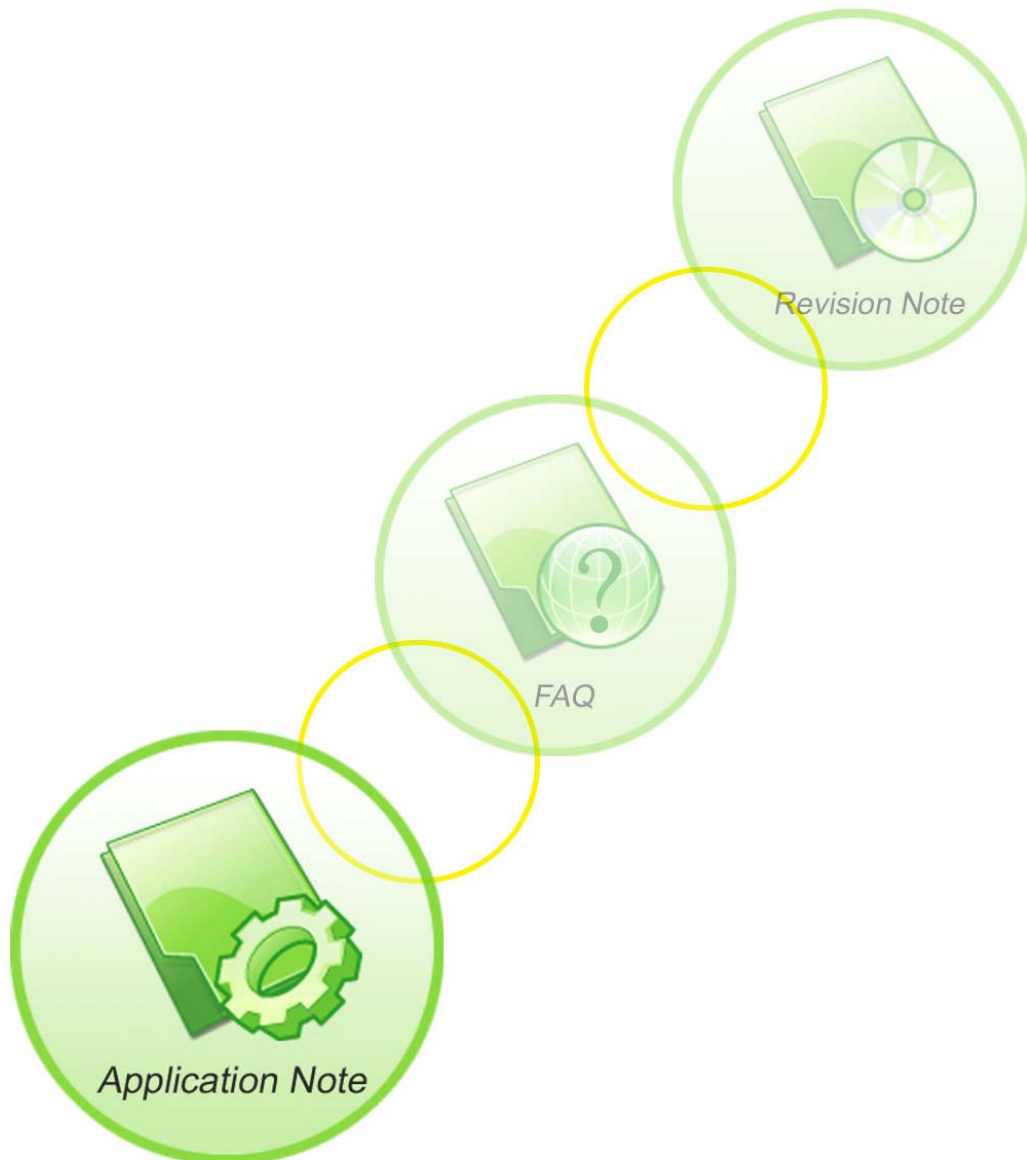




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# **SIM800 Series\_STK\_Application Note \_V1.00**



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## Version History

Date	Version	Description of change	Author
2013-08-01	1.00	New version	Ping.zhang

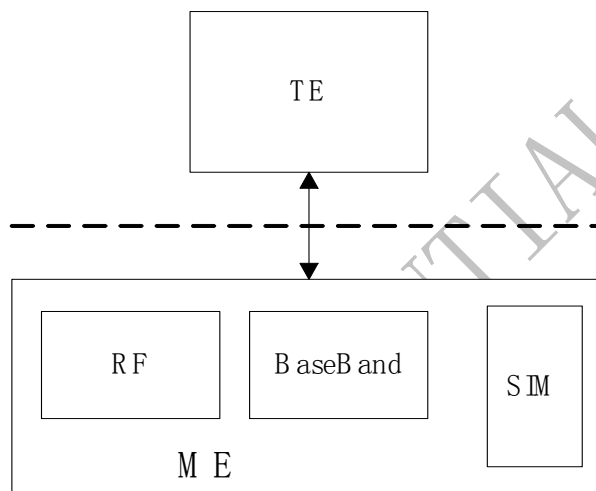
## Scope

This document presents the AT command of STK operation and application examples. This document can apply to SIM800 series modules, including SIM800, SIM800W, SIM800V, SIM800L and SIM800H.

## 1. STK Function

### 1.1. 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).

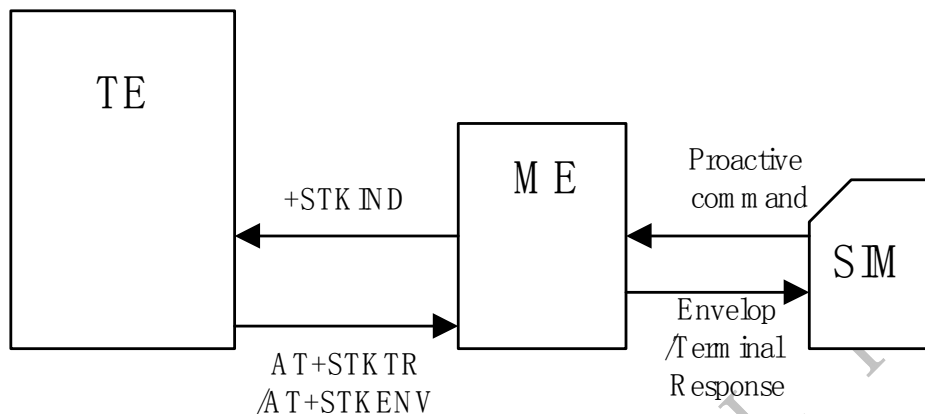
The SAT supported includes class 2 and class 3 (optional). No letter classes are supported.

### 1.2. 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	Involve ment	AT commands used	Class
Proactive SIM	Display text	TE	<+STKPCI,0> +STKTRS	Class 2
	Get inkey	TE	<+STKPCI,0> +STKTRS	Class 2
	Ge input	TE	<+STKPCI,0> +STKTRS	Class 2
	More time	ME	Do Nothing	Class 2
	Play tone	TE	<+STKPCI,0> +STKTRS	Class 2
	Poll interval	ME	Do Nothing	Class 2
	Refresh	TE/ME	<+STKPCI,1> Call Ready, SM BL Ready	Class 2
	Setup menu	TE	<+STKPCI,0> +STKTRS	Class 2
	Select item	TE	<+STKPCI,0> +STKTRS	Class 2
	Sendshort message	TE/ME	<+STKPCI,2> +STKSMS	Class 2
	Send ss	TE/ME	<+STKPCI,2> +STKSS	Class 2
	Send ussd	TE/ME	<+STKPCI,2> +STKUSSD	Class 2
	Set up call	TE/ME	<+STKPCI,2> +STKCALL	Class 2

	Polling off	ME	Do Nothing	Class 2
	Provide local information	ME	<+STKPCI,1>	Class 2
	Set up event list	ME	<+STKPCI,1>	Class 3
	Perform card apdu	NA	Not Support	Class A
	Power off card	NA	Not Support	Class A
	Power on card	NA	Not Support	Class A
	Get reader status	NA	Not Support	Class A
	Timer management	ME	Do Nothing	Class 3
	Set up idle mode text	TE	<+STKPCI,0> +STKTRS	Class 3
	Run at command	TE/ME	<+STKPCI,1> +STKTRS	Class B
	Send dtmf	TE/ME	<+STKPCI,1> +STKDTMF	Class 3
	Language notification	TE/ME	<+STKPCI,1>	Class 3
	Launch browser	TE	<+STKPCI,0> +STKTRS	Class C
	Open channel	TE	<+STKPCI,0> +STKTRS	Class E
	Close channel	TE	<+STKPCI,0> +STKTRS	Class E
	Receive data	TE	<+STKPCI,0> +STKTRS	Class E
	Send data	TE	<+STKPCI,0> +STKTRS	Class E
	Get channel status	TE	<+STKPCI,0> +STKTRS	Class E
Data	SMS-PP data download	ME	Do Nothing	Class 2
Download	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 event	NA	Not Support	Class A
	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



## 2. STK AT Commands Definition

SIM800 series STK AT command overview.

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.

### 2.1. AT+STKTRS STK Terminal Response

#### 2.1.1. Description

This command is used to send STK Terminal Response.

#### 2.1.2. Format

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

#### 2.1.3. 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

## 2.2. AT+STKENVS STK Envelope Command

### 2.2.1. Description

This command is used to send STK Envelope command.

### 2.2.2. Format

Command	Response
AT+STKENVS=<command>[,<data>]>]	OK ERROR
AT+STKENVS=?	OK

### 2.2.3. 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

## 2.3. AT+STKCALL STK Call Setup

### 2.3.1. Description

To setup a STK call

### 2.3.2. Format

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

### 2.3.3. 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").*

## 2.4. AT+STKSMS STK SMS Delivery

### 2.4.1. Description

To deliver a SMS

### 2.4.2. Format

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

AT+STKSMS=?	OK
-------------	----

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

## 2.5. AT+STKSS STK SS Setup

### 2.5.1. Description

To setup a SS.

### 2.5.2. Format

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

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

## 2.6. AT+STKUSSD STK USSD Setup

### 2.6.1. Description

To setup a USSD.

### 2.6.2. Format

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

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

## 2.7. AT+STKDTMF STK Sending DTMF

### 2.7.1. Description

To send DTMF tone.

### 2.7.2. Format

Command	Response
AT+STKDTMF=0	OK
AT+STKDTMF=4	
AT+STKDTMF=32	
AT+STKDTMF=?	OK

### 2.7.3. 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: Above are the possible terminal response values be responded by the application. It is*

*ME's responsibility to respond other terminal response values.*

## 2.8. +STKPCI STK Proactive Command Indication

### 2.8.1. Description

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

### 2.8.2. Format

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

### 2.8.3. 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>

-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

<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].

<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

## 2.9. AT+STKPCIS SIM URC Switch

### 2.9.1. Description

Switch the STK URC string



### 2.9.2. Format

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

### 2.9.3. Field

<switch>: the switch of STK URC

-0 the STK URC is off

-1 the STK URC is ON

## 2.10. AT+STKMENU Get SIM Toolkit Setup Menu Data

### 2.10.1. Description

To get SIM toolkit setup menu data

### 2.10.2. Format

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

### 2.10.3. Field

<index>: the menu's index, begin 1

<id>: the item identifier

<text>: the content of item, code by EFADN

### 3. STK Usage Example

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.

#### 3.1. Setup Menu

##### 3.1.1. Proactive Command Setup Menu

Grammar	Description
<b>+STKPCI:</b> <b>0,SET</b> <b>UP</b> <b>MENU,12,8051687403901A4E13533A</b>	Proactive command SETUP MENU ,there are 12 items

##### 3.1.2. Terminal Response of Setup Menu

Grammar	Description
<b>AT+STKTRS=00</b> <b>OK</b>	Response to proactive command SETUP MENU
<b>AT+STKMENU?</b> <b>+STKMENU: 1,F0,806211662F51687403901A</b> <b>+STKMENU: 2,F3,808D857EA753F77C3F</b> <b>+STKMENU: 3,F8,806D3B52A84FE1606F</b> <b>+STKMENU: 4,FF,804E1A52A163A88350</b> <b>+STKMENU: 5,0A,808D448D3963A88350</b> <b>+STKMENU: 6,0B,8081EA52A9670D52A1</b> <b>+STKMENU:</b> <b>7,0C,8079FB52A865B04E1A52A1</b> <b>+STKMENU: 8,10,805F6994C38BBE7F6E</b> <b>+STKMENU: 9,18,8097F34E506392884C699C</b> <b>+STKMENU: 10,21,8065B095FB8D448BAF</b> <b>+STKMENU: 11,25,8065E07EBF4F1195F2</b> <b>+STKMENU:</b> <b>12,FE,8000530049004D53614FE1606F</b> <b>OK</b>	Query main menu Item 1, ID is"F0" Item 2, ID is "F3"
<b>+STKPCI: 2</b>	End of session

### 3.2. Menu Selection Item

Grammar	Description
AT+STKENVS=D3,F0 OK	Select item which ID is "F0"
+STKPCI: 0,SELECT ITEM,2,0 +STKPCI: 0,ITEM,1,01,8054C1724C4FE1606F7EA7522B +STKPCI: 0,ITEM,2,02,8066F465B054C1724C4FE1606F	Proactive command select item, there are 2 items Sub item 1, ID is "01" Sub imte 2, ID is "02"
+STKPCI: 2	End of session

### 3.3. Display Text

Grammar	Description
AT+STKTRS=00,01 OK	Select item which id is "01"
+STKPCI: 0,DISPLAY TEXT, 129,085C0A656C768451687403901A5BA26237 FF1A611F8C2260A8900962E94E2D56FD79FB 52A8901A4FE1FF0151687403901A52A960A86 210529FFF01	Proactive command DISPLAY TEXT 129: high priority, wait for user to clear message 08: Unicode encoding
AT+STKTRS=00 OK	Respond to DISPLAY TEXT
+STKPCI: 2	End of session

### 3.4. Get Input

Grammar	Description
AT+STKENVS=D3,F3 OK	Select item which ID is "F3"
+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	Proactive command SELECT ITEM, there are 7 sub itmes Sub item 2, ID is "02"

+STKPCI: 0,ITEM,6,06,807FA47EC47BA17406 +STKPCI: 0,ITEM,7,07,8065B0589E8BB05F55	
AT+STKTRS=00,02 OK	Respond to SELECT ITEM. Select item which id is "02"
+STKPCI: 0,GET INPUT, 1, 088F93516599965B576BCDFF1A,00,01	Proactive command GET INPUT 1: input is alphabet set 00,01 input length is 0 or 1.
AT+STKTRS=00,0161 OK	Respond to GET INPUT 01: default sms data encode 61: is alphabet set of 'A'
+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	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,DISPLAY TEXT, 128,08521788684E3A7A7AFF01	Proactive command DISPLAY TEXT 128: normal priority, wait user to clean
AT+STKTRS=11 OK	Respond to DISPLAY TEXT, mean to backward move
+STKPCI: 0,SELECT ITEM,4,0 +STKPCI: 0,ITEM,1,01,8053F77C3F0031 +STKPCI: 0,ITEM,2,02,8053F785840032 +STKPCI: 0,ITEM,3,03,8000610062006300640065006600 67 +STKPCI: 0,ITEM,4,04,80516890E8	Proactive SELECT ITEM, there are 4 sub items
AT+STKTRS=10 OK	Respond to SELECT ITEM, end this session
STKPCI: 2	End of session

SIM

## Appendix

### A Related Documents

SN	Document name	Remark
[1]	SIM800 Series_AT Command Manual	

### B Terms and Abbreviations

Abbreviation	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

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