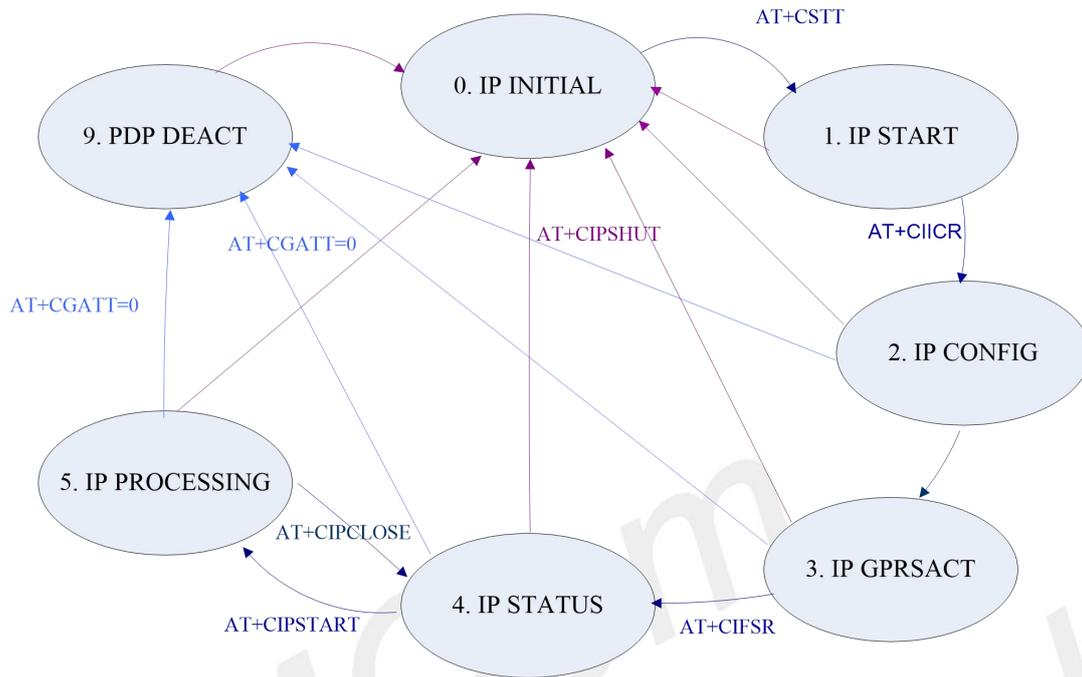


Figure2: APPTCP States Diagram for single connection



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

- IP INITIAL: 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

## 10 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.

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## 11 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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## 12 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.

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## 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, 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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