



SIM800 Series_ STK_Application Note

GPRS Module

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About Document

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Scope

This document presents the AT command of STK operation and application examples.

This document can apply to SIM800 series modules with STK function.

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1 Introduction

1.1 Purpose of the document

Based on module AT command manual, this document will introduce STK application process.

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

1.2 Related documents

[1] SIM800 Series_AT Command Manual

1.3 Conventions and abbreviations

Abbreviations	Description
SAT	SIM Application Toolkit
EVB	Evaluation Board
STK	SIM Toolkit Command begin tag
URC	Unsolicited request code
TE	Terminal Equipment
TA	Terminal Adapter
DTE	Data Terminal Equipment or plainly "the application" which is running on an embedded system
DCE	Data Communication Equipment or facsimile DCE(FAX modem, FAX board)
ME	Mobile Equipment
MS	Mobile Station

2 STK Introduction

2.1 STK Brief Introduction

Although the base band of GSM/GPRS module is powerful enough to provide mobile phone applications, there are chances that other devices are used for main controller and GSM/GPRS base band serves as only a communication module. It may be because of MIPS requirement or domain-specific applications. For example, a PDA with phone capability may use a powerful processor as CPU and requires only communication functions of GSM/GPRS base band. The following figure is the basic building blocks of such applications.

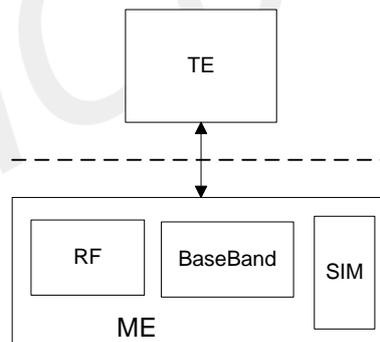


Figure 1: Basic building block

The terms used follow those in the ETSI/3GPP specifications. So that TE represents the application device, which is the controller and serves for special functionalities. ME represents the GSM/GPRS module, which provides GSM/GPRS service to the TE.

SIM is another separated IC, and may not reside in GSM/GPRS modules. However, there should be direct interfaces between SIM and GSM/GPRS BaseBand as defined in 3GPP specification TS 11.11. So the SIM is conceptually a part of ME. (ME, SIM, and TE comprise a MT, which is Mobile Terminal).

The SAT supported includes class 2 and class 3 (optional). No letter classes are supported.

2.2 STK AT Command Usage

SAT is defined in GSM 11.14. The AT commands listed in chapter2 are implemented to support SAT functions. It should be noted that there are some special handling of SAT commands. For example, SAT SETUP CALL requests not to check FDN, and so "ATD" should not be used to setup SAT calls. It is the same operation for sending SS, SMS, USSD, and etc.

The AT commands are designed to achieve maximum flexibilities for TE. The basic operation for ME is to forward Proactive commands and to receive Envelop/Terminal Responses between SIM and TE.

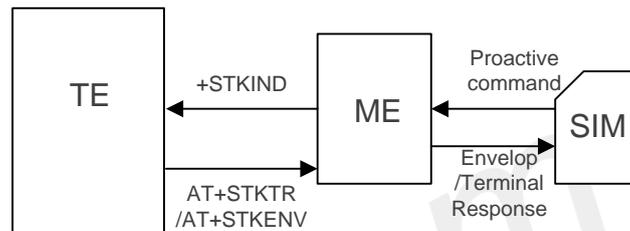


Figure 2: Basic AT command flow block diagram

However, some commands must be handled by ME. The commands of SAT are categorized into 3 groups:

- Handled by TE only: ME transparently forwards the command to TE.eg. DISPLAY TEXT.
- Handled by ME: TE is notified, but not involved in the SAT procedure.eg. POLL INTERVAL
- Handled by both TE and ME together.

The table following shows all commands.

STK procedures	Commands	Involvement	AT commands used	CLASS
Proactive SIM	Display text	TE	<+STKPCI,0> +STKTRS	Class 2
Proactive SIM	Get inkey	TE	<+STKPCI,0> +STKTRS	Class 2
Proactive SIM	Ge input	TE	<+STKPCI,0> +STKTRS	Class 2
Proactive SIM	More time	ME	Do Nothing	Class 2
Proactive SIM	Play tone	TE	<+STKPCI,0> +STKTRS	Class 2
Proactive SIM	Poll interval	ME	Do Nothing	Class 2
Proactive SIM	Refresh	TE/ME	<+STKPCI,1> Call Ready, SM BL Ready	Class 2
Proactive SIM	Setup menu	TE	<+STKPCI,0> +STKTRS	Class 2
Proactive SIM	Select item	TE	<+STKPCI,0> +STKTRS	Class 2
Proactive SIM	Sendshort message	TE/ME	<+STKPCI,2> +STKSMS	Class 2

Proactive SIM	Send ss	TE/ME	<+STKPCI,2> +STKSS	Class 2
Proactive SIM	Send ussd	TE/ME	<+STKPCI,2> +STKUSSD	Class 2
Proactive SIM	Set up call	TE/ME	<+STKPCI,2> +STKCALL	Class 2
Proactive SIM	Polling off	ME	Do Nothing	Class 2
Proactive SIM	Provide local information	ME	<+STKPCI,1>	Class 2
Proactive SIM	Set up event list	ME	<+STKPCI,1>	Class 3
Proactive SIM	Perform card apdu	NA	Not Support	Class A
Proactive SIM	Power off card	NA	Not Support	Class A
Proactive SIM	Power on card	NA	Not Support	Class A
Proactive SIM	Get reader status	NA	Not Support	Class A
Proactive SIM	Timer management	ME	Do Nothing	Class 3
Proactive SIM	Set up idle mode text	TE	<+STKPCI,0> +STKTRS	Class 3
Proactive SIM	Run at command	TE/ME	<+STKPCI,1> +STKTRS	Class B
Proactive SIM	Send dtmf	TE/ME	<+STKPCI,1> +STKDTMF	Class 3
Proactive SIM	Language notification	TE/ME	<+STKPCI,1>	Class 3
Proactive SIM	Launch browser	TE	<+STKPCI,0> +STKTRS	Class C
Proactive SIM	Open channel	TE	<+STKPCI,0> +STKTRS	Class E
Proactive SIM	Close channel	TE	<+STKPCI,0> +STKTRS	Class E
Proactive SIM	Receive data	TE	<+STKPCI,0> +STKTRS	Class E
Proactive SIM	Send data	TE	<+STKPCI,0> +STKTRS	Class E
Proactive SIM	Get channel status	TE	<+STKPCI,0> +STKTRS	Class E
Data Download	SMS-PP data download	ME	Do Nothing	Class 2
	CB data download	ME	Do Nothing	Class 2
Menu Selection		TE	+STKENVS	Class 2
Call Control by SIM		ME	Do Nothing	Class 2
MO SMS control by SIM		ME	Do Nothing	Class 2
Event Download	MT call event	ME	Do Nothing	Class 3
	Call connected event	ME	Do Nothing	Class 3
	Call disconnected event	ME	Do Nothing	Class 3
	Location status event	ME	Do Nothing	Class 3
	User activity event	TE	+STKENVS	Class 3
	Idle screen available event	TE	+STKENVS	Class 3
	Card reader status	NA	Not Support	Class A

	event			
	Language selection event	TE	+STKENVS	Class 3
	Browser Termination event	TE	+STKENVS	Class C
	Data available event	TE	+STKENVS	Class E
	Channel Status	TE	+STKENVS	Class E

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3 STK AT Commands Definition

SIM800 series STK AT command overview.

AT Command	Description
AT+STKTRS	This command is used to send STK Terminal Response
AT+STKENVS	This command is used to send STK Envelope command
AT+STKCALL	Trigger STK Call
AT+STKSMS	Trigger STK SMS
AT+STKSS	Trigger STK SS
AT+STKUSSD	Trigger STK USSD
AT+STKDTMF	Trigger STK DTMF
AT+STKMENU	Show STK main menu
AT+STKPCIS	Switch SKR URC string
+STKPCI	This unsolicited result code is used to indicate Proactive Command Indication.

3.1 AT+STKTRS STK Terminal Response

3.1.1 Description

This command is used to send STK Envelope command.

3.1.2 Format

Command	Response
AT+STKTRS=<result>[,<text>]	OK or ERROR
AT+STKTRS=?	+STKTRS: <result_length>,<text_length> OK

3.1.3 Field

- <result>** HEX String --specified in GSM11.14[12.12]
- '00' = Command performed successfully
 - '10' = Proactive SIM session terminated by the user
 - '11' = Backward move in the proactive SIM session requested by the user
- <text>** Hex String
- If response to **GET INPUT** or **GET INKEY** --specified in GSM11.14[12.15]
- text string, the first 2 char is Data coding scheme
- If response to **SELECT ITEM** --specified in GSM11.134[12.10]
- Identifier of item chosen

3.2 AT+STKENVS STK Envelope Command

3.2.1 Description

This command is used to send STK Envelope command.

3.2.2 Format

Command	Response
AT+STKENVS=<command>[,<d ata>]	OK or ERROR
AT+STKENVS=?	OK

3.2.3 Field

- <command>** HEX String --specified in GSM11.14[13.1]
- 'D3' = Menu Selection
 - 'D6' =Event download
- <data>** Hex String
- If command is 'D3' --specified in GSM11.14[8.2]
- Item identifier of main menu

If command is 'D6' --specified in GSM11.14[11]

-event list

- '04' = User activity
- '05' = Idle screen available
- '07' = Language selection

3.3 AT+STKCALL STK Call Setup

3.3.1 Description

To setup a STK call

3.3.2 Format

Command	Response
AT+STKCALL=0	
AT+STKCALL=4	
AT+STKCALL=16	OK
AT+STKCALL=18	
AT+STKCALL=32	
AT+STKCALL=34	
AT+STKCALL=?	OK

3.3.3 Field

AT+STKCALL=0: Trigger modem to send STK CALLSETUP

AT+STKCALL=4: Trigger modem to send STK CALLSETUP but icon cannot be displayed

AT+STKCALL=16: Proactive session terminated by user

AT+STKCALL=18: No response from user

AT+STKCALL=32: ME currently unable to process this command

AT+STKCALL=34: User rejecting setup call

AT+STKCALL=50: Command data not understood by ME

NOTE

- Above are the possible terminal response values to be responded by the application. It is ME's responsibility to respond other terminal response values.
- According to spec 11.14 , 0x12 ("No response from user") is not a possible terminal response value for STK CALLSETUP. So we will translate 0x12("No response from user") to 0x20("ME currently unable to process this command")

3.4 AT+STKSMS STK SMS Delivery

3.4.1 Description

To deliver a SMS

3.4.2 Format

Command	Response
AT+STKSMS=0	OK
AT+STKSMS=4	
AT+STKSMS=?	OK

3.4.3 Field

AT+STKSMS=0: Trigger modem to send STK SMS

AT+STKSMS=4: Trigger modem to send STK SMS but icon cannot be displayed

NOTE

Note: Above are the possible terminal response values to be responded by the application. It is ME's responsibility to respond other terminal response values.

3.5 AT+STKSS STK SS Setup

3.5.1 Description

To setup a SS.

3.5.2 Format

Command	Response
AT+STKSS=0	OK
AT+STKSS=4	
AT+STKSS=50	
AT+STKSS=?	OK

3.5.3 Field

AT+STKSS=0: Trigger modem to send STK SS

AT+STKSS=4: Trigger modem to send STK SS but icon cannot be displayed

AT+STKSS=50: Command data not understood by ME

NOTE

Note: Above are the possible terminal response values be responded by the application. It is ME's responsibility to respond other terminal response values.

3.6 AT+STKUSSD STK USSD Setup

3.6.1 Description

To setup a USSD.

3.6.2 Format

Command	Response
AT+STKUSSD=0	OK
AT+STKUSSD=4	
AT+STKUSSD=50	
AT+STKUSSD=?	OK

3.6.3 Field

AT+STKUSSD=0: Trigger modem to send STK USSD

AT+STKUSSD=4: Trigger modem to send STK USSD but icon cannot be displayed

AT+STKUSSD=50: Command data not understood by ME

NOTE

Note: Above are the possible terminal response values be responded by the application. It is ME's responsibility to respond other terminal response values.

3.7 AT+STKDTMF STK Sending DTMF

3.7.1 Description

To send DTMF tone.

3.7.2 Format

Command	Response
AT+STKDTMF=0	OK

AT+STKDTMF=4	
AT+STKDTMF=32	
AT+STKDTMF=?	OK

3.7.3 Field

AT+STKDTMF=0: Trigger modem to send STK DTMF

AT+STKDTMF=4: Trigger modem to send STK DTMF but icon cannot be displayed

AT+STKDTMF=32: ME currently unable to process command

NOTE

Note: Above are the possible terminal response values be responded by the application. It is ME's responsibility to respond other terminal response values.

3.8+STKPCI STK Proactive Command Indication

3.8.1 Description

This unsolicited result code is used to indicate Proactive Command Indication.

3.8.2 Format

Command	Response
	+STKPCI: < pci_type > [,<proactive_command>,...]

3.8.3 Field

< pci_type >

-0 The SAT command is handled by TE

-1 The SAT command is handled by ME

-2 No other command (end of session)

<proactive command>

- DISPLAY TEXT,< Data coding scheme>,<text string>
- GET INKEY, < Data coding scheme>,<text string>
- GET INPUT, < Data coding scheme>,<text string>,<Min length>,<Max length>[,<default text>]
- PLAY TONE,<alpha id>,<tone>,<duration>
- SET UP MENU,<the number of item >,<alpha id>
- SELECT ITEM, <the number of item >,<alpha id>
- ITEM,<index>,<id>,<item string>
- SEND SHORT MESSAGE,<alpha id>,<addr>,<sms tpdu>
- SEND SS,<alpha id>,<ss string>
- SEND USSD,<alpha id>,<ussd string>
- SETUP CALL,<alpha id>,<addr>
- SET UP IDLE MODE TEXT,<data coding scheme>,<text string>
- SEND DTMF,<alpha id>,<dtmf string>.

<Command Qualifier>

- DISPLAYTEXT

- bit 1: 0 = normal priority
1 = high priority
- bits 2-7: = RFU
- bit 8: 0 = clear message after a delay
1 = wait for user to clear message

- GET INKEY,

- bit 1: 0 = digits (0-9, *, # and +) only
1 = alphabet set
- bit 2: 0 = SMS default alphabet
1 = UCS2 alphabet
- bit 3: 0 = character sets defined by bit 1 and bit 2 are enabled
1 = character sets defined by bit 1 and bit 2 are disabled and the "Yes/No" response is requested
- bits 4-7: = RFU
- bit 8: 0 = no help information available
1 = help information available

- GETINPUT,

- bit 1: 0 = digits (0-9, *, #, and +) only
1 = alphabet set
- bit 2: 0 = SMS default alphabet
1 = UCS2 alphabet
- bit 3: 0 = ME may echo user input on the display
1 = user input shall not be revealed in any way (see note)
- bit 4: 0 = user input to be in unpacked format
1 = user input to be in SMS packed format
- bits 5 to 7: = RFU
- bit 8: 0 = no help information available
1 = help information available

<default text>

<text string>

- The first two octets is Data coding scheme, Data coding scheme is coded as for SMS Data coding scheme

defined in GSM 03.38 [5].

<Min length>

- min length,HEX value

<Max length>

- max length,HEX value

<alpha id>

- The alpha identifier is coded as for EFADN. See GSM 11.11 [20] for the coding of all EFs

<item string>

- The item string is coded in the same way as the alpha identifier for EFADN. Any unused bytes at the end of the value part shall be coded 'FF'.

<ss string>

- The first two octets is TON/NPI, TON/NPI and SS or USSD control string are coded as for EFADN, where the ADN record relates to a Supplementary Service Control string. See GSM 11.11 [20] for the coding of EFADN.

<ussd string>

- The first two octets is Data coding scheme ,The Data coding scheme is coded as for Cell Broadcast defined in GSM 03.38 [5]. The coding of the USSD string is defined in GSM 02.30 [4].

<dtmf string>

- The DTMF string which can be single or multiple characters is coded in BCD, in the same way as the Dialling number string defined for EFADN in GSM 11.11 [20]. It may include extended BCD coding. There is no need for a DTMF control digit separator at the beginning of the string, but if present it shall be interpreted as PAUSE.

<sms tpdu>

- The TPDU is formatted as described in GSM 03.40 [6].

Where the TPDU is being sent from the SIM to the ME (to be forwarded to the network), and where it includes a TPMessage-Reference which is to be incremented by the ME for every outgoing message, the TP-Message-Reference as provided by the SIM need not be the valid value. TP-Message-Reference shall be checked and corrected by the ME to the value described in GSM 03.40 [6].

<addr>

- The first two octets is TON/NPI, and other is Dialling number string, Dialling number string is coded as for EFADN, and may include DTMF separators and DTMF digits, which the ME shall send in the same way as for EFADN but without locally generating audible DTMF tones to the user. See GSM 11.11 [20] for the coding of all EFs.

<tone>

- Tones can be either the standard supervisory tone, as defined in GSM 02.40 [18], or proprietary tones defined by the ME manufacturer. The code values for proprietary tones shall be supported by the ME. If proprietary tones are not supported the ME shall map these codings to tones that it can generate. The tones to be used are left as an implementation decision by the manufacturer.

< Time unit >

- Contents: time unit used; minutes, seconds or tenths of seconds.

- Coding:

'00'Minutes

'01'Seconds

'02'Tenths of seconds

All other values are reserved

< Time interval>

- Contents: the length of time required, expressed in units.
- Coding: The time interval is coded in integer multiples of the time unit used. The range is from 1 unit to 255 units.

The encoding is:

- '00': reserved
- '01': 1 unit
- '02': 2 units
- ::
- 'FF': 255 units

3.9 AT+STKPCIS SIM URC Switch

3.9.1 Description

Switch the STK URC string

3.9.2 Format

Command	Response
<code>AT+STKPCIS=<switch></code>	OK or ERROR
<code>AT+STKPCIS?</code>	+STKPCIS: <switch> OK

3.9.3 Field

<switch>: the switch of STK URC

- 0 the STK URC is off
- 1 the STK URC is ON

3.10 AT+STKMENU Get SIM Toolkit Setup Menu Data

3.10.1 Description

To get SIM toolkit setup menu data

3.10.2 Format

Command	Response
AT+STKMENU?	[+STKMENU:<index>,<id>,<text>] [+STKMENU:<index>,<id>,<text>] [+STKMENU:<index>,<id>,<text>] [...] OK
AT+STKMENU=?	OK

3.10.3 Field

- <index>: the menu's index, begin 1
- <id>: the item identifier
- <text>: the content of item, code by EFADN

4 STK Usage Examples

The following tables provide some examples for STK usage. Different SIM card has different STK function. It is not necessary that the following examples are suitable for all of the SIM cards.

In the "Grammar" columns of following tables, input of AT commands are in black , module return values are in blue.

4.1 Setup Menu

4.1.1 Proactive Command Setup Menu

//Setup Menu Examples

**+STKPCI: 0,SETUP MENU,12,8051687
403901A4E13533A**

// Proactive command SETUP MENU ,there are 12 items

4.1.2 Terminal Response of Setup Menu

// Response of Setup Menu Examples

AT+STKTRS=00

// Response to proactive command SETUP MENU

OK

AT+STKMENU?

// Query main menu

+STKMENU: 1,F0,806211662F51687403901A

Item 1, ID is "F0"

+STKMENU: 2,F3,808D857EA753F77C3F

Item 2, ID is "F3"

+STKMENU: 3,F8,806D3B52A84FE1606F

+STKMENU: 4,FF,804E1A52A163A88350

+STKMENU: 5,0A,808D448D3963A88350

+STKMENU: 6,0B,8081EA52A9670D52A1

+STKMENU: 7,0C,8079FB52A865B04E1A52A1

+STKMENU: 8,10,805F6994C38BBE7F6E

+STKMENU: 9,18,8097F34E506392884C699C

+STKMENU: 10,21,8065B095FB8D448BAF

+STKMENU: 11,25,8065E07EBF4F1195F2

+STKMENU:

12,FE,8000530049004D53614FE1606F

OK

+STKPCI: 2

//End of session

4.2 Menu Selection Item

//STK Menu Selection Examples

AT+STKENVS=D3,F0

// Select item which ID is "F0"

OK

+STKPCI: 0,SELECT ITEM,2,0

// Proactive command select item, there are 2 items

+STKPCI:

0,ITEM,1,01,8054C1724C4FE1606F7EA7522B

Sub item 1, ID is "01"

+STKPCI:

Sub imte 2, ID is "02"

0,ITEM,2,02,8066F465B054C1724C4FE1606F

+STKPCI: 2

// End of session

4.3 Display Text

//Display Text Examples

AT+STKTRS=00,01

// Select item which id is "01"

OK

+STKPCI:0,DISPLAY TEXT,

// Proactive command DISPLAY TEXT

129,085C0A656C768451687403901A5BA2

129: high priority, wait for user to clear message

6237FF1A611F8C2260A8900962E94E2D5

08: Unicode encoding

6FD79FB52A8901A4FE1FF015168740390

1A52A960A86210529FFF01

// Respond to DISPLAY TEXT

AT+STKTRS=00

OK

//End of session

+STKPCI: 2

4.4 Get Input

//Get Input Examples

AT+STKENVS=D3,F3

OK

+STKPCI: 0,SELECT ITEM,7,0
 +STKPCI: 0,ITEM,1,01,8053F77C3F7BA17406
 +STKPCI: 0,ITEM,2,02,8062FC97F367E58BE2
 +STKPCI: 0,ITEM,3,03,8059D3540D67E58BE2
 +STKPCI: 0,ITEM,4,04,8053F77C3F6D4F89C8
 +STKPCI: 0,ITEM,5,05,8077ED4FE17FA453D1
 +STKPCI: 0,ITEM,6,06,807FA47EC47BA17406
 +STKPCI: 0,ITEM,7,07,8065B0589E8BB05F55

// Select item which ID is "F3"

// Proactive command SELECT ITEM, there are 7 sub itmes

Sub item 2, ID is "02"

AT+STKTRS=00,02

OK

+STKPCI: 0,GET INPUT, 1,
 088F93516599965B576BCDFF1A,00,01

// Respond to SELECT ITEM. Selsect item which id is "02"

// Proactive command GET INPUT

1: input is alphabet set

00,01 input length is 0 or 1.

AT+STKTRS=00,0161

OK

+STKPCI: 0,SELECT ITEM,4,0
 +STKPCI: 0,ITEM,1,01,8053F77C3F0031
 +STKPCI: 0,ITEM,2,02,8053F77C3F0032
 +STKPCI: 0,ITEM,3,03,8053F77C3F0033
 +STKPCI: 0,ITEM,4,04,80516890E8

// Respond to GET INPUT

01: default sms data encode

61: is alphabet set of 'A'

// Proactive command SELECT ITEM, there are 4 sub items

Sub item 2, Id is "02"

Sub item 3, Id is "03"

Sub item 4, Id is "04"

AT+STKTRS=00,04

OK

// Respond to SELECT ITEM, select item which id is "04"

+STKPCI:0,DISPLAYTEXT,
 128,08521788684E3A7A7AFF01

// Proactive command DISPLAY TEXT

128: normal priority, wait user to clean

AT+STKTRS=11

OK

// Respond to DISPLAY TEXT, mean to backword move

+STKPCI: 0,SELECT ITEM,4,0
 +STKPCI: 0,ITEM,1,01,8053F77C3F0031
 +STKPCI: 0,ITEM,2,02,8053F785840032
 +STKPCI:
 0,ITEM,3,03,80006100620063006400650066
 0067+STKPCI: 0,ITEM,4,04,80516890E8

// Proactive SELECT ITEM, there are 4 sub items

AT+STKTRS=10

// Respond to SELECT ITEM, end this session

OK

STKPCI: 2

// End of session

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