SIM/USIM Application Toolkit Application Note

80000NT10030A Rev. 1 – 2011-03-08

Making machines talk.

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APPLICABLE PRODUCTS

PRODUCT
GT863-PY
GT864-QUAD
GT864-PY
GM862-GPS
GC864-PY
GC864-QUAD
GC864-QUAD V2
UC864-E
UC864-E-AUTO
UC864-E-DUAL
UC864-G
UC864-WD
GE863-GPS
GE863-SIM
GE863-PRO^3
GE864-PY
GE864-QUAD
GE864-QUAD V2
GE864-QUAD AUTOMOTIVE V2
GE864-QUAD ATEX
GE865
GL865

SW Version
7.03.01 / 7.02.06
8.01.xx6

Contents

1. Introduction

1.1. Scope

The aim of this application note is to provide indications about using AT Commands to interact with the SIM/USIM Application toolkit feature.

1.2. Audience

This document is intended for Telit customers developing SIM/USIM Toolkit functionalities on their applications.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit's Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
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Alternatively, use:
http://www.telit.com/en/products/technical-support-center/contact.php
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http://www.telit.com
To register for product news and announcements or for product questions contact Telit's Technical Support Center (TTSC).
Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.
Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

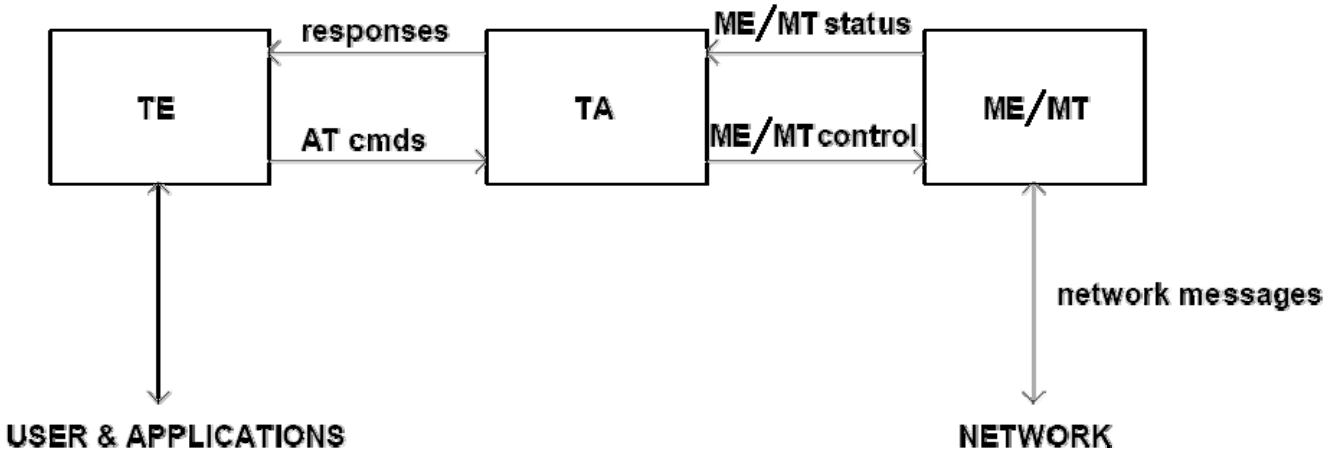
[1]	3GPP TS 27.007: "AT command set for User Equipment (UE)"
[2]	3GPP TS 51.011: "Specification of the Subscriber Identity Module - Mobile Equipment (SIM-ME) Interface"
[3]	3GPP TS 51.014: "Specification of the SIM Application Toolkit (SAT) for the Subscriber Identity Module - Mobile Equipment (SIM-ME) Interface"
[4]	ETSI TS 102.223: "Smart Cards;Card Application Toolkit (CAT)"
[5]	3GPP TS 31.102: "Characteristics of the USIM application"
[6]	3GPP TS 31.111: "Universal Subscriber Identity Module Application Toolkit (USAT)"
[7]	Telit Communications S.p.A.: "Telit AT Commands Reference Guide", 80000ST10025a
[8]	3GPP TS 23.038: "Alphabets and language-specific informations"
[9]	ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (UCS)"; UCS2, 16 bit coding.
[10]	UC864-E/G/WD/E-DUAL AT Commands Reference Guide, 80304ST10041

1.6. Document History

Revision	Date [yyyy/mm/dd]	Changes
ISSUE #0	2009-09-03	First Issue
ISSUE #1	2011-01-10	Introduction of new SAT activation modes: 17, 18, 19, 33, 34, 35 Alignment to code after bug fixing activity: command **#STSR**, management of *<UserResponse>=0* **XGold specific** extensions: proactive commands "RUN AT COMMAND", "OPEN CHANNEL", "CLOSE CHANNEL", "RECEIVE DATA", "SEND DATA"

2. General concepts

Based on Specification [1], **AT Commands** are recommended to be used for controlling **ME / MT** functions and GSM/WCDMA network services from a **TE** through **TA**. The abstract architecture to be considered is the following



TELIT MODULEs physical implementation of this abstract architecture integrates the TA under the ME cover, and implements the TE as a separate entity.

SIM/USIM Application Toolkit (SAT/USAT) is a set of applications and related procedures, existing in the SIM/USIM, which may be used during a GSM/WCDMA session.

SAT/USAT provides mechanisms which allow applications, existing in the SIM/USIM, to interact and operate with any ME which supports the specific mechanism(s) required by the application.

NOTE:

USER can issue AT Commands to know the status of the interaction SAT/USAT←→ME and to provide the SIM/USIM with any requested response.

Scope of this document is providing USER with simple “How-To”-explanations and -examples regarding his operativeness through “SIM/USIM Toolkit AT Commands”.

3. "How-to" Description

NOTICE:

This document has to be considered complementary to [7][10]

3.1. SAT/USAT mechanisms

The SIM/USIM Application Toolkit provides mechanisms which allow applications, existing in the SIM/USIM, to interact and operate with any ME which supports the specific mechanisms required by the application.
The following mechanisms have been defined. These mechanisms are dependent upon the commands and protocols relevant to SIM/USIM Application Toolkit in [3][4].
What follows is the list of SAT/USAT mechanisms with a slightly in-depth vision of that more related to our aims.

- *Profile Download*
» *The profile download instruction is sent by the ME to the SIM/USIM as part of the SIM/USIM initialization procedure ([2][5])*
» *Profile downloading provides a mechanism for the ME to tell the SIM/USIM what is capable of.*
- *Proactive SIM/USIM*
» *Proactive SIM/USIM gives a mechanism whereby the SIM/USIM can initiate actions to be taken by the ME. These actions include:*
- *displaying text from the SIM/USIM to the ME;*
- *sending a short message;*
- *setting up a voice call to a number held by the SIM/USIM;*
- *setting up a data call to a number and bearer capabilities held by the SIM/USIM;*
- *sending a SS control or USSD string;*
- *playing tone in earpiece;*
- *initiating a dialogue with the user;*
- *SIM/USIM initialization request and notification of changes to EF(s);*
- *providing local information from the ME to the SIM/USIM;*
- *communicating with the additional card(s) (if class "a" is supported);*
- *providing information about the additional card reader(s) (if class "a" is supported);*
- *managing timers running physically in the ME;*
- *running an AT command received from the SIM/USIM, and returning the result to the SIM/USIM (if class "b" is supported);*

- *sending DTMF;*
- *requesting the ME to launch the browser corresponding to a URL. (if class "c" is supported);*
- *establishing and managing a bearer independent protocol (if class "e" is supported).*

- *Data download To SIM/USIM*
- *Menu selection*
  - » *A set of possible menu entries is supplied by the SIM/UISM in a proactive SIM/USIM command. The menu selection mechanism is used to transfer the SIM/USIM application menu item which has been selected by the user to the SIM/USIM.*
- *Call control by SIM/USIM*
  - » *When this service is activated by the SIM/USIM, all dialled digit strings, supplementary service control strings and USSD strings are first passed to the SIM before the ME sets up the call, the supplementary service operation or the USSD operation. (...)*
- *MO Short Message control by SIM/USIM*
  - » *When this service is activated by the SIM/USIM, all MO short messages are first passed to the SIM/USIM before the ME sends the short message. (...)*
- *Event download*
- *Security (currently NOT IMPLEMENTED)*
- *Multiple card (currently NOT IMPLEMENTED)*
- *Timer Expiration*
- *Bearer Independent Protocol*
  - » *The set of proactive commands (OPEN CHANNEL, CLOSE CHANNEL, SEND DATA, RECEIVE DATA and GET CHANNEL STATUS) and events (Data available, Channel status) allows the SIM/USIM to establish a data channel with the ME, and through the ME to a remote Server in the Network. The SIM/USIM provides information for the ME to select an available bearer at the time of channel establishment. The ME then allows the SIM/USIM and the Server to exchange data on this channel, transparently. The SIM/USIM uses service of ME lower layer to send data by providing Service Data Unit to ME. The default lower layer is the higher layer of selected bearer*

3.2. SIM/USIM Application Toolkit AT Commands

NOTE:

A set of SAT specific AT Commands has been coded in the MODULE so that USER has mechanisms through which activate the SAT and provide the right TERMINAL RESPONSE to any SAT/USAT proactive command.

In what follows we're considering more deeply this argument.

3.2.1. Proactive SIM/USIM, proactive commands and the dialogue ME←→SAT/USAT

ME communicates to the SIM/USIM using a specific protocol in which ME is always the "master" and initiates commands to the SIM/USIM, and therefore in this protocol there is no mechanism for the SIM/USIM to initiate a communication with the ME.

The **proactive SIM/USIM service** provides a mechanism which stays within the above mentioned protocol, but it also allows the SIM/USIM to say to the ME "I have some information to send to you". This mechanism permits the SIM/USIM to initiate a communication with the ME and the SIM/USIM can issue a variety of commands through this mechanism, the **proactive commands**.
ME tells the SIM/USIM if the command was successful or not using a specific command result procedure.

NOTE:

There's a **subset of proactive commands** that require USER to interact with SAT through AT Commands, either because USER has to know the status of the dialog ME←→SAT/USAT, or because USER is the recipient of some URC sent by TA indicating the occurrence of some event of interest in the dialog ME←→SAT/USAT (i.e. SAT/USAT sent a proactive command to ME), or because USER has to issue to SAT/USAT the right terminal response to a proactive command.

*This set of **AT-related proactive commands** is going to be of major interest.*

*In the rest of the document: the term **proactive command** will actually indicate such an **AT-related proactive command**.*

In the dialogue ME←→SAT/USAT each proactive command is identified by its numerical code. Next table shows the list of proactive commands of interest for the document (i.e. the AT-related proactive commands) and their numerical code.

Proactive command	Numerical code
REFRESH	1
SET UP EVENT LIST	5
SET UP CALL	16
SEND SS	17
SEND USSD	18
SEND SM	19
SEND DTMF	20
PLAY TONE	32
DISPLAY TEXT	33
GET INKEY	34
GET INPUT	35
SELECT ITEM	36
SET UP MENU	37
SET UP IDLE MODE TEXT	40
RUN AT COMMAND(*)	52
OPEN CHANNEL(*)	64
CLOSE CHANNEL(*)	65
RECEIVE DATA(*)	66
SEND DATA(*)	67

(*) Implemented for **Xgold chipset only**; not available for Elite chipset; they can be executed only if USER previously and successfully ran the command **AT#STTA=1**

AT-related proactive commands

Only one proactive command can be ongoing at any one time.

We've already said the tools provided by the AT Interface permit USER to get information from SAT/USAT and to provide the correct RESPONSE for SAT/USAT. They are:

WHAT	DIRECTION	DESCRIPTION
#STIA	TE → TA (···→ SAT/USAT)	AT Command to activate the SAT/USAT interface
#STGI	TE → TA (···→ SAT/USAT)	AT Command to get information about ongoing proactive command
#STSR	TE → TA (···→ SAT/USAT)	AT Command letting USER provide RESPONSE to SAT/USAT
#STN	(SAT/USAT →···) TA → TE	Multipurpose URC to notify TE of what happens in the SIM/USIM Application

SIM/USIM Toolkit AT Commands and URC

3.2.2. Facing SAT/USAT

First of all USER could get information about SAT/USAT interface. It should be interesting to have an answer to the following questions:

1. Is SAT/USAT already running?
2. Is the URC **#STN** enabled? If yes, which is the mode it has been enabled?
3. What is the timeout interval for USER to answer to a proactive command that requires user interaction?
4. What is the current **SAT/USAT Terminal Profile** (i.e. what SAT/USAT facilities are currently supported by ME)

USER can get this information issuing the Read Command

AT#STIA?

This command returns always four values:

#STIA: <MainMenuState>, <URCEnablingStatus>,<Timeout>,<TerminalProfile>
(See [7][10], "SIM Toolkit Interface Activation - #STIA" for the right syntax and interpretation)

Query example

```
AT#STIA?
#STIA: 0,0,10,7fffffff7f00005f96000000000000000000

OK
```
'*The result tells that the SAT/USAT main menu has not been created, the SAT/USAT unsolicited indications are not enabled, the timeout for user responses is 10 min. It follows the SAT/USAT Terminal Profile*

3.2.3. Exploiting SAT/USAT

3.2.3.1. SAT/USAT Activation / Deactivation → #STIA

When USER wants to exploit SAT/USAT he has first to activate it (if SAT/USAT has not been activated yet, every issues of commands **#STGI** or **#STSR** returns an error code).

NOTE:

USER must be informed that

a) *at every power cycle just one CMUX instance (See [7][10], "Multiplexing Mode - +CMUX") can exploit SAT/USAT: it is the CMUX instance that first issued the SAT/USAT activation AT Command.*

b) if the ENS functionality has been enabled SAT/USAT is always activated on CMUX instance number 0 only (See [7][10], "Enhanced Network Selection - #ENS")

*c) (**XGold chipset only**) for the proactive commands **RUN AT COMMAND (52)**, **OPEN CHANNEL (64)**, **CLOSE CHANNEL (65)**, **RECEIVE DATA (66)** and **SEND DATA (67)** to be executed the right way, it is mandatory that user previously and successfully ran the command **AT#STTA=1** (See **[7][10], "SIM Toolkit Terminal Attach - #STTA"**). Otherwise an error is raised.*

NOTE:

Before activating SAT/USAT, USER is strongly recommended:

a) *to tell TA that SMS messages format be 'TEXT MODE' (issuing AT+CMGF=1);*

to enable unsolicited indications for incoming SMS messages (issuing AT+CNMI=3,1 or AT+CNMI=2,1 or AT+CNMI=2,2).

USER has nine different SAT/USAT activation modes:

a) **AT#STIA=1[,<Timeout>]** activates SAT/USAT without unsolicited indication #STN; the SIM will determine the alphabet to use when displaying text (either GSM 7 bit Default Alphabet, see [8], or UCS2 Alphabet, see [9]).

b) **AT#STIA=2[,<Timeout>]** activates both SAT/USAT and unsolicited indication #STN; it activates the URC in extended mode (this is the activation mode suggested by TELIT); the SIM will determine the alphabet to use when displaying text (either GSM 7 bit Default Alphabet, see [8], or UCS2 Alphabet, see [9]).

c) **AT#STIA=3[,<Timeout>]** activates both SAT/USAT and unsolicited indication #STN; it activates the URC in reduced mode; the SIM will determine the alphabet to use when displaying text (either GSM 7 bit Default Alphabet, see [8], or UCS2 Alphabet, see [9]).

d) **AT#STIA=17[,<Timeout>]** activates SAT/USAT without unsolicited indication #STN; GSM 7 bit Default Alphabet (see [8]) is always used when displaying text.

e) **AT#STIA=18[,<Timeout>]** activates both SAT/USAT and unsolicited indication #STN; it activates the URC in extended mode (this is the activation mode suggested by TELIT; GSM 7 bit Default Alphabet (see [8]) is always used when displaying text.

f) **AT#STIA=19[,<Timeout>]** activates both SAT/USAT and unsolicited indication #STN; GSM 7 bit Default Alphabet (see [8]) is always used when displaying text.

g) **AT#STIA=33[,<Timeout>]** activates SAT/USAT without unsolicited indication #STN; UCS2 Alphabet (see [9]) is always used when displaying text.

h) **AT#STIA=34[,<Timeout>]** activates both SAT/USAT and unsolicited indication #STN; it activates the URC in extended mode (this is the activation mode suggested by TELIT); UCS2 Alphabet (see [9]) is always used when displaying text.

i) **AT#STIA=35[,<Timeout>]** activates both SAT/USAT and unsolicited indication #STN; it activates the URC in reduced mode; UCS2 Alphabet (see [9]) is always used when displaying text.

(See [7][10], "SIM Toolkit Interface Activation - #STIA" for the right syntax and interpretation)

To be more precise, every SAT/USAT activation request (SAT/USAT deactivation as well) is actually a sequence of both AT Commands and actions that USER has to carry out successfully. Next two tables show both procedures.

SAT/USAT Activation Procedure		
1 -	**AT#STIA=n[,<timeout>]** n is in (1-3,17-19, 33-35)	So that at the next SIM/USIM initialization procedure the **SIM/USIM ←→ ME** information exchange will cause the SAT/USAT to be activated
2 -	**AT&W0**	To store the complete device configuration on profile **<0>**
3 -	**AT&P0**	To load at next start-up the configuration stored on profile **<0>**
4 -	***Reboot***	So that the previous settings be effective and SAT/USAT be activated

SAT/USAT Deactivation Procedure		
1 -	**AT#STIA=0**	So that at the next SIM/USIM initialization procedure the **SIM/USIM ←→ ME** information exchange will cause the SAT/USAT not to be activated
2 -	**AT&W0**	To store the complete device configuration on profile **<0>**

3 - **AT&P0**	To load at next start-up the configuration stored on profile **<0>**
4 - ***Reboot***	So that the previous settings be effective and SAT/USAT be not activated

What does it happen after reboot?

a) If SAT/USAT has been activated with **<mode> 2, 3, 18, 19, 34 or 35** (therefore URC **#STN** activated as well) a typical SAT/USAT session starts after TE received the unsolicited indication **#STN: 37**: it means the SAT/USAT main menu is ready.
b) If SAT/USAT has been activated with **<mode> 1, 17 or 33** (therefore the unsolicited **#STN** has not been activated) it is necessary for USER to poll the SAT/USAT Main Menu State (**AT#STGI?**) until the response **#STGI: 1, 37** is received.

Both these arguments and 'how to proceed' information are detailed in the following chapters.

SAT/USAT activation example

```
AT#STIA?
#STIA: 0,0,10,7fffffff7f00005f96000000000000000000

OK
AT#STIA=2,1
OK
'SAT/USAT activation request with 1 minute timeout
AT&W0
OK
AT&P0
OK
AT#REBOOT
OK
'Reboot request
AT+CPIN?
+CPIN: SIM PIN

OK
AT+CPIN=9603
OK
AT#STGI?
+CME ERROR: operation not allowed
'SAT/USAT has been activated but main menu has not been created yet

#STN: 37
AT#STGI?
#STGI: 1,37
```

```
OK
'Finally main menu has been created
AT#STIA?
#STIA: 1,2,1,7fffffff7f00005f96000000000000000000

OK
'The result tells that the SAT/USAT main menu has been created, the SAT/USAT unsolicited indications
have been enabled in "Extended" mode, the timeout for user responses is 1 min. It follows the SAT/USAT
Terminal Profile
```

3.2.3.2. How to get information about the ongoing proactive command → #STGI

Once the SAT/USAT has been activated, the **basic tool for USER to know exactly what is the ongoing proactive command**, is the AT Command Query

AT#STGI?

This command returns always a couple of values:

#STGI: <SAT/USATMainMenuState>,<CmdType>

The first one tells whether the SAT/USAT main menu has been already created or not; the second one is the numerical code of the ongoing proactive command.

The basic tool for the USER to know exactly what are the parameters of the ongoing proactive command, is the AT Command

AT#STGI=<CmdType>
*Where **<CmdType>:** numerical code of the ongoing proactive command.*

The **#STGI:** response has multiple formats, because it has to represent the parameter syntax for all the proactive commands.
(See [7][10], "SIM Toolkit Get Information - #STGI" for the right syntax and interpretation)

This command returns the right **#STGI:** response only if **<CmdType>** effectively is the numerical code of the ongoing proactive command, else an error code is raised.

3.2.3.2.1. Examples

1. *#STGI basic use example, if GSM 7 bit Default Alphabet is used for displaying text*

```
AT#STGI?
#STGI: 1,37

OK
AT#STGI=37
#STGI: 37,00,12,"SIM i.TIM"
#STGI: 37,1,"SCOPRI SERVIZI"
#STGI: 37,2,"MY TIM"
#STGI: 37,3,"SCRIPTIM"
#STGI: 37,4,"ATTIVA MMS"
#STGI: 37,5,"i.box"
#STGI: 37,6,"LOSAI DI TIM"
#STGI: 37,7,"MilleunaTIM"
#STGI: 37,8,"2 IN 1"
#STGI: 37,9,"TIMC@FE'"
#STGI: 37,10,"TIM PayForMe"
#STGI: 37,11,"TIMSPOT"
#STGI: 37,12,"RICARICA"

OK
```

2. *Same basic #STGI example, if UCS2 Alphabet is used for displaying text*

```
at#stgi?
#STGI: 1,37

OK
at#stgi=37
#STGI: 37,00,12,"00530049004D00200069002E00540049004D"
#STGI: 37,1,"00530043004F00500052004900200053004500520056004900 5A0049"
#STGI: 37,2,"004D00590020005400490 04D"
#STGI: 37,3,"00530043005200490050005400490 04D"
#STGI: 37,4,"00410054005400490056004100200 04D004D0053"
#STGI: 37,5,"0069002E0062006F0078"
#STGI: 37,6,"004C004F00530041004900200044004900200054004900 4D"
#STGI: 37,7,"004D0069006C006C00650075006E006100540049004D"
#STGI: 37,8,"003200200049004E00200031"
#STGI: 37,9,"00540049004D00430040004600450027"
#STGI: 37,10,"00540049004D00200050006100790046006F0072004D0065"
#STGI: 37,11,"00540049004D00530050004F0054"
#STGI: 37,12,"00520049004300410052004900430041"

OK
```

3. *Basic #STGI example in 'mixed' mode: SIM decides the alphabet to use when displaying text (it can be either 7 Bit Default Alphabet or UCS2 Alphabet)*

```
AT+CPIN=9603
OK

#STN: 37
AT#STIA?
#STIA: 1,2,1,7FFFFFFF7F00005F96000000000000000000

OK
'SAT/USAT has been activated with 'mixed' mode
AT#STGI=37
#STGI: 37,00,2,"Fun & Info"
#STGI: 37,1,"Fun & Info"
#STGI: 37,0,2,"05D705D5002205DC002005DE05D505D605DC"
OK
'Either 7 Bit Default Alphabet and UCS2 Alphabet are used for displaying text
```

4. *Basic #STGI example when SAT activation mode requires 7 Bit Default Alphabet only (#STIA=18)*

```
AT+CPIN=9603
OK

#STN: 37
AT#STIA?
#STIA: 1,18,1,7FFFFFFF7F00005F96000000000000000000

OK
'SAT/USAT has been activated by At#STIA=18
AT#STGI=37
#STGI: 37,00,2,"Fun & Info"
#STGI: 37,1,"Fun & Info"
#STGI: 37,0,2,""
'Last item is a sequence of blanks, because those characters are not displayable by 7 Bit Default Alphabet
```

5. *Basic #STGI example when SAT activation mode requires UCS2 Alphabet only.*

```
AT+CPIN=9603
OK

#STN: 37
AT#STIA?
#STIA: 1,34,1,7FFFFFFF7F00005F96000000000000000000

OK
'SAT/USAT has been activated by At#STIA=34
AT#STGI=37
#STGI: 37,00,2,"00460075006E00200026002000049006E0066006F"
#STGI: 37,1,"00460075006E00200026002000049006E0066006F"
#STGI: 37,2,"05D705D5002205DC002005DE05D505D605DC"
```


```
OK.
'UCS2 Alphabet used for displaying text
```

3.2.3.3. The Unsolicited Indication #STN

It is possible to activate an URC indicating occurrence of a SAT/USAT-related event

If SAT/USAT has been activated either by

AT#STIA=2, AT#STIA=18, AT#STIA=34

Or

AT#STIA=3, AT#STIA=19, AT#STIA=35

TA sends to TE the unsolicited indication **#STN** every time SAT/USAT issues a proactive command to ME.

#STN is a multipurpose URC: it is actually used with various meanings and with various formats, as it appears in the next chapters.

3.2.3.3.1. #STN to notify USER that SAT/USAT has just sent a proactive command requiring USER interaction.

#STN format depends on SAT/USAT activation mode

<mode>	URC type	Description
2 18 34	EXTENDED	**#STN: <cmdType>[,<α_1>[,...]]** URC format has: a) always a fixed part, reporting the proactive command code **<cmdType>** b) a variable part for some proactive command only; this part contains the proactive command parameter list; this list is the same as that resulting from **AT#STGI=<cmdType>** the proactive commands for which the unsolicited indication **#STN** effectively has an extended representation mode are: REFRESH 1

		SEND SS: 17 SEND USSD: 18 SEND SM: 19 SEND DTMF: 20 PLAY TONE: 32 DISPLAY TEXT(*): 33(*) RUN AT COMMAND(**): 52(**) CLOSE CHANNEL(**): 65(**) RECEIVE DATA(**): 66(**) SEND DATA(**): 67(**) These are proactive commands that notify something to USER but don't require USER interaction explicitly. (*) *SIM/USIM can send the proactive command 33 and ask for USER to accept this command too. If this is the case the URC format has only the fixed part, even if SAT/USAT has been activated in extended mode.* (**) *Implemented for **Xgold chipset only**; not available for Elite chipset; they can be executed only if USER previously and successfully ran the command **AT#STTA=1***
3 19 35	REDUCED	**#STN: <cmdType>** URC format has only a fixed part, reporting the proactive command code **<cmdType>**

*(See [7][10], "SIM Toolkit Interface Activation - #STIA" for the list of proactive commands whose parameters are notified by mean of URC **#STN** in extended mode)*
See examples.

Examples

1. *SIM Toolkit activated by AT#STIA=2; proactive commands GET INPUT (35), SELECT ITEM (36) and SET UP MENU (37)*

```
AT+CPIN=9603
OK

#STN: 37
AT#STIA?
#STIA: 1,2,1,7FFFFFFF7F00005F96000000000000000000

OK
AT#STGI=37
#STGI: 37,00,12,"SIM I.TIM"
#STGI: 37,1,"SCOPRI SERVIZI"
#STGI: 37,2,"MY TIM"
#STGI: 37,3,"SCRIPTIM"
#STGI: 37,4,"ATTIVA MMS"
#STGI: 37,5,"I.BOX"
#STGI: 37,6,"LOSAI DI TIM"
#STGI: 37,7,"MILLEUNATIM"
#STGI: 37,8,"2 IN 1"
#STGI: 37,9,"TIMC@FE'"
#STGI: 37,10,"TIM PAYFORME"
#STGI: 37,11,"TIMSPOT"
#STGI: 37,12,"RICARICA"

OK
AT#STSR=37,0,9
OK

#STN: 36
AT#STGI=36
#STGI: 36,00,8
#STGI: 36,1,"ISCRIVITI"
#STGI: 36,2,"LOG IN"
#STGI: 36,3,"CHI SONO?"
#STGI: 36,4,"INVIA MSG"
#STGI: 36,5,"CERCA AMICI"
#STGI: 36,6,"CHATROOM"
#STGI: 36,7,"FORUM"
#STGI: 36,8,"LOG OUT"

OK
AT#STSR=36,0,1
OK

#STN: 35
AT#STGI=35
#STGI: 35,01,"NICKNAME?",1,12

OK
'Input data is requested
AT#STSR=35,0,"ABCD"
OK
```

```
#STN: 35
AT#STGI=35
#STGI: 35,01,"PASSWORD?",1,12

OK
'Input data is requested
AT#STSR=35,0,"EFGH"
OK

#STN: 36
AT#STGI=36
#STGI: 36,00,2
#STGI: 36,1,"UOMO"
#STGI: 36,2,"DONNA"

OK
AT#STSR=36,0,1
OK

#STN: 35
AT#STGI=35
#STGI: 35,00,"ET ?",0,2

OK
'Input data is requested
'We won't send any response for more than <timeout> minutes
AT#STGI?
#STGI: 1,35

OK
'Timeout has not been expired yet, the response to the query is the same as before

#STN: 135
'Now timeout has been expired: proactive command 35 has been aborted and SAT/USAT is back to main
menu
AT#STGI?
#STGI: 1,37

OK
AT#STGI=37
#STGI: 37,00,12,"SIM I.TIM"
#STGI: 37,1,"SCOPRI SERVIZI"
#STGI: 37,2,"MY TIM"
#STGI: 37,3,"SCRIPTIM"
#STGI: 37,4,"ATTIVA MMS"
#STGI: 37,5,"I.BOX"
#STGI: 37,6,"LOSAI DI TIM"
#STGI: 37,7,"MILLEUNATIM"
#STGI: 37,8,"2 IN 1"
#STGI: 37,9,"TIMC@FE'"
#STGI: 37,10,"TIM PAYFORME"
#STGI: 37,11,"TIMSPOT"
#STGI: 37,12,"RICARICA"

OK
```

2. SIM Toolkit activated by AT#STIA=34; same example as above

```
AT+CPIN=9603
OK

#STN: 37
AT#STIA?
#STIA: 1,2,1,7FFFFFFF7F00005F96000000000000000000

OK
AT#STGI=37
#STGI: 37,00,12,"00530049004D00200069002E00540049004D"
#STGI: 37,1,"00530043004F00500052004900200053004500520056004900 5A0049"
#STGI: 37,2,"004D00590020005400 49004D"
#STGI: 37,3,"00530043005200490050005400 49004D"
#STGI: 37,4,"00410054005400490056004100 20004D004D0053"
#STGI: 37,5,"0069002E0062006F0078"
#STGI: 37,6,"004C004F00530041004900200044004900200054004900 4D"
#STGI: 37,7,"004D0069006C006C00650075006E006100540049004D"
#STGI: 37,8,"003200200049004E00200031"
#STGI: 37,9,"00540049004D00430040004600450027"
#STGI: 37,10,"00540049004D00200050006100790046006F0072004D0065"
#STGI: 37,11,"00540049004D00530050004F0054"
#STGI: 37,12,"00520049004300410052004900430041"

OK
AT#STSR=37,0,9
OK

#STN: 36
AT#STGI=36
#STGI: 36,00,8
#STGI: 36,1,"00490073006300720069007600690074 0069"
#STGI: 36,2,"004C006F006700200069006E"
#STGI: 36,3,"00430068006900200073006F006E006F003F"
#STGI: 36,4,"0049006E00760069006100200 04D00730067"
#STGI: 36,5,"00430065007200630061002000 41006D006900630069"
#STGI: 36,6,"00430068006100740072006F006F006D"
#STGI: 36,7,"0046006F00720075006D"
#STGI: 36,8,"004C006F00670020006F00750074"

OK
AT#STSR=36,0,1
OK

#STN: 35
AT#STGI=35
#STGI: 35,01,"004E00690063006B006E0061006D0065003F",0,12

OK
‘INPUT DATA IS REQUESTED
AT#STSR=35,0,"0065006600670068"
OK

#STN: 35
AT#STGI=35
#STGI: 35,01,"00360038007300730077006F00720064003F",0,12
```

```
OK
‘INPUT DATA IS REQUESTED
AT#STSR=35,0,"0065006600670068"
OK

#STN: 36
AT#STGI=36
#STGI: 36,00,2
#STGI: 36,1,"0055006F006D006F"
#STGI: 36,2,"0044006F006E006E0061"

OK
AT#STSR=36,0,1
OK

#STN: 35
AT#STGI=35
#STGI: 35,00,"00450074007F003F",0,2

OK
```

3.2.3.3.2. #STN to notify USER that the timeout expired to answer to the ongoing proactive command

USER should answer to a proactive command that requires USER response within a fixed interval of time defined by **<timeout>** parameter in **#STIA** command (parameter is optional, default value is 10 minutes).
If timeout expires SAT/USAT will abort the command and, if the unsolicited indication has been activated, USER will be notified by **URC #STN** as follows:

#STN: <CmdTerminateValue>
Where **<CmdTerminateValue> = <CmdType> + TerminationOffset**

Currently **TerminationOffset=100**.

Example

1. *Timeout expiration example*

```
AT+CPIN=9603
OK
AT#STGI?
+CME ERROR: operation not allowed
‘SAT/USAT has been activated but main menu has not been created yet

#STN: 37
```

```
AT#STGI?
#STGI: 1,37

OK
AT#STIA?
#STIA: 1,2,1,7fffffff7f00005f96000000000000000000

OK
'SAT/USAT has been activated with 1 minute timeout
at#stgi=37
#STGI: 37,00,12,"SIM i.TIM"
#STGI: 37,1,"SCOPRI SERVIZI"
#STGI: 37,2,"MY TIM"
#STGI: 37,3,"SCRIPTIM"
#STGI: 37,4,"ATTIVA MMS"
#STGI: 37,5,"i.box"
#STGI: 37,6,"LOSAI DI TIM"
#STGI: 37,7,"MilleunaTIM"
#STGI: 37,8,"2 IN 1"
#STGI: 37,9,"TIMC@FE'"
#STGI: 37,10,"TIM PayForMe"
#STGI: 37,11,"TIMSPOT"
#STGI: 37,12,"RICARICA"

OK
AT#STSR=37,0,7
OK

#STN: 36
AT#STGI?
#STGI: 1,36

OK
'Ongoing proactive command is 36 (SELECT ITEM): It requires a USER response
AT#STGI=36
#STGI: 36,00,3
#STGI: 36,1,"Verifica punti"
#STGI: 36,2,"Premi"
#STGI: 36,3,"Informazioni"

OK
'We won't send any request/response for more than 1 minute
AT#STGI?
#STGI: 1,36

OK
'Timeout has not been expired yet, the response to the query is the same as before

#STN: 136
'Now timeout has been expired: proactive command 36 has been aborted and SAT/USAT is back to main
menu
AT#STGI?
#STGI: 1,37

OK
'Obviously it changes the response to the query
```

3.2.3.3.3. #STN to notify USER it failed the sending to the network of a MO SMS message

SAT/USAT send to ME/MT the proactive command 19 (SEND SM) when it has to send to the network a MO SMS message. It is possible that the sending to the network fails. In this case the unsolicited indication **#STN** is sent to TE with the following specific format:

#STN: 119

Example

1. *Network failure indication example*

```
AT#STGI=37
#STGI: 37,00,12,"SIM i.TIM"
#STGI: 37,1,"SCOPRI SERVIZI"
#STGI: 37,2,"MY TIM"
#STGI: 37,3,"SCRIPTIM"
#STGI: 37,4,"ATTIVA MMS"
#STGI: 37,5,"i.box"
#STGI: 37,6,"LOSAI DI TIM"
#STGI: 37,7,"MilleunaTIM"
#STGI: 37,8,"2 IN 1"
#STGI: 37,9,"TIMC@FE'"
#STGI: 37,10,"TIM PayForMe"
#STGI: 37,11,"TIMSPOT"
#STGI: 37,12,"RICARICA"

OK
AT#STSR=37,0,7
OK

#STN: 36
AT#STGI=36
#STGI: 36,00,3
#STGI: 36,1,"Verifica punti"
#STGI: 36,2,"Premi"
#STGI: 36,3,"Informazioni"

OK
'Selection 36,3 is causing SAT/USAT to send a SMS message to the network in order to have back informations
AT#STSR=36,0,3
OK

#STN: 19,"Invio Richiesta"
'URC notifies that SAT/USAT is trying to send a SMS message to the network

#STN: 119
```

```
'URC notifies that the sending to the network failed

#STN: 254
'URC notifies that SAT/USAT is back to main menu
AT#STGI?
#STGI: 1,37

OK
```

3.2.3.3.4. #STN to support the SAT/USAT mechanisms "Call control by SIM/USIM" and "MO Short Message control by SIM/USIM"

Let's start with a brief description of what these SAT/USAT mechanisms are:

Call control by SIM/USIM

When this service is activated by the SIM/USIM, all dialed digit strings, supplementary service control strings and USSD strings are first passed to the SIM/USIM before the ME sets up the call, the supplementary service operation or the USSD operation. The ME shall also pass to the SIM/USIM at the same time its current serving cell. The SIM/USIM has the ability to allow, bar or modify the call, the supplementary service operation or the USSD operation. The SIM/USIM also has the ability to replace a call request, a supplementary service operation or a USSD operation by another call request or supplementary service operation or USSD operation.

MO Short Message control by SIM/USIM

When this service is activated by the SIM/USIM, all MO short messages are first passed to the SIM/USIM before the ME sends the short message. The ME shall also pass to the SIM/USIM at the same time its current serving cell. The SIM/USIM shall have the ability to allow the sending, bar the sending or modify the destination address of the short message before sending it.

If one or both services are activated by the SIM/USIM, the **#STN** unsolicited indication could be sent, to indicate either if the outgoing call has been accepted, rejected or modified by the SIM/USIM, or if the SMS service centre address has been modified by the SIM/USIM or if the MO Short Message destination address has been modified by the SIM/USIM.
#STN format is as follows:

#STN: <CmdTerminateValue>,<Result>[,<TextInfo>[,<Number>[,<MODestAddr>]]]
Where

<CmdTerminateValue>=150 for MO Short Message control by SIM/USIM
<CmdTerminateValue>=160 for Call control by SIM/USIM

(See [7][10], "SIM Toolkit Interface Activation - #STIA" for the right syntax and interpretation of the above parameters)

3.2.3.3.5. #STN to notify USER that SAT/USAT enters its main menu again after startup

When SAT/USAT enters its main menu again at a certain time after startup, URC **#STN** is sent to TE with the format:

#STN: 254

After receipt of this unsolicited indication the ongoing proactive command actually is:

SET UP MENU → 37

This can be verified issuing the AT Command query #STGI?

AT#STGI?
#STGI: 1,37

3.2.3.3.6. #STN to notify USER that SAT/USAT main menu has been removed from TA

It is possible that SAT/USAT requests to remove the SAT/USAT main menu from TA. This is actually an extremely rare event; nevertheless it is object of specific tests. In this case the unsolicited indication **#STN** is sent to TE with the following specific format:

#STN: 237

After such an indication has been received, every issue **AT#STGI=37** will raise an error code.

3.2.3.4. Explicit USER interaction → #STSR

AT Command **#STSR** makes possible the interaction SAT/USAT←→USER. It permits USER to send to SAT/USAT the right response to those proactive commands that

require user interaction, as well it permits USER to send to SAT/USAT special requests, like anticipated termination, help information, and so on.

TELIT software implements the **<UserResponse>**s listed in the following table

<UserResponse> code	<UserResponse> description
0	Command performed successfully (call accepted in case of call setup)
16	Proactive SIM/USIM session terminated by USER
17	Backward move in the proactive SIM/USIM session requested by USER
18	No response from USER
19	Help information required by USER
20	USSD/SS transaction terminated by USER
32	ME currently unable to process command
34	USER did not accept the proactive command
35	USER cleared down SIM/USIM call before connection or network release

(See [7][10], "SIM Toolkit Interface Activation - #STSR" for the right syntax and interpretation of parameters)

It is possible to issue AT command **#STSR** with 2 or 3 parameters, but not all the combinations of values are admitted. Next table shows the accepted issues of command **#STSR** and correspondent meaning, ordered by **<UserResponse>** first.

2 params only: AT#STSR= <CmdType>, <UserResponse>	3 parameters: AT#STSR= <CmdType>, <UserResponse>, <Data>	Description

<UserResponse>=0		
AT#STSR=1,0		Accepted syntax, no meaning
AT#STSR=5,0		Accepted syntax, no meaning
AT#STSR=16,0		Call accepted
AT#STSR=17,0		Accepted syntax, no meaning
AT#STSR=18,0		Accepted syntax, no meaning
AT#STSR=19,0		Accepted syntax, no meaning
AT#STSR=20,0		Accepted syntax, no meaning
AT#STSR=32,0		Accepted syntax, no meaning
AT#STSR=33,0		It is possible that the proactive command DISPLAY TEXT ask for user acceptance
AT#STSR=34,0		Accepted syntax, no meaning
	AT#STSR=34,0,<Data>	Command performed successfully, input key has been sent to SAT/USAT
AT#STSR=35,0		Command performed successfully, default string has been sent to SAT/USAT
	AT#STSR=35,0,<Data>	Command performed successfully, input string has been sent to SAT/USAT
AT#STSR=36,0		Accepted syntax, no meaning
	AT#STSR=36,0,<Data>	Command performed successfully, an item has been selected
AT#STSR=37,0		Accepted syntax, no meaning
	AT#STSR=37,0,<Data>	Command performed successfully, an item has been selected
AT#STSR=40,0		Accepted syntax, no meaning

AT#STSR=52,0[*]		Accepted syntax, no meaning
AT#STSR=64,0		Command performed successfully
AT#STSR=65,0[*]		Accepted syntax, no meaning
AT#STSR=66,0[*]		Accepted syntax, no meaning
AT#STSR=67,0[*]		Accepted syntax, no meaning
<UserResponse>=16		
AT#STSR=*<cmd>*,16 *<cmd>: any proactive command*		Proactive SIM/USIM session terminated by USER
<UserResponse>=17		
AT#STSR=*<cmd>*,17 *<cmd>: any proactive command*		Backward move in the proactive SIM/USIM session requested by USER
<UserResponse>=18		
AT#STSR=*<cmd>*,18 *<cmd>: any proactive command*		No response from USER
<UserResponse>=19		
AT#STSR=34,19		Help information requested by USER about “GET INKEY” proactive command
AT#STSR=35,19		Help information requested by USER about “GET INPUT” proactive command
AT#STSR=36,19		Help information requested by USER about “SELECT ITEM” proactive command
AT#STSR=37,19		Help information requested by USER about

[*] Implemented for **Xgold chipset only**; not available for **Elite chipset**; they can be executed only if USER previously and successfully ran the command **AT#STTA=1**

		"SETUP MENU" proactive command
<UserResponse>=20		
AT#STSR=18,20		USSD transaction terminated by USER
<UserResponse>=32		
AT#STSR=18,32		TA currently unable to process the command "SEND USSD"
AT#STSR=33,32		TA currently unable to process the command "DISPLAY TEXT"
<UserResponse>=34		
AT#STSR=16,34		USER did not accept the proactive command "CALL SETUP"
AT#STSR=64,34(*)		USER did not accept the proactive command "OPEN CHANNEL"
<UserResponse>=35		
AT#STSR=16,35		USER cleared down SIM/USIM call before connection or network release

Issuing **#STSR** with other combinations of values for parameters **<UserResponse>**, **<CmdType>** and **<Data>** will raise an ERROR.

(*) Implemented for **Xgold chipset only**; not available for **Elite chipset**; it can be executed only if USER previously and successfully ran the command **AT#STTA=1**

4. Terms and acronyms

TELIT	The company TELIT Communications S.p.A.
MODULE	(generic) TELIT Module
ME	Mobile Equipment
MT	Mobile Termination
TE	Terminal Equipment
TA	Terminal Adaptor
USER	(generic) MODULE User, as well as an external application controlling the MODULE.
	TE and USER are used interchangeably.
SAT/USAT	SIM/USIM Application Toolkit
SCRIPT	AT Command based script
URC	Unsolicited Result Code