Monarch 2 Platform

LR 8.2 Software Release

AT Commands Reference Manual

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Preface

Legal Notices

Document Revision History

Revision	Date	Software Revision	Changes
1	April 2023	LR 8.2.0.0	N/A
2	July 2023	LR 8.2.0.2-59200	• Evolution to `AT+SQNDIT` • Corrected a typo in `AT+SQNRMON` *cinr_thold* value • Additional info in `AT+SMCWRX` • Add a precision in `AT+SQNSNVR` • Corrected the output of `AT+SQNCTM` • Add a precision about the *resume* parameter in `AT+SQNSPCFG` • Modification to `AT+SQNINS` • Deprecate the use of the *"strid"* and *"json"* subcommands of both `AT+SQNSNVW` and `AT+SQNSNVR` • Major correction to `AT+SQNSSEND` • Correction to the *rat* parameter of `AT+SQNBANDSEL`, `AT+SQNEARFCNSEL`, `AT+SQNHPLMN` and `AT+SQNTXPWR` • Reinstate the FTPS protocol in `AT+SQNSUPGRADE` • `AT+SQNINS=<action>` can only be used with CFUN 0/4

Revision	Date	Software Revision	Changes
			• Correct a typo in `AT+CSQNPTAU` • Additional info in `AT+SQNHWCFG="antennatuning"` • Introduce suspend/resume commands in `AT+SQNSUPGRADE` • Clarification in `AT+SQNSMQTTRCVMESSAGE` • Addition to `AT+SQNSMQTTCONNECT`
3	May 2024	LR8.2.0.5-60964	• General clean-up of most AT commands • Further corrections to: `AT+SQNTXPWR`, `AT+SQNSNVR`, `AT+SQNSMQTTRCVMESSAGE`, `AT+CIPCA`, `AT+SQNHTTPCFG`, `AT+CSIM`,`AT+SQNEDRX`, `AT+SQNFGET`, `AT+SQNSMSSEND`, `AT+CNMI`, `AT+SQNSUPGRADE`, `AT+SQNRMON`, `AT+SQNHWCFG`, `AT+SQNCOAPSEND`, `AT+SQNMONI`, `AT+SQNSI`, `AT+SQNSCFG`, `AT+CGCONTRDP`, `AT+SQNOMAAUTOSTART`, `AT+CEREG`, `AT+SMCWTX`, `AT+SQNSUPGRADE`. • New AT Commands added

About this Manual

Purpose and Scope

This Reference Manual includes the complete list of AT commands supported by the Sequans LTE User Equipment (UE) firmware. It is applicable to *Monarch 2* LTE Software Release LR 8.2.0.5-60964.

Who Should Read this Document?

This document is intended for engineers using Sequans LTE products, during development and test phases.

References

Reference	Document Title
ITU-T V.250	SERIES V: DATA COMMUNICATION OVER THE TELEPHONE NETWORK – Control procedures – Serial asynchronous automatic dialling and control
3GPP TS 27.007-13.6.0	AT commands set for User Equipment
3GPP TS 27.005-13.0.0	AT commands set for Short Message Service (SMS) and Cell Broadcast Service (CBS)
3GPP TR 21.905-9.4.0	Vocabulary for 3GPP Specifications
3GPP TS 36.133 v14.12.0, v13.9	Requirements for support of radio resource management

Definition of AT Commands Header Table

The description of each AT command features a header table listing some of the command's main characteristics:

- **Mode**: The mode of operation. Either LTE-M (a.k.a. 'CatM'), NB-IoT or both.
- **Type**: Whether the command is synchronous (responds immediately after execution) or asynchronous (starts a background process which communicates with the host using Unsolicited Response Codes 'URCs').
- **Prerequisite**: Indicates if the command requires the module to be in a certain state or depends on the prior execution of other commands.
- **Time-out**: Expected maximum command execution duration. Command execution time may vary depending on the module CPU load or the responsiveness of the network. The given figure must be taken as a rough estimate only.
- **Persistency**: In case the command sets one or more parameters, indicates if the values set are saved in non-volatile memory or not (in which case the values are lost after a reboot, upgrade or power-down).

Contents

Chapter 1. AT Channel Control Commands

Backwards Compatibility NOP Commands: AT&K, ATL, ATM, ATN, ATS0, ATX

Syntax

Command	Possible Response(s)
AT&K ATL ATM ATN ATS0 ATX	OK

Description

These commands are included for backwards compatibility with existing software. They are ignored by the modem and return OK.

Command Line Editing Character: ATS5

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	300 ms
Time-out	1 s
Persistency	Not reboot persistent (see Write Active Profile in Memory: AT&W *(on page 70)*)

Syntax

Command	Possible Response(s)
`ATS5=[`*<value>*`]`	
`ATS5?`	*<value>*

Description

This 'S-parameter' represents the decimal IA5 value of the character interpreted by the DCE as a request to delete from the command line the immediately preceding character.

Defined Values

value

Integer: 0..127. Set the command line editing character to this value. The recommended default value is 8, i.e. the Backspace character (BS, IA5 0/8).

Command Line Termination Character: ATS3

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not reboot persistent (see Write Active Profile in Memory: AT&W *(on page 70)*)

Syntax

Command	Possible Response(s)
ATS3=[<*value*>]	
ATS3?	<*value*>

Description

This 'S-parameter' represents the decimal IA5 value of the character recognized by the DCE as terminating a DTE command line. It is also generated by the DCE as part of the header, trailer, and terminator for result codes and information text, along with the S4 parameter (see the description of the V parameter for usage).

The previous value of S3 is used as the command line termination character of a new ATS3 setting command. However, the result code issued uses the new value of S3. For example, if S3 is set to 13 and the command 'ATS3=30' is issued, that command must end with a CR character (IA5 0/13), but the result code issued will use the character with the ordinal value 30 (IA5 2/14) in place of the CR.

Defined Values

value

Integer: 0..127. Set command line termination character to this value. The mandatory default value is 13, or 'Carriage Return' (CR, IA5 0/13).

DCE Response Format: ATV

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not reboot persistent (see AT&W *(on page 70)*)

Syntax

Command	Possible Response(s)
ATV[<*value*>]	0 if value is 0 (because numeric response text is being used). OK If value is 1. 4 for unsupported values (if previous value was V0). ERROR for unsupported values (if previous value was V1).

Description

Setting this parameter determines the contents of the header and trailer transmitted with result codes and information responses. It also determines whether result codes are transmitted in numeric or alphabetic (so-called 'verbose') form. The text portion of information responses is not affected by this setting.

Table 1: Effect of V Parameter on Response Formats *(on page 4)* shows the effect of the setting of this parameter on the format of information text and result codes. All references to <S3> mean 'the character with the ordinal value specified in parameter S3'; all references to <S4> likewise mean 'the character with the ordinal value specified in parameter S4'. See Table 1: Effect of V Parameter on Response Formats *(on page 4)*.

Table 1. Effect of V Parameter on Response Formats

	V0	V1
Information Response	<text><S3><S4>	<S3><S4><text><S3><S4>
Result Codes	<numeric code><S3>	<S3><S4><verbose code><S3><S4>

Defined Values

value

Integer: 0 or 1.

Note: The recommended default value is 1.

Table 2. *value*

Value	Description
0	DCE transmits limited headers, trailers and numeric text.

Table 2. *value* (continued)

Value	Description
1	DCE transmits full headers, trailers and verbose response text.

Echo: ATE

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not reboot persistent (see AT&W *(on page 70)*)

Syntax

Command	Possible Response(s)
ATE<*value*>	

Description

The setting of this parameter determines whether or not the DCE echoes (sends back) characters received from the DTE during command state and online command state.

Defined Values

value

Integer: 0 or 1.

Note: The default value is 0, i.e. DCE does not echo characters.

Table 3. *value*

Value	Description
0	DCE does not echo characters during command state and online command state.
1	DCE echoes characters during command state and online command state.

Enable Smart Terminal: AT+SMART

Mode	CatM – NBIoT
Type	Synchronous
Requirements	–
Time-out	300 ms
Settings	Not reboot persistent

Syntax

Command	Possible response(s)
AT+SMART[=*enable*]	OK
AT+SMART=?	

Description

This command switches the AT command interface between the default 'dumb' text-based terminal mode and a human-friendly smart terminal mode (with, for example, up and down arrow search in command history and in-line command editing).

Defined Values

The following values are defined:

enable

Integer: 0 or 1. Enable (1) or disable (0) the smart terminal. The default value is 1.

Repeat Command Line: A/

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
A/	

Description

If the prefix A/ or a/ is received, the DCE immediately repeats the preceding command. No editing is possible, and no termination character is necessary. A command may be repeated multiple times, if desired. Responses to the repeated command line shall be issued using the parity and format of the original command line, and the rate of the A/. If A/ is received before any command line has been executed, the preceding command line is assumed to have been empty, which results in an OK result code).

Reset to Default Configuration: ATZ

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Not Available in Manufacturing Mode
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
ATZ[0]	OK

Description

This command instructs the DCE to reset all parameters to their factory defaults as specified by the manufacturer. This may include the hardware settings such as configuration switches or reset persistent parameters (if implemented). If the DCE is connected to the network, it is disconnected, thereby terminating any call in progress.

All the internal operations triggered by the command are completed before the DCE issues the result code. The DTE should not include additional commands on the same command line after the ATZ command because they may be ignored.

Note: Because this command may restore the settings of switches and parameters, it does not necessarily return the DCE to a 'known state'. In particular, the DCE may, after the execution of this command, be found in a state in which it appears to not respond to DTE commands, or respond in a completely different format than that which was being used before the execution of the command.

CAUTION: The use of this command is strongly discouraged. Please use Device Reset to Factory State: AT+SQNSFACTORYRESET *(on page 484)* instead.

Response Formatting Character: ATS4

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not reboot persistent (see AT&W *(on page 10)*)

Syntax

Command	Possible Response(s)
ATS4=[<*value*>]	
ATS4?	<*value*>

Description

This 'S-parameter' represents the decimal IA5 value of the character generated by the DCE as part of the header, trailer, and terminator of result codes and information text, along with the S3 parameter (see the description of the V parameter for usage).

If the value of S4 is changed in a command line, the result code issued in response to that command line will use the new value of S4.

Defined Values

value

Integer: 0..127. Set response formatting character to this value. The recommended default value is 10, i.e. the Line Feed character (LF, IA5 0/10).

Result Code Suppression: ATQ

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not reboot persistent (see AT&W *(on page 70)*)

Syntax

Command	Possible Response(s)
ATQ[<*value*>]	OK if value is 0. No response if value is 1 (because result codes are suppressed). ERROR for unsupported values (if previous value was Q0). No response for unsupported values (if previous value was Q1).

Description

The setting of this parameter determines whether the DCE transmits result codes to the DTE or not. When result codes are being suppressed, no portion of any intermediate, final, or unsolicited result code – header, result text, line terminator, or trailer – is transmitted. Information text transmitted in response to commands is not affected by this parameter.

Defined Values

value

Integer: 0 or 1.

Note: The recommended default value is 0.

Table 4. *value*

Value	Description
0	DCE transmits result codes.
1	Result codes are not transmitted.

Select TE Character Set: AT+CSCS

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+CSCS= <*charset*>	OK
AT+CSCS?	+CSCS: <*charset*> OK
AT+CSCS=?	+CSCS: (*list of supported <charset>s*) OK

Description

The "Set" command informs the TA which character set <*charset*> is used by the TE. The TA can then convert strings between TE and MT character sets.

When the TA – TE interface is set to 8 bit operation and the TE charset is only 7 bit wide, the highest bit is set to zero.

Note: The conversion between the MT internal codeset and the TE codeset is manufacturer specific.

Read command shows current setting and test command displays conversion schemes implemented in the TA.

Defined Values

charset

String.

CAUTION: Only the 'GSM', 'UCS2' and 'UTF-8' types are supported.

Table 5. *chset*

Value	Description
'GSM'	GSM 7 bit default alphabet (3GPP TS 23.038 [25]); this setting is not compatible with software flow control (XON/XOFF). **Note:** If MT is using GSM 7 bit default alphabet, its characters shall be padded with 8th bit (zero) before converting them to hexadecimal numbers (i.e. no SMS style packing of 7 bit alphabet).
'HEX'	Character strings consist only of hexadecimal numbers from 00 to FF; e.g. '032FE6' equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set are attempted.
'IRA'	International reference alphabet (see ITU T Recommendation T.50 [13]).
'PCCPxxx'	IBM PC Code Page xxx
'PCDN'	IBM PC Danish/Norwegian character set
'UCS2'	16-bit coded Unicode character set (see ISO/IEC10646 [32]); UCS2 character strings are converted to hexadecimal numbers ranging from 0000 to FFFF; e.g. '004100620063' equals three 16-bit characters with decimal values 65, 98 and 99.
'UTF-8'	Byte (8-bit) based variable length encoding of Unicode (see RFC 3629 [69]); UTF-8 encodes each Unicode character as a variable number of bytes, where the number of bytes depends on the character code point. The input format must be a stream of bytes. It must not be converted to hexadecimal numbers as in 'HEX' or 'UCS2'. This character set requires an 8-bit TA – TE interface.
'8859-n'	ISO 8859-n Latin ($1 \leq n \leq 6$) character set
'8859-C'	ISO 8859 Latin/Cyrillic character set
'8859-A'	ISO 8859 Latin/Arabic character set
'8859-G'	ISO 8859 Latin/Greek character set
'8859-H'	ISO 8859 Latin/Hebrew character set

Chapter 2. Control Plane Data Commands

CIoT Optimisation Configuration: AT+CCIOTOPT

Mode	NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CCIOTOPT=*[<n>, [<supported_UE_opt>[, <preferred_UE_opt>]]]*	+CME ERROR:*<err>*
AT+CCIOTOPT?	CCIOTOPT:*<n>, <supported_UE_opt>,<preferred_UE_opt>*
AT+CCIOTOPT=?	CCIOTOPT:*(list of supported <n>s),(list of supported <supported_UE_opt>s),(list of supported <preferred_UE_opt>s)*
URC	+CCIOTOPTI: <supported_Network_opt>

Description

This command controls which CIoT EPS optimisations the UE indicates as supported and preferred in the ATTACH REQUEST and TRACKING AREA UPDATE REQUEST messages. The command also allows reporting of the CIoT EPS optimisations that are supported by the network. A UE supporting CIoT functionality may support control plane CIoT EPS optimisation or user plane CIoT EPS optimisation or both (see 3GPP TS 24.301 [83], sub-clause 9.9.3.34). Based on the application characteristics the UE may prefer to be registered for control plane CIoT EPS optimisation or for user plane CIoT EPS optimisation (see 3GPP TS 24.301 [83], subclause 9.9.3.0B). Further the network may support control plane CIoT EPS optimisation or user plane CIoT EPS optimisation or both (see 3GPP TS 24.301 [83], sub-clause 9.9.3.12A).

The set command is used also to control the unsolicited result code +CCIOTOPTI. An unsolicited result code +CCIOTOPTI: <supported_Network_opt> is used to indicate the supported CIoT EPS optimizations by the network.

The read command returns the current settings for supported and preferred CIoT EPS optimisations and the current status of unsolicited result code +CCIOTOPTI.

The test command returns values supported as compound values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

Defined Values

n

Integer. Enables or disables reporting of unsolicited result code +CCIOTOPTI.

Table 6. *n*

Value	Description
0	Disable reporting
1	Enable reporting
3	Disable reporting and reset the parameters for CIoT EPS optimisation to the default values.

supported_UE_opt

Integer: 0, 1, 2 or 3. Indicates the UE's support for CIoT EPS optimisations.

Note: 1 is the only supported choice in the current software release.

Table 7. *supported_UE_opt*

Value	Description
0	No support.
1	Support for control plane CIoT EPS optimisation.
2	Support for user plane CIoT EPS optimisation. (Not supported)
3	Support for both control plane CIoT EPS optimisation and user plane CIoT EPS optimisation. (Not supported)

preferred_UE_opt

Integer: 0, 1 or 2. Indicates the UE's preference for CIoT EPS optimisations.

Note: 1 is the only supported choice in the current software release.

Table 8. *preferred_UE_opt*

Value	Description
0	No preference.
1	Preference for control plane CIoT EPS optimisation.
2	Preference for user plane CIoT EPS optimisation. (Not supported.)

supported_Network_opt

Integer: 0, 1, 2 or 3. Indicates the Network support for CIoT EPS optimisations.

Note: 1 is the only supported choice in the current software release.

Table 9. *reporting*

Value	Description
0	No support.
1	Support for control plane CIoT EPS optimisation.
2	Support for user plane CIoT EPS optimisation. (Not supported.)

Table 9. *reporting* (continued)

Value	Description
3	Support for both control plane CIoT EPS optimisation and user plane CIoT EPS optimisation. (Not supported.)

Reporting Terminating Data using the Control Plane: AT +CRTDCP

Mode	NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CRTDCP=*[<reporting>]*	+CME ERROR:*<err>*
AT+CRTDCP?	CRTDCP:*<reporting>*
AT+CRTDCP=?	CRTDCP:*(list of supported <reporting>s), (range of supported <cid>s), (maximum number of octets of user data indicated by <cpdata_length>)*

Description

This command enables or disables reporting of data from the network to the MT transmitted using the control plane in the downlink direction. If reporting is enabled, the MT returns the unsolicited result code +CRTDCP: <cid>,<cpdata_length>,<cpdata> when data is received from the network.

The read command returns the current settings.

The test command returns supported values as compound values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <err> values.

Defined Values

reporting

Integer: 0 or 1. Enable or disable reporting.

Table 10. *reporting*

Value	Description
0	Disable reporting of MT control plane data.
1	Enable reporting of MT control plane data by the unsolicited result code +CRTDCP.

cid

Integer. A numeric parameter which specifies a particular PDP context or EPS bearer context definition. The *<cid>* parameter is local to the TE-MT interface and identifies the PDP or EPS bearer contexts which have been setup via AT command (see the AT+CGDCONT *(on page)* and AT +CGDSCONT *(on page)* commands).

cpdata_length

Integer. Size of the *<cpdata>* information element in bytes. 0 when there are no data to transmit.

cpdata

Byte string. User data container contents (refer to 3GPP TS 24.301 [83] sub-clause 9.9.4.24). When there is no data to transmit, the <*cpdata*> must be empty (""). This parameter must not be converted as defined by the AT+CSCS *(on page)* command. The coding format of the user data container and the maximum length of <*cpdata*> are implementation specific.

Sending Originating Data using the Control Plane: AT+CSODCP

Mode	NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CSODCP=<*cid*>, <*cpdata_length*>, <*cpdata*>[, <*RAI*>[, <*type_of_user_data*>]]	+CME ERROR:<*err*>
AT+CSODCP=?	CSODCP:*(range of supported <cid>s), (maximum number of octets of user data indicated by <cpdata_length>), (list of supported <RAI>s), (list of supported <type_of_user_data>s)*

Description

This command transmits data over the control plane to the network via MT. The context identifier <*cid*> is used to link the data to a particular context.

Optionally, the application indicates that the exchange of data:

- Is expected to be completed with this uplink data transfer; or
- Is expected be completed with the next received downlink data.

This command also optionally indicates whether or not the data transmitted is exception data.

This command causes transmission of an ESM DATA TRANSPORT message, as defined in 3GPP TS 24.301 [83].

Test command returns range of supported <cid>s, the maximum number of bytes of user data indicated by <*cpdata_length*>, supported <*RAI*>s and supported <*type_of_user_data*>s as compound values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

cid

Integer. A numeric parameter which specifies a particular PDP context or EPS bearer context definition. The <*cid*> parameter is local to the TE-MT interface and identifies the PDP or EPS bearer contexts which have been setup via AT command (see the AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

cpdata_length

Integer. <*cpdata*> length in bytes. 0 if there are no data to transmit.

cpdata

Byte string. User data container contents (refer to 3GPP TS 24.301 [83] sub-clause 9.9.4.24). When there is no data to transmit, the <*cpdata*> must be empty (""). This parameter must not be converted as

defined by the Select TE Character Set: AT+CSCS *(on page 12)* command. The coding format of the user data container and the maximum length of <*cpdata*> are implementation specific.

RAI

Integer: 0, 1 or 2. Value of the Release Assistance Indication, Release 13. Refer to 3GPP TS 24.301 [83] sub-clause 9.9.4.25.

Table 11. *RAI*

Value	Description
0	No information
1	No further uplink or downlink data transmissions are expected
2	Only a single downlink data transmission is expected

type_of_user_data

Integer: 0 or 1. Regular or exception data.

Table 12. *type_of_user_data*

Value	Description
0	Regular data
1	Exception data

Chapter 3. Data Communication Equipement Identification Commands

Request Identification Information: ATI

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
ATI[<*value*>]	
ATI or ATI0	<*manufacturer*><S3><S4> <*model*><S3><S4> <*ue_version*>
ATI1	<*ue_version*><S3><S4> <*lr_version*>
ATI2	SERIAL: <*serial*> IMEISV:<*imeisv*> OK
ATI3	<*hwversion*> <*lasermarking*> OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See ATS3 *(on page 3)* and ATS4 *(on page 10)*

Description

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, followed by a final result code. <value> may optionally be used to select from among multiple types of identifying information, specified by the manufacturer.

Note: The responses to this command shall not be used to determine the DCE manufacturer, revision level, feature set, or other information, and should not be relied upon for software operation. In particular, expecting a specific numeric response to an `ATI0` command to indicate which other features and commands are implemented in a DCE dooms software to certain failure, since manufacturer implementations differ widely, even amongst devices that may, coincidentally, respond with identical values. Software developers should use `ATI` commands with extreme caution. The amount of data returned by a specific implementation may vary from a few bytes to several thousand bytes or more. Software must prepare to receive `ERROR` responses if the value passed is not recognised.

`ATI` or `ATI0` write commands reports device MT manufacturer, MT model and the UE software version.

`ATI1` write commands reports the UE and LR software versions.

`ATI2` reports the device's serial number and IMEISV.

`ATI3` reports the device's hardware version and laser marking.

Defined values

serial

String (max. 64 characters). Device serial number.

imeisv

String. IMEISV (International Mobile station Equipment Identity and Software Version number). Refer to 3GPP TS 23.003 [7], sub-clause 6.2.2. The 16 digits of IMEISV are composed of Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) and the software version (SVN) (2 digits). The character set used is specified using the command Select TE Character Set: AT+CSCS *(on page 12)*.

hwversion

String. The module's hardware version.

lasermarking

String. The laser marking as engraved on the module's top casing.

Example

```
ATI
SEQUANS Communications
CB410L
UE4.1.6.0-53323
OK
ATI1
UE4.1.6.0-53323
LR4.1.6.0-53323
ATI2
SERIAL: G2Q2106160008013
IMEISV: 0157700008800111
OK
```

Request International Mobile Subscriber Identity: AT+CIMI

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CIMI	<IMSI> +CME ERROR:<*err*>
AT+CIMI=?	

Description

Execution command causes the TA to return <*IMSI*>, which is intended to permit the TE to identify the individual SIM card or active application in the UICC (GSM or USIM) which is attached to MT.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

IMSI

String (without double quotes). International Mobile Subscriber Identity.

Request Manufacturer Identification: AT+CGMI

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
`AT+CGMI`	*<manufacturer>* `+CME ERROR:`*<err>*
`AT+CGMI=?`	`OK`

Description

The execution of this command causes the TA to return one or more lines of information `<manufacturer>`, chosen by the MT manufacturer, which is intended to permit the user of the TA to identify the manufacturer of the MT it is connected to. Typically, a single line containing the manufacturer's name is returned, but manufacturers may elect to provide more information, if desired.

Refer to Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <err> values.

Defined Values

manufacturer

String. The total number of characters, including line terminators, in the information text shall not exceed 2,048 characters. Text must not contain either '0<S3>' or 'OK<S3>'. Here, <*S3*> represents the value of the command line termination character. See Command Line Termination Character: ATS3 *(on page 3)*

Request Model Identification: AT+CGMM

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CGMM	<*model*> +CME ERROR: <*err*>
AT+CGMM=?	OK

Description

This command causes the TA to send one or more lines of information text <*model*>, determined by the MT manufacturer, so that the user of the TA can identify the specific model of the MT it is connected to. Typically, the text will consist of a single line containing the name of the product, but manufacturers may elect to provide more information, if desired.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

model

String. The total number of characters, including line terminators, in the information text must not exceed 2048 characters. Text must not contain the sequence 0<S3> or OK<S3>. Here <S3> represents the value of the command line termination character. See ATS3 *(on page 3)*.

Request Product Serial Number Identification: AT+CGSN

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CGSN[=<*snt*>]	When <snt>=0 (or omitted) and the command succeeds: <*sn*> When <snt>=1 and the command succeeds: +CGSN:<*imei*> When <snt>=2 and the command succeeds: +CGSN:<*imeisv*> When <snt>=3 and the command succeeds: +CGSN:<*svn*> If the command fails: +CME ERROR: <*err*>
AT+CGSN=?	When TE supports <*snt*> and command successful: +CGSN: OK

Description

Execution command causes the TA to return the IMEI (International Mobile station Equipment Identity number) and related information to identify the MT that the TE is connected to.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The command returns the supported values as a compound value. For a TA which does not support <*snt*>, only OK is returned.

Defined Values

snt

Integer: 0, 1, 2 or 3. Serial number type requested.

Table 13. *snt*

Value	Description
0	returns <*sn*>
1	returns the IMEI (International Mobile station Equipment Identity)
2	returns the IMEISV (International Mobile station Equipment Identity and Software Version number)
3	returns the SVN (Software Version Number)

sn

String. One or more lines of information text determined by the MT manufacturer. Typically, the text will consist of a single line containing the IMEI number of the MT, but manufacturers may elect to provide more information if desired. The total number of characters, including line terminators, in the information text must not exceed 2048 characters. Text must not contain the sequence `0<CR>` or `OK<CR>`

imei

String in decimal format. IMEI: refer to 3GPP TS 23.003 [7], sub-clause 6.2.1. IMEI is composed of: the Type Allocation Code (TAC) (8 digits), the Serial Number (SNR) (6 digits) and the Check Digit (CD) (1 digit). Character set used in <*imei*> is specified using the command Select TE Character Set: AT+CSCS *(on page 12)*.

imeisv

String in decimal format. IMEISV: refer to 3GPP TS 23.003 [7], sub-clause 6.2.2. The 16 digits of IMEISV are composed of: the Type Allocation Code (TAC) (8 digits), the Serial Number (SNR) (6 digits) as per ETSI 3GPP TS 27.007 version 12.10.0 Release 12 23 ETSI TS 12 007 V12.10.0 (2015-10) and the software version (SVN) (2 digits). Character set used in <*imeisv*> is specified using the command Select TE Character Set: AT+CSCS *(on page 12)*.

svn

String in decimal format. Current SVN which is a part of IMEISV; refer 3GPP TS 23.003 [7], sub-clause 6.2.2. This allows identifying different software versions of a given mobile. Character set used in <*svn*> is specified using the command Select TE Character Set: AT+CSCS *(on page 12)*.

Note: The default value <*snt*>=0 returns the information text <*sn*> without he command name prefix, so as to keep backward compatibility. All other values of <*snt*> return the information text including the command name prefix.

Examples:

- To get <*sn*> which returns IMEI of the MT

```
AT+CGSN
490154203237518
OK
```

- To get <*imei*> which returns IMEI of the MT

```
AT+CGSN=1
+CGSN: "490154203237518"
OK
```

Request Product Serial Number Identification: AT+GSN

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
`AT+GSN`	*(Information text)* `OK`

Description

This command is implemented as the Request Product Serial Number Identification: AT+CGSN *(on page 26)* command. They both behave in the same way. Please refer to AT+CGSN *(on page 26)* documentation for further details.

Request Revision Identification: AT+CGMR

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
`AT+CGMR`	*<revision>* `+CME ERROR:` *<err>*
`AT+CGMR=?`	

Description

Execution command causes the TA to return one or more lines of information text `<revision>`, chosen by the MT manufacturer, so that the user of the TA can identify the version, revision level or date, or other relevant information about the MT it is connected to. Typically, the text will consist of a single line containing the version of the product, but manufacturers may elect to provide more information if desired.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

Defined Values

revision

String. The total number of characters, including line terminators, in the information text must not exceed 2048 characters. Text must not contain the sequence `0<CR>` or `OK<CR>`

Chapter 4. Device Configuration Commands

Alarm: AT+CALA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not reboot persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CALA=<*time*> [,<*n*> [,<*type*> [,<*text*> [,<*recurr*> [,<*silent*>]]]]]	+CME ERROR:<*err*>
AT+CALA?	[+CALA: <*time*>,<*n1*>,<*type*> [,<*text*>] [,<*recurr*>] [,<*silent*>] [<S3><S4>+CALA:<*time*>,<*n2*>,<*type*> [,<*text*>] [,<*recurr*>] [,<*silent*>] [...] +CME ERROR:<*err*>
AT+CALA=?	+CALA:(*list of supported <n>s*), (*list of supported <type>s*), <*tlength*>, <*rlength*>, (*list of supported <silent>s*) +CME ERROR:<*err*>

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

The set command sets an alarm time in the MT. There can be an array of different types of alarms, and each alarm can cause a different text to be displayed in the MT display. If setting fails, for example because the given time is before the current real-time clock (see the AT+CCLK command *(on page 39)*), +CME ERROR: <*err*> is returned.

To set up a recurrent alarm for one or more days in the week, the <*recurr*> parameter may be used.

When an alarm goes off, the unsolicited result code `+CALV: <n>` is emitted, even if the alarm is set up to be silent.

The read command returns the list of currently active MT alarms.

The test command returns the supported array index values, alarm types and maximum length of the text to be displayed as compound values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

time

See parameter **time** in Clock: AT+CCLK *(on page 39)*

If the <*recurr*> parameter is used, then the <*time*> parameter must not contain a date.

n, n1, n2

Integer. Index of the alarm; default is manufacturer specific.

type

Integer. Type of the alarm (e.g. sound, volume, LED); values and default are manufacturer specific.

text

String. Text to be displayed when alarm goes off; maximum length <*tlength*>; values and default are manufacturer specific.

tlength

Integer. Maximum length of <*text*>.

recurr

String. Day(s) of the week for the alarm in one of the following formats (values and default are manufacturer specific).

Table 14. *recurr*

Value	Description
0	Alarm goes off every day.
1..7	Sets a recurrent alarm for one or more days of the week. The digits 1 to 7 corresponds to the days of the week, Monday (1) to Sunday (7). The string "1,2,3,4,5" sets an alarm every weekday.

rlength

Integer. Maximum length of <*recurr*>.

silent

Integer: 0 or 1. Specify whether the alarm is silent or not.

Table 15. *silent*

Value	Description
0	The alarm is not silent
1	The alarm is silent and its only effect is to send a +CALV URC

Auto-Connect: AT+SQNAUTOCONNECT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNAUTOCONNECT=<*autoconnect*>[,*forceautoconnect*]	OK
AT+SQNAUTOCONNECT?	+SQNAUTOCONNECT:<*autoconnect*> OK
AT+SQNAUTOCONNECT=?	+SQNAUTOCONNECT:(0,1),(0,1) OK

Description

This command changes the autoconnect mode of the device. When enabled, the device will automatically set the UE to its highest functionality level (equivalent to AT+CFUN=1) after each reboot. The setting persists across reboot.

The read command returns the current autoconnect mode.

The test command returns the possible autoconnect values.

Defined Values

autoconnect

Integer: 0 or 1. Autoconnect Mode.

Table 16. *autoconnect*

Value	Description
0	Autoconnect is disabled.
1	Autoconnect is enabled.

forceautoconnect

Integer: 0 or 1. Force autoconnect Mode.

Table 17. *forceautoconnect*

Value	Description
0	ForceAutoconnect if disabled, the Autoconnect is overriden to 0 in case of "3gpp-conformance", "verizon-conformance"
1	ForceAutoconnect is enabled.

Example

Enable autoconnect:

```
AT+SQNAUTOCONNECT=1
OK
```

Read the current autoconnect setting:

```
AT+SQNAUTOCONNECT?
+SQNAUTOCONNECT: 1
OK
```

Battery Voltage Monitoring: AT+SQNVMON

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	2.5 s / 300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNVMON=<*mode*>[,<*threshold*>,<*period*>]	+SQNVMON:<*mode*>,<*status*>,<*voltage*> OK
AT+SQNVMON?	+SQNVMON:<*mode*>,<*threshold*>,<*period*>,<*voltage*> OK
AT+SQNVMON=?	+SQNVMON:(0-4),(22-55),*(list of supported <period>s)* OK
URC	+SQNVMONS:<*mode*>,<*status*>,<*voltage*>

Description

This command activates/deactivates and configures the voltage monitoring function. Enabling the voltage threshold detection is optional.

When the feature is enabled, the module voltage is measured at the internal voltage sensor every <*period*> seconds.

If <*mode*> is not 0, the values of <*threshold*> and <*period*> are saved in non-volatile memory and restored after reboots or power cycles.

Trying to set new parameters' values identical to those currently active results in ERROR

The voltage monitoring behaves according to the following rules:

- If the measured voltage goes below <*threshold*>, then the +SQNVMONS notification is issued
- After three seconds, if module is still below the threshold and <*mode*> is set to 2 or 4, the device sends a new URC (+SQNVMONS: <mode>,10,<voltage>) and triggers an emergency shutdown procedure.

The +SQNVMONS URC is also issued after enabling the feature indication (with <*mode*> set to a non-zero value).

Note: Low power mode considerations:

- If <*mode*> is 3 or 4, voltage monitoring extends to deep sleep mode. With the default <*period*>, the impact on the deep sleep consumption is negligible. Unless otherwise advised, it is recommended to keep the default value.
- If <*mode*> is 3 or 4, and the module is in deep sleep when the measured voltage crosses the defined threshold, the module wakes up to issue the URC. It is therefore advised to set the threshold at a level below which the LTE modem really needs to be awaken from deep sleep.

Note: The timeout is 2.5 s the first time this command is called with the <*mode*> parameter not null. Successive calls have a standard 300 ms timeout.

Defined Values

mode

Integer: 0..4. Voltage monitoring mode:

Table 18. *mode*

Value	Description
0	Default value, voltage monitoring disabled.
1	Voltage monitoring activated only during active mode. `+SQNVMONS` URC activated.
2	Voltage monitoring activated only during active mode. `+SQNVMONS` URC activated. Automatic emergency shutdown enabled 3 s after the first `+SQNVMONS` URC is sent.
3	Voltage monitoring activated during active mode and deep sleep mode. `+SQNVMONS` URC activated.
4	Voltage monitoring activated during active mode and deep sleep mode. `+SQNVMONS` URC activated. Automatic emergency shutdown enabled 3 s after the first `+SQNVMONS` URC is sent.

threshold

Integer: 22..55. Low voltage threshold in tenths of volts. The default value is 25 (i.e. 2.5 V).

status

Integer: 0, 1 or 10. Voltage monitoring status.

Table 19. *status*

Value	Description
0	Above threshold.
1	Below threshold.
10	Below threshold, shutdown procedure started.

voltage

Integer 22..55. Current VBAT voltage in tenths of volts.

period

Integer. Time between two VBAT measurements. Default is 30 s.

Cell Reselection Before Paging Opportunity in eDRX Mode: AT +SQNRBPO

Syntax

Command	Possible Response(s)
AT+SQNRBPO=<*mode*>	OK ERROR
AT+SQNRBPO?	+SQNRBPO=<*mode*>
AT+SQNRBPO=?	+SQNRBPO=(0-1)

Description

In eDRX mode, the modem has to wake up early to allow for resynchronising with the serving cell before the paging time window opens. This anticipated wake-up assumes that the serving cell's RF signal has not changed since the previous paging time window (PTW). If, on the contrary, the RF signal has dropped out of the acceptable range, the modem must trigger an unexpected neighbour cell scan and consequently misses the first paging opportunity of the current PTW. This commands makes room for a preliminary cell scan, so that the modem is ready when the first paging opportunity of the current PTW presents itself.

If the feature is activated and the modem detects that the current cell's RF signal strength is strong enough, it will skip the cell scan phase and go into 'light sleep' until the paging opportunity window opens.

As a rule of thumb, activation of this feature is highly recommended in mobile applications, whereas it is usually pointless in fixed applications such as metering.

Defined values

mode

Integer 0 or 1. Disable (0, default) or enable (1) the cell scan and reselection before paging opportunity (PO).

Clock: AT+CCLK

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CCLK=<*time*>	+CME ERROR: <*err*>
AT+CCLK?	+CCLK:<*time*> +CME ERROR: <*err*>
AT+CCLK=?	OK

Description

The set command sets the real time clock of the MT. If the setting fails, +CME ERROR: <err> is returned. See Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)*.

The read command returns the current time.

Defined Values

time

String. Format is "yy/MM/dd,hh:mm:ss+zz", where characters indicate year (two last digits), month, day, hour, minutes, seconds and the 'GMT offset', computed as the difference in quarters of an hour, between the local legal time and GMT; range is -96...+96). E.g. 6th of May 1994, 10:10:00 PM GMT+2 hours equals to "94/05/06,22:10:00+08"

Conformance Test Mode: AT+SQNCTM

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	1 s
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT +SQNCTM=<*ctm*>[,<*RAT*>]	OK
AT+SQNCTM?	+SQNCTM:<*ctm*>,<*automatic*> OK
AT+SQNCTM=?	+SQNCTM:("3gpp-conformance", *list of supported operators*)[, (1-2)] OK
AT+SQNCTM	+SQNCTM:<ctm1>,<RAT1> +SQNCTM:<ctm2>,<RAT2> OK

Description

This command changes the conformance test mode of the device.

CAUTION: For the change to be effective, a reboot of the device is required. Reboot is automatic except for `3gpp-conformance` mode or when the <*RAT*> optional parameter is present. These two cases need manual reboot.

If the <*RAT*> parameter is not given, then it defaults to the current RAT.

The read command returns which operator mode is active for the current RAT. To get the value for both RATs, use the 'execute' command `AT+SQNCTM`.

The test command returns the supported operator modes.

Note: The values not listed in Table 20: ctm *(on page 41)* are reserved for Sequans use and should not be used.

Defined Values

ctm

String. Operator Mode.

Table 20. *ctm*

Value	Description	Applicable RATs
"standard"	Standard 3GGP mode.	all
"3gpp-conformance"	Standard 3GGP mode to pass GCF tests.	all
"verizon"	Verizon's requirements and specific settings mode.	all
"att"	ATT's requirements and specific settings mode.	LTE-M
"tmo"	T Mobile's requirements and specific settings mode.	LTE-M
"telstra"	Telstra's requirements and specific settings mode.	all
"kddi"	KDDI's requirements and specific settings mode.	LTE-M
"docomo"	Docomo's requirements and specific settings mode.	LTE-M

RAT

Integer: 1 or 2. Radio Access Technology. 1: LTE-M; 2: NB-IoT.

Examples

Change the conformance test mode to `"3gpp-conformance"` to run PS tests:

```
AT+SQNCTM="3gpp-conformance"
OK
AT^RESET
```

Read the current conformance test mode:

```
AT+SQNCTM?
+SQNCTM: 3gpp-conformance
OK
```

Delete Alarm: AT+CALD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CALD=<*n*>	+CME ERROR: <*err*>
AT+CALD=?	+CALD:(*list of supported*<*n*>*s*) +CME ERROR: <*err*>

Description

The set command deletes an alarm in the MT. If the command fails, +CME ERROR: <err> is returned.

The test command returns the supported array index values as a compound value.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

n

Integer: Index of the alarm to reset; default is manufacturer specific.

Device Management Configuration: AT+SQNDMCFG

Mode	CatM – NBIoT
Type	Synchronous
Requirements	Needs Subsequent Rebooting
Time-out	1 s
Persistency	Reboot persistent

Syntax

Command	Possible Response(s)
AT+SQNDMCFG=*<dmProfile>* *[,<serverId>* *[,<serverURL>]* *[,<pskId>]* *[,<pskSecret>]]*	OK ERROR
AT+SQNDMCFG=?	+SQNDMCFG:*<dmProfile>,<serverId>,<serverURL>,<pskId>,<pskSecret>*
AT+SQNDMCFG?	+SQNDMCFG:*(list of supported <dmProfile>s)*

Description

Note: This command is accessible in Manufacturing Mode only (AT+CFUN=5).

The device management configuration profiles are pre-provisioned in the system using the operator device management service requirements and the user can override some of them for testing or security rules enforcement, for example.

This command selects and configures the device management connectivity. Each device management server configuration profile is identified by a unique profile name *<dmProfile>*.

An existing device management configuration profile can be updated using the AT +SQNDMCFG=<dmProfile>,... command. Currently, the editable configuration is:

- Server address (IP address or server name)
- Pre-share key identity (psk identity)
- Pre-share key secret (psk secret)

Prior to any connection to the device management server, some configuration items may be displayed as empty, because they are computed during first connection to server. This is typically the case for pre-shared key: if 'psk' is not provided by user, it will be automatically generated at the first connection following device management requirements (which depends on DM profile).

The device management configuration profiles are stored in non-volatile memory and persist over device reboots, software upgrades and factory resets. The configuration update will be applied the next time the device registers to the network (AT+CFUN=1 *(on page 299)*).

CAUTION: Default device management connectivity configuration overriding is at user's own risks and may lead to connectivity failure or non-compliance with the device management service security rules.

Defined Values

dmProfile

String: Device management server profile name (such as "Verizon" or "AT&T")

serverId

Integer 1..65535: Device management short server ID.

serverURL

String: Device management server address (FQDN or IP).

pskId

String: Pre-shared key identity in hexadecimal format. Maximum length is 32 characters (256-bit key)

pskSecret

String: Pre-shared key in hexadecimal format. Maximum length is 32 characters (256-bit key)

DTE-DCE Character Framing: AT+ICF

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *ITU-T V.250*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+ICF=[<*format*[,<*parity*>]]	
AT+ICF?	+ICF:<*format*>,<*parity*>
AT+ICF=?	+ICF:(*list of supported <format> values*), (*list of supported <parity> values*)

Description

This extended-format compound parameter is used to determine the local serial port start-stop (asynchronous) character framing that the DCE shall use while accepting DTE commands and while transmitting information text and result code, if this is not automatically determined; AT+IPR=0 *(on page 49)* forces AT+ICF=0. Note that the definition of fixed character format for online data state is for further study.

Defined Values

format

Integer: 0..6. Number of bits in the data bits, the presence of a parity bit, and the number of stop bits in the start-stop frame. Default value is 3.

Note: The semantics of this command are derived from ITU-T Rec. V.58.

Table 21. *format*

Value	Description
0	Autodetect
1	8 Data ; 2 Stop
2	8 Data ; 1 Parity ; 1 Stop
3 (default)	8 Data ; 1 Stop
4	7 Data ; 2 Stop
5	7 Data ; 1 Parity ; 1 Stop
6	7 Data ; 1 Stop

parity

Integer: 0..3. Parity bit generation and verification, if present. Default value is 3.

Table 22. *parity*

Value	Description
0	Odd
1	Even
2	Mark
3 (default)	Space

Examples

- Read syntax

```
+ICF?
+ICF:3,3
```

for the recommended defaults.

- Test syntax

```
+ICF=?
+ICF:(0-6),(0-3)
```

for all defined values.

DTE-DCE Local Flow Control: AT+IFC

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *ITU-T V.250*. See Section *References*.

Syntax

Command	Possible Response(s)
`AT +IFC=[`*<DCE_by_DTE>*`[,`*<DTE_by_DCE>*`]]`	
`AT+IFC?`	`+IFC:`*<DCE_by_DTE>,<DTE_by_DCE>*
`AT+IFC=?`	`+IFC:`*(list of supported <DCE_by_DTE> values), (list of supported <DTE_by_DCE> values)*

Description

This extended-format compound parameter is used to control the operation of local flow control between the DTE and DCE during the data state when V.42 error control is being used, or when fall-back to non-error control mode is specified to include buffering and flow control. It takes two numeric parameters:

- *<DCE_by_DTE>*, which specifies the method to be used by the DTE to control the flow of received data from the DCE;
- *<DTE_by_DCE>*, which specifies the method to be used by the DCE to control the flow of transmitted data from the DTE.

Defined Values

DCE_by_DTE

Integer: 0..3. Method to be used by the DTE to control the flow of received data from the DCE. Recommended default value is 2.

Note: The semantics of this command are derived from ITU-T Rec. V.58.

Table 23. *DCE_by_DTE*

Value	Description
0	None
1	DC1/DC3 on circuit 103; do not pass DC1/DC3 characters to the remote DCE
2	Circuit 133 (Ready for Receiving)

Table 23. *DCE_by_DTE* (continued)

Value	Description
3	DC1/DC3 on circuit 103 with DC1/DC3 characters being passed through to the remote DCE in addition to being acted upon for local flow control
4 to 12	Reserved for future standardisation
Other	Reserved for manufacturer-specific use

DTE_by_DCE

Integer: 0, 1 or 2. Specifies the method to be used by the DCE to control the flow of transmitted data from the DTE. Recommended default value is 2.

Table 24. *DTE_by_DCE*

Value	Description
0	None
1	DC1/DC3 on circuit 104
2	Circuit 106 (Clear to Send/Ready for Sending)
3 to 12	Reserved for future standardisation
Other	Reserved for manufacturer-specific use

Examples

- Read syntax

```
+IFC?
+IFC:2,2
```

for the recommended defaults.

- Test syntax

```
+IFC=?
+IFC:(0-3),(0-2)
```

for all defined values.

Fixed DTE Rate: AT+IPR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent (default) / Not Reboot Persistent

Note: This command is described in *ITU-T V.250*. See Section *References*.

Syntax

Command	Possible Response(s)
`AT+IPR=`*<rate>[,<persistence>]*	`OK`
`AT+IPR?`	`+IPR:`*<rate>, <persistence>*
`AT+IPR=?`	`+IPR:`*(list of supported auto-detectable <rate> values)* *[,(list of fixed-only <rate> values)]*

Description

This numeric extended-format parameter specifies the data rate at which the DCE will accept commands, in addition to 1200 bit/s or 9600 bit/s (as required in 4.3). It may be used to select operation at rates at which the DCE is not capable of automatically detecting the data rate being used by the DTE. Specifying a value of 0 disables the function and allows operation only at rates automatically detectable by the DCE. The specified rate takes effect following the issuance of any result code(s) associated with the current command line.

The *<rate>* specified does not apply in online data state if direct mode of operation is selected.

Defined Values

rate

The value specified shall be the rate in bits per second at which the DTE-DCE interface should operate, e.g., `"19200"` or `"115200"`. The rates supported by a particular DCE are manufacturer-specific; however, the `AT+IPR` parameter should permit the setting of any rate supported by the DCE during online operation. Rates which include a non-integral number of bits per second should be truncated to the next lower integer (e.g., 134.5 bit/s should be specified as 134; 45.45 bit/s should be specified as 45).

Note: 0 (automatic detection) or unspecified values are not currently supported.

persistence

Integer: 0 or 1.

Table 25. *persistence*

Value	Description
0	Disabled. The `AT+IPR` settings are lost at reboot
1	Enabled (default). The `AT+IPR` settings are kept at reboot

Examples

- Read syntax

```
AT+IPR?
```

The DCE transmits a string of information text to the DTE, consisting of `+IPR:<rate>`.

  - `+IPR:0` if set for automatic rate detection.
  - `+IPR:9600` if set to 9600 bit/s.

- Test syntax

```
AT+IPR=?
```

The DCE transmits one or two strings of information text to the DTE, consisting of `+IPR:(list of supported autodetectable <rate> values)[,(list of fixed-only <rate> values)]`, for example `+IPR:(0,300,1200,2400,4800,9600),(19200,38400,57600)` if the DCE can auto-detect up to 9600 bit/s and can support three additional higher fixed rates.

GPIO Pin Configuration: AT+SQNGPIO

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNGPIO=<*gpio*>[, <*polarity*>,<*direction*>,<*value*>]	OK +CME ERROR:<*err*>
AT+SQNGPIO?	<*gpio1*>: <*polarity1*> <*direction1*> <*value1*> <*gpio2*>: <*polarity2*> <*direction2*> <*value2*> … OK
AT+SQNGPIO=?	+SQNGPIO: *gpio*[, *polarity*, *direction*[, *value*]] OK

Description

This command allows:

- Setting GPIOs as outputs with a given value
- Setting GPIOs as inputs and reading their value

The syntax AT+SQNGPIO=<gpio> results in the printing of the polarity, direction and value of that GPIO.

Note: For this command to work properly, the GPIO pin needs to have been configured as GPIO using AT+SQNHWCFG.

Important:

1. All GPIOs are shut down when the module goes into deep sleep mode. Modules do not drive GPIOs in deep sleep mode and require an external pull-up, if need be. GPIOs, however, remain active in the sleep, standby and active modes. Please refer to the *Module Integration Guide* and the *Module Data Sheet* for further information;
2. After the module exits deep sleep mode, the value set with this command is restored;
3. The value set is not reboot (hardware or software) persistent;
4. Input GPIOs do not wake the IC from deep sleep. This must be done using dedicated wake pins.

Defined Values

gpio

String. Name of the GPIO as defined in the product's data sheet.

direction

String.

Table 26. *direction*

Value
"output"
"input"

polarity

String.

Table 27. *polarity*

Value	Meaning
"normal"	A 'high' logic level corresponds to a 'high' voltage input/output
"inversed"	A 'high' logic level corresponds to a 'low' voltage input/output and vice-versa

Attention: The second value is 'inversed' with a 's' and NOT 'inverted' with a 't'.

value

String.

Table 28. *value*

Value	
"low"	GPIO logic value is 'low'
"high"	GPIO logic value is 'high'

Examples

```
AT+SQNGPIO="gpio1"
gpio1: normal output high
OK
```

GPIO1 is used as output, with normal polarity and logic value high: GPIO1 pin is at 1.8 V

```
AT+SQNGPIO="gpio25"
gpio25: inversed input low
OK
```

GPIO25 is used as input, with inverted polarity and logic value low: GPIO25 pin is at 1.8 V

Host Device Identity Configuration: AT+ODIS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	CFUN=1 and LwM2M enabled mode
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+ODIS=*[<pid>],<huid>,<hman>,<hmod>,<hsw>*	OK ERROR
AT+ODIS=?	OK
AT+ODIS?	+ODIS:*<pid>*, 0, *<huid>* +ODIS:*<pid>*, 1, *<hman>* +ODIS:*<pid>*, 2, *<hmod>* +ODIS:*<pid>*, 3, *<hsw>* OK ERROR

Description

This reads and writes the host device identity:

- Host Device Unique ID
- Host Device Manufacturer
- Host Device Model
- Host Device Software Version

The device is pre-provisioned with 2 host device instances described in Table 29: Pre-Provisioned Host Instances *(on page 53)*.

Table 29. Pre-Provisioned Host Instances

Resource ID	Resource Name	Instance #0	Instance #1
0	Host Device Unique ID	HUID0	HUID1
1	Host Device Manufacturer	HMAN0	HMAN1
2	Host Device Model	HMOD0	HMOD1
3	Host Device Software Version	HSW0	HSW1

Both instances are shared with device management client (LwM2M portfolio object #16) when available.

The read and write commands' behaviour depends on the module state:

- When in operational or screening mode:
  - The read command displays all host device identity resources except for the 'Host Device Unique ID' which will be hidden (Null value).
  - The write command returns `ERROR`. Configuration change is forbidden in this mode.
- When in manufacturing mode (password protected):
  - Read command return the full host device identity.
  - Write command is allowed and enable user to set host device ID, manufacturer, model and software version for all host device instances.

The host device identity configuration is stored in non-volatile memory and survives device reboots, software upgrades and factory resets. Any update is effective when the device registers to the network `(CFUN=1)`.

This commands returns `ERROR` if the LwM2M stack is unavailable.

Defined Values

huid

String. Host Device Unique ID string. Printable characters only. Max length: 64 chars.

hman

String. Host Device Manufacturer. Printable characters only. Max length: 64 chars.

hmod

String. Host Device Model. Printable characters only. Max length: 64 chars.

hsw

String. Host Device Software Version. Printable characters only. Max length: 64 chars.

pid

Integer: 0 or 1. Portfolio instance ID. Default value is 0.

Usage Example

- In operational mode:

```
AT+ODIS?
+ODIS: 0,0, <--- null value (not in manufacturing mode)
+ODIS: 0,1,HMAN0
+ODIS: 0,2,HMOD0
+ODIS: 0,3,HSW0
+ODIS: 1,0, <--- null value (not in manufacturing mode)
+ODIS: 1,1,HMAN1
+ODIS: 1,2,HMOD1
+ODIS: 1,3,HSW1
OK
AT+ODIS=0,"MyID","MyManufacturer","MyModel","MySW"
ERROR
```

- In manufacturing mode:

```
AT+ODIS=0,"MyID","MyManufacturer","MyModel","MySW"
OK
AT+ODIS?
+ODIS: 0,0,MyID
+ODIS: 0,1,MyManufacturer
+ODIS: 0,2,MyModel
+ODIS: 0,3,MySW
```

```
+ODIS: 1,0,HUID1
+ODIS: 1,1,HMAN1
+ODIS: 1,2,HMOD1
+ODIS: 1,3,HSW1
OK
```

Power Saving Configuration (Host Latency): AT+SQNPSCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNPSCFG=<*latency*>	OK
AT+SQNPSCFG?	+SQNPSCFG:(0-10000)
AT+SQNPSCFG=?	+SQNPSCFG:<*latency*>

Description

This command sets the power saving configuration, with direct effect on the module power saving behaviour.

The read command displays the active power saving configuration.

The configuration is non-volatile.

This command configures the maximum <*latency*> the module can take to exit sleep mode after the host wakes it.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

latency

Integer: 0..10000 (default: 5000). Maximum wake-up latency in milliseconds. The module enters the deepest power saving mode compatible with the required wake-up time. Configuring a maximum latency below the suspend wake-up time (about 4 seconds) typically prevents the module to sleep.

Read Data in NVM: AT+SQNSNVR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSNVR="privatekey"*[,<index>,<mode>]*	+SQNSNVR:*<index>*, "-----BEGIN RSA PRIVATE KEY-----<S3><S4> *<8 first bytes>* […] *<8 last bytes>"* "-----END RSA PRIVATE KEY----- [<S3><S4>+SQNSNVR:*<index>*, "-----BEGIN RSA PRIVATE KEY-----<S3><S4> *<8 first bytes>* […] *<8 last bytes>"* "-----END RSA PRIVATE KEY-----" […]] OK
AT+SQNSNVR="certificate"*[,<index>[,<mode>*	+SQNSNVR:*<type>,<index>,<issuer>,<serial number>* *,<subject>,<valid from>,<valid to>,<signature algorithm>* *,<signature>,<thumbprint algorithm>,<thumbprint>* [<S3><S4>+SQNSNVR:*<type>*… […]] OK ERROR +CME ERROR:*<err>*
AT+SQNSNVR="strid"*[,<index>]*	
AT+SQNSNVR?	OK
AT+SQNSNVR=?	+SQNSNVR: "certificate",*(list of supported <index>)* +SQNSNVR: "privatekey",*(list of supported <index>),* *(list of supported <mode>s)* +SQNSNVR: "strid",*(list of supported <index>)* OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command reads data (certificates, private keys) stored in the non-volatile (NV) memory or the in the Flash File System.

Usage and syntax vary according to the type of stored data.

- `AT+SQNSNVR="certificate"[,<index>]`

  This command dumps all the certificates stored in the system. According to the value of *<mode>*, the command displays either the first 8 bytes and the last 8 bytes of the certificates, separated by `[...]` (this is the defaut if *<mode>* is absent), or the SHA-1 hash of the DER formatted certificates.

  If *<index>* is provided, only the certificate at *<index>* is displayed. `ERROR` is reported if the entry is empty.

  If *<index>* is not provided, all defined certificates are displayed, one per line.

- `AT+SQNSNVR="privatekey"[,<index>,<mode>]`

  This command dumps all the private keys stored in the system. According to the value of *<mode>*, the command displays either the first 8 bytes and the last 8 bytes of the private keys, separated by `[...]` (this is the defaut if *<mode>* is absent), or the SHA-1 hash of the DER formatted private keys.

  If *<index>* is provided, only the private key at *<index>* is displayed. `ERROR` is reported if the entry is empty.

  If *<index>* is not provided, all defined private keys are displayed, one per line.

- `AT+SQNSNVR="strid"[,<index>]`

  Deprecated. Do not use.

Defined Values

type

String: Type of data.

`"certificate"`: Certificate data.

`"privatekey"`: Private key data.

index

Integer: 0..19. Certificate index.

mode

Integer: 0 or 1. Private key representation:

- 0: Partial PEM representation (full content is hidden for security reasons).
- 1: SHA-1 hash of the DER formatted private key.

issuer

String: Certificate issuer (Entity that verified the information and issued the certificate).

serial-number

String: Certificate serial number.

subject

String: Certificate subject (person or entity identified).

valid-from

String: Certificate inception date.

valid-to

String: Certificate expiration date.

signature-algorithm

String: Certificate signature algorithm.

signature

String: Certificate signature.

thumbprint-algorithm

String: Certificate thumbprint algorithm (hash algorithm).

thumbprint

String: SHA1 hash value of the certificate in PEM form.

Example

- Read certificate at index 3

```
AT+SQNSNVR="certificate",3

+SQNSNVR:
"certificate",3,"/C=US/O=DigiCert Inc/OU=www.digicert.com/CN=DigiCert Global Root CA",
"0000000000000000","/C=US/O=DigiCert Inc/OU=www.digicert.com/CN=DigiCert Global Root CA",
"06/11/10 00:00:00","31/11/10 00:00:00","sha1RSA",
"00000000000000[…]0000","sha1","4418290c0af661843b28c70f4eb728f4cc462960"
```

- Read all certificates:

Note: All certificate data is not displayed in the example below. Shortened sections are identified by '[…]'.

```
AT+SQNSNVR="certificate"
+SQNSNVR: "certificate",0,
"/C=US/O=VeriSign, Inc./OU=VeriSign Trust Network/OU=(c) 2006 VeriSign, Inc.
 - For authorized use only/CN=VeriSign Class 3 Public Primary Certification Authority - G5",
"0000(...)00000",
"/C=US/O=VeriSign, Inc./OU=VeriSign Trust Network/OU=(c) 2006 VeriSign, Inc.
 - For authorized use only/CN=VeriSign Class 3 Public Primary Certification Authority - G5",
"06/11/08 00:00:00","36/07/16 23:59:59","sha1RSA","0000(…)0000","sha1",
"b054ec81256dc47f1f0360e38fe30d6ccba35424"
+SQNSNVR: "certificate",1,
"/OU=Amazon Web Services O=Amazon.com Inc. L=Seattle ST=Washington C=US",
"0000000(...)0000000000",
"/CN=AWS IoT Certificate","18/01/03 07:06:00","49/12/31 23:59:59",
"sha256RSA","000000(…)0000","sha1","f6bb69bdc40afedb840e6854749db37c74501e6b"
OK
```

- read a single private key:

```
AT+SQNSNVR="privatekey",2
+SQNSNVR: 1,"-----BEGIN RSA PRIVATE KEY-----
MIIFQTCC [...] 4PsJYGw=
-----END RSA PRIVATE KEY-----
```

RING Line Behavior Configuration: AT+SQNRICFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNRICFG=*[<mode>][,<events>][,<timeout>]*	+SQNRICFG:*<mode>,<events>,<timeout>*
AT+SQNRICFG?	+SQNRICFG:<mode>,<events>,<timeout>
AT+SQNRICFG=?	+SQNRICFG:[(0-2)][,(0-3)][,(100-5000)]

Description

This command sets the RING line behaviour according to the channel (defined by *<mode>* parameter), the *<events>* selected and a *<timeout>*.

Defined Values

mode

Integer: 0, 1 or 2. RING line behaviour for signalling URCs, both when the interface is idle and reserved, i.e. while busy on AT command execution or data transmission. This functionality serves to fine-tune the conditions under which the ME signals service request to the TE.

Table 30. *mode*

Value	Description
0	URCs are not indicated by a RING line.
1	(default): URCs are indicated by an activated ring line on the same interface where the URC appears. If URC is presented on AT channel mapped to UART0, then RING line will be activated. If URC happen on an AT channel not mapped to UART0, then the RING line is unaffected.
2	All URCs are indicated by the RING line of the UART0 interface, irrespective of their origin.

events

Integer: 0..3. Event.

Table 31. *events*

Value	Description
0	No RING activation
1	RING activation triggered by general URC events
2	RING activation triggered by data events

Table 31. *events* (continued)

Value	Description
3	(default): RING activation triggered by general URC events and data.

timout

Integer: 100..5000 (Default: 1000). RING line active duration in milliseconds.

This parameter determines how long the RING line is activated to indicate a URC or pending data. No value means no change.

Usage Examples

- Read configuration:

```
AT+SQNRICFG?
+SQNRICFG: 1,3,1000
OK
```

- Write default configuration and read again:

```
AT+SQNRICFG
OK
AT+SQNRICFG?
+SQNRICFG: 2,3,1000
OK
```

- Write other configuration and read again:

```
AT+SQNRICFG=0,0
OK
AT+SQNRICFG?
+SQNRICFG: 0,0,1000
OK
```

Set LED Blink Mode: AT+SQNLED

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	LED must be enabled (see Hardware Function Configuration: AT+SQNHWCFG *(on page 253)*)
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)

`AT+SQNLED=`*<mode>*	`OK`
	`ERROR`
	`+CME ERROR:`*<err>*

`AT+SQNLED?`	`+SQNLED:`*<mode>* `OK`
`AT+SQNLED=?`	`+SQNLED:`(list of possible *<modes>*) `OK`

Description

This commands turns the LTE LED on or off. The LTE LED blinks when traffic is exchanged over the air.

The read form returns the current LED state.

The test form returns the list of possible modes.

Defined Values

mode

0 or 1. Configures the LTE LED mode. This setting persists at reboot.

Table 32. *mode*

Value	Description
0 (default)	Blink mode Off. The LED is switched off.
1	Blink mode On. The LED will blink according to the system state.

Set to Factory-Defined Configuration: AT&F

Note: This command is described in *ITU-T V.250*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Not Available in Manufacturing Mode
Time-out	10 s
Persistency	N/A

Syntax

Command	Possible Response(s)
AT&F[<*value*>]	OK if value is valid. ERROR if value is not recognised or supported.

Description

This command instructs the DCE to set all parameters to default values specified by the manufacturer, which may include hardware configuration switches and other manufacturer-defined hardware/software switches/variables.

An OK result code for this command is issued using the same rate, parity, and word format as the DTE command line containing the command, but using the factory-defined values for other parameters that affect the format of result codes (e.g., ATQ, V, ATS3, ATS4) and dependent upon other commands that may follow on the same command line.

The execution time of this command varies widely depending on the manufacturer's implementation. The DTE should not assume the amount of time required to execute this command, but shall instead await a result code or another indication from the DCE that it is ready to accept a new command.

CAUTION: The use of this command is strongly discouraged. Please use Device Reset to Factory State: AT+SQNSFACTORYRESET *(on page 484)* instead.

Defined Values

value

Integer: 0.

Table 33. *value*

Value	Description
0	Set parameters to factory defaults.
Other	Reserved for manufacturer proprietary use.

Temperature Monitoring: AT+SQNTMON

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)

`AT+SQNTMON[=`*<mode>[, <extremeLow>, <warningLow>, <warningHigh>, <extremeHigh>]*`]`	`+SQNTMON:`*<mode>, <status>, <temperature>*
	`OK`
	`ERROR`
	`+CME ERROR:`*<err>*

`AT+SQNTMON?`	`+SQNTMON:`*<mode>, <extremeLow>, <warningLow>, <warningHigh>, <extremeHigh>, <temperature>* `OK`
`AT+SQNTMON=?`	`+SQNTMON:(0-2),(-100-100),(-100-100),(-100-100),(-100-100)`
URC	`+SQNTMONS:`*<mode>,<status>,<temperature>*

Description

This command activates/deactivates and configures the temperature monitoring function.

Temperature range is split into five operation zones:

- 0: Extreme low temperature range: below *<extremeLow>*
- 1: Low temperature range: from *<extremeLow>* to *<warningLow>*
- 2: Operational range: from *<warningLow>* to *<warningHigh>*
- 3: High temperature range: from *<warningHigh>* to *<extremeHigh>*
- 4: Extreme high temperature range: above *<extremeHigh>*

Temperature thresholds configuration is optional, defaults values are *<extremeLow>* = -40°C, *<warningLow>* = -30°C, *<warningHigh>* = +80°C, *<extremeHigh>* = +90°C.

When the feature is enabled, the module temperature is measured at the internal temperature sensor (accuracy ± 3 °C) according to the following rules:

- When the modules enters a new thermal operation range, the `+SQNTMONS` notification is issued.
- To avoid fluctuations, a non-configurable hysteresis of ± 2 °C is applied to the raw temperature.
- Operating in low or high temperature ranges is still safe.

If the module remains in the low or high extreme zone for more than three seconds and <*mode*> set to 2, the device sends a final URC (`+SQNTMONS:2,10,<temperature>`), then triggers an emergency shut-down procedure to prevent damage.

The `+SQNTMONS` URC is also sent after enabling the feature indication (by means of setting <*mode*> to value 1 or 2).

The read command allows reading the configured parameters as well as the current <*temperature*>.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

mode

Integer: 0, 1 or 2. Temperature monitoring mode.

Integer: 0 or 1. Temperature monitoring mode.

Table 34. *mode*

Value	Description
0	Default value. Temperature monitoring disabled.
1	Temperature monitoring activated with `+SQNTMONS` URC activated.
2	Temperature monitoring activated with `+SQNTMONS` URC activated and automatic emergency shut-down enabled.

extremeLow

Integer: -100..100. Extreme low temperature threshold in °C. Default value is -40.

warningLow

Integer: -100..100. Warning low temperature threshold in °C. Default value is -30.

warningHigh

Integer: -100..100. Warning high temperature threshold in °C. Default value is 80.

extremeHigh

Integer: -100..100. Extreme high temperature threshold in °C. Default value is 90.

status

Integer. Temperature monitoring status:

Table 35. *status*

Value	Description
-2	Below extreme low temperature limit
-1	Below low temperature limit
0	Normal operating temperature
1	Above high temperature alert limit
2	Above extreme high temperature limit
10	Extreme temperature timer expired, shut-down procedure started

temperature

Integer. Current board temperature in Celsius.

Example

```
AT+SQNTMON=?
+SQNTMON: (0-2),(-100-100),(-100-100),(-100-100),(-100-100)
OK
```

UART Interface Power Saving Configuration: AT+SQNIPSCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Needs subsequent rebooting
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
`AT+SQNIPSCFG=`*<mode>[,<timeout>]*	`+CME ERROR:` *<err>* `OK`
`AT+SQNIPSCFG?`	`+SQNIPSCFG:(0-2),(100-10000)`
`AT+SQNIPSCFG=?`	`+SQNIPSCFG:` *<mode>[,<timeout>]*

Description

This command sets the UARTs power saving configuration, with global effect on the module power saving behaviour.

Important: This command does not immediately apply mode transitions. A reset is required to apply a mode change.

The read command displays the power saving mode and the time-out.

Available power modes:

- In *<mode>*=0, power saving is disabled. UART0, UART1, UART2 interfaces are permanently activated and the module never enters sleep mode.
- In *<mode>*=1, power saving is activated. UART0 interface is activated with sleep mode support (RTS0 line). UART1 and UART2 interfaces do not interfere on module power saving behaviour. The module does not enter sleep mode as long as the RTS0 line state is low.

  Note: In *<mode>*=1, in order to ignore RTS1 line, it is also necessary to disable the `wakeRTS1` signal with these commands:

  ```
  AT+CFUN=5
  AT+SQNHWCFG="wakeRTS1","disable"
  AT^RESET
  ```

- In *<mode>*=2, power saving is activated. UART0/UART1/UART2 interfaces are activated with sleep mode support (RTS0/1/2 lines) whenever applicable (hardware flow control supported and activated on UART interface). The module does not sleep until all RTS lines are high.

When power saving is enabled, the module power state is controlled by RTS line:

- If the RTS line state is set to OFF, the power saving mode is allowed.
- If the RTS line state is set to ON, the module exits from power saving mode.

More precisely, when power saving is enabled:

- When no activity is detected on the UART, the CTS line will be set to OFF state (driven high level) <*timeout*> milliseconds (100 ms to 10 s, default 5 s) after the last sent character, then the module goes into sleep mode as soon as the DTE set the RTS line to OFF state (driver high level).
- When the module is in sleep mode, it can be waken-up by driving the RTS0 line (<*mode*>=1 or 2) or one of RTS1/2 lines (<*mode*>=2) to ON state (low level). After RTS0/1/2 assertion (RTS line set ON state, e.g. pin set to low level), and module waken-up, CTS line signals will change to ON state (low level), stating UART interfaces are ready to operate.

Notes:

- UART sleep mode support requires that CTS/RTS flow control be configured both on the UE side and the DTE side.
- If <*mode*>=1 or 2 the DTE can start sending data to the module without risk of data loss after having asserted the UART RTS line.
- Factory default is <*mode*>=2, <*timeout*>=5000 ms.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

mode

Integer: 0, 1 or 2. UART power saving mode.

Table 36. *mode*

Value	Description
0	Power saving is disabled. UART0, UART1, UART2 interfaces are permanently activated and the module never enters sleep mode.
1	Default value. Power saving is activated. UART0 interface is activated with sleep mode support. The module's power state is controlled by the RTS0 line
2 (default)	Power saving is activated. UART0/UART1/UART2 interfaces are activated with sleep mode support whenever applicable (HW flow control activated). The module power state is controlled by the RTS0, RTS1 and RTS2 lines.

timeout

Integer: 100..10000 (default: 5000). Inactivity time-out in milliseconds. In sleep modes (<*mode*>=1 or 2), this is the guard period during which no character should be received on UART before module entering in sleep mode. This parameter is ignored if the power saving mode is disabled (<*mode*>=0).

View Configuration Profiles: AT&V

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Not Available in Manufacturing Mode
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT&V	<CR><LF>(list of stored settings)<CR><LF> <CR><LF>OK<CR><LF>

Description

This command reads the current settings of the system for various parameters set by AT commands and stored by AT&W *(on page 70)*.

Example

```
AT&V

E: 0; V: 1; Q: 0; &C: 1; &D: 2; &S: 0;

S3 : 013; S4 : 010; +IFC : 2,2; +ICF: 3;

+IPR : 921600;

OK

AT+CFUN?

+CFUN: 0

OK
```

Write Active Profile in Memory: AT&W

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Not Available in Manufacturing Mode
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT&W[<*profile*>]	OK

Description

This command stores the current AT command settings to a user defined profile in non-volatile memory. The settings corresponding to the following commands are stored:

- ATE
- ATV
- ATQ
- AT&C
- AT&D
- AT&S
- ATS3
- ATS4
- AT+IFC
- AT+ICF
- AT+IPR

See also command View Configuration Profiles: AT&V *(on page 69)*.

Defined Values

profile

Integer: 0. Only 0 is supported.

Write Data in NVM: AT+SQNSNVW

Syntax

Command	Possible Response(s)
AT+SQNSNVW="certificate",<*index*>,<*size*> <S3><S4><*data*> OK	
AT+SQNSNVW="privatekey",<*index*>,<*size*> <S3><S4><*data*>	
AT+SQNSNVW="strid",<*index*>,<*size*> <S3><S4><*data*>	
AT+SQNSNVW?	OK
AT+SQNSNVW=?	+SQNSNVW:"certificate", *(list of supported <index>), (list of supported <size>)* +SQNSNVW:"privatekey", *(list of supported <index>), (list of supported <size>)* +SQNSNVW:"strid", *(list of supported <index>), (list of supported <size>)* OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command writes/deletes data (certificates, etc.) to/from the non-volatile (NV) memory. Data stored in non-volatile memory is not affected by device reboots and software upgrades.

Attention: A factory reset (see Device Reset to Factory State: AT+SQNSFACTORYRESET *(on page 484)*) deletes all data written in the NV memory.

Usage and syntax changes according to the type of data to store.

- AT+SQNSNVW="certificate",<index>,<size>

  The form with "certificate" writes a single certificate, or several concatenated certificates, in the non volatile memory. Once the operation is completed, public certificates are immediately available for all client secured IP connection (Device Initiated Upgrade: AT+SQNSUPGRADE *(on page 74)*, Secured socket). For secured sockets in server mode, the certificate <*index*> must be used to assign private certificate to the secure server.

  An <*index*> must be provided for the system to identify the certificate (or bundle thereof) in future operations (delete, etc.)

The <*size*> parameter gives the size in bytes of the certificate to upload: after the command is issued, the user must provide the certificate size in bytes using the PEM *(Privacy-enhanced Electronic Mail)* format. Once <*size*> bytes have been received, the operation is automatically completed. If the certificate is successfully uploaded and verified, the response is `OK`. If the upload fails for some reason, then an error code is reported. Maximum <*size*> for certificates is 8 kB.

Writing a zero byte certificate at ID <*index*> deletes the certificate stored at that index.

- `AT+SQNSNVW="privatekey",<index>,<size>`

This form of the command writes a private key in PEM format to the non-volatile memory. Maximum <*size*> for private keys is 2 kB.

Note: Password encrypted private RSA keys are not supported.

Note: The MQTT broker can provide certificates and private keys files with `<CR><LF>` (Carriage Return and Line Feed) endings. The parameter <*size*>, however, must not take the `<CR>` characters into account. To remove the `<CR>`s, use the following command on UNIX: `cat file_with_cr | tr -d \015 > no_cr_file`

- `AT+SQNSNVW="strid",<index>,<size>`

Deprecated. Do not use.

Defined Values

type

String: Type of data.

"certificate": Certificate data.

"privatekey": Private key.

"strid": Generic string.

index

Integer: 0..19. Certificate, private key or string index.

CAUTION: Indexes 0 to 4 and 7 to 10 are reserved for Sequans's internal use. Do not change their contents.

size

Integer: Size in bytes of the certificate, private key or string to upload. A '0' value removes the corresponding entry. See above for individual limits.

Important: The NVRAM has a maximum user capacity of 200 kB. Any attempt to store new data beyond that limit fails with `ERROR`.

Example

- Certificate upload at index 5:

```
AT+SQNSNVW="certificate",5,1346
-----BEGIN CERTIFICATE-----
MIIDXTCCAkWgAwIBAgIJAJC1[…]j3tCx2IUXVqRs5mlSbvA==
-----END CERTIFICATE-----
OK
```

- Delete certificate at index 5:

```
AT+SQNSNVW="certificate",5,0
OK
```

- Upload client private key with keyid 6:

```
$ AT+SQNSNVW="privatekey",6,1675
> -----BEGIN RSA PRIVATE KEY-----
...
-----END RSA PRIVATE KEY-----
OK
```

Chapter 5. Device Upgrade

Device Initiated Upgrade: AT+SQNSUPGRADE

Mode	LTE-M – NBIoT
Type	Synchronous / Asynchronous
Prerequisite	Not Available in Manufacturing Mode
Time-out	Network dependent
Persistency	N / A

Syntax

Command	Possible Response(s)
AT+SQNSUPGRADE=*<firmware_url>*, *[<reboot>*, *[<report_progress>*, *[<command>*, *[<spId>]]]]*	+CME ERROR:*<err>*
AT+SQNSUPGRADE?	SQNSUPGRADE:*<upgrade_state>[, …]*
AT+SQNSUPGRADE=?	SQNSUPGRADE:*(max string length of <firmware_url>)*, *(list of supported <reboot>s)*, *(range of supported <report_progress>)*, *(list of supported <command>s)*, *(range of supported <spId>)*

Description

This command triggers a device upgrade with a firmware fetched from an external server (a.k.a 'FOTA', *Firmware Over The Air*) or from a file already available in the module's file system. In the latter case, the upgrade procedure leaves the local file untouched. Deletion is under user's responsibility. See *<firmware_url>* parameter below for syntax.

The parameters *<reboot>*, *<report_progress>* and *<command>* are optional. A device reboot is necessary to finalise the system upgrade. Any kind of reboot is acceptable (AT^RESET, AT+SQNSSHDN, hardware reset). The *<reboot>* parameter triggers an automatic reboot after the downloaded firmware has been validated and installed. The upgrade can be launched in foreground or background as specified by the *<command>* value.

The user can cancel the upgrade by sending the cancel *<command>* any time before the device reboots. The device acknowledges the command with a +SQNSUPGRADE: "cancelled" URC (mind the two 'l').

It is also possible to suspend an upgrade during the download phase and resume it later. When the download is suspended, the chunk of code already downloaded is saved into the non-volatile memory, so the download resumes from where it stopped. This is especially convenient for devices which run on limited power ('super-caps') and can only be turned on for a limited period at a time. The download is started, then suspended each time the power is running low, and resumed later when the battery is back to full charge, until the whole file has eventually arrived and the upgrade can proceed to installation.

An unsolicited result code `+SQNSUPGRADE: "installed"` is sent as soon as the new firmware has been verified, indicating that the device is ready to reboot. *<report_progress>* controls the sending of the unsolicited result code `+SQNSUPGRADE: "downloading"`.

When the device upgrade process downloads a firmware from a secured FOTA server using a private key stored in a Hosted Cryptographic Engine (see `AT+SQNSPCFG` and HCE storage mode), the foreground upgrade mode is mandatory to enable signature AT command exchanges (`AT+SQNSHCESIGN`) during the establishment of the connection with the FOTA server. Requesting a device upgrade in background mode with a HCE secured connection usage results in `ERROR`.

Requesting a device upgrade from an unsecured FOTA server or from a server without HCE support, is possible both in foreground and background modes.

In background upgrade mode, `AT+SQNSUPGRADE` returns immediately either `OK` if the upgrade has started or `CME ERROR` (see below for specific error codes). `+SQNSUPGRADE`: "connecting" notification is issued as soon as the connection to the FOTA server is established. Once the connection is secured, the firmware download starts and the `+SQNSUPGRADE` notification is used to report on progress ("downloading", "installed", etc.). If the connection to the FOTA server fails, the upgrade is aborted and "`+CME ERROR: 531`" (Upgrade failed: Network error) is sent back.

The write form is also used in case of manual network initiated firmware upgrade, to control the firmware upgrade operation: the user calls this command to trigger the firmware upgrade and/or to cancel the operation.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <err> values.

The read command returns the status of result code presentation corresponding to the current state of upgrade process.

The test command returns the values supported as a compound value.

Note: The current implementation returns 256 as max URL string size, but this limitation is not enforced by the command parser, so a longer URL can be used.

Defined Values

firmware_url

String. URL (compliant with RFC1738) of the firmware (protocol://user:password@host:port/path):

- If the firmware is fetched from a remote source: *<firmware_url>* = "http(s)://…" or "ftp(s)://…"
- If the firmware is fetched from the local file system: *<firmware_url>* = "file:///…" using an absolute path to the file

This command supports FTP(S) and HTTP(S) protocols, in addition to direct file fetching.

reboot

Integer: 0 or 1.

Table 37. *reboot*

Value	Description
0	No reboot after the firmware is downloaded. The user must reboot the device to activate the new firmware
1	Default value. Reboot is triggered after the firmware is installed

Note: Due to current software implementation, the module will trigger a delayed software update when resuming operation from **deep** sleep mode (as opposed to mere sleep mode)

report_progress

Integer: 0..100.

Table 38. *report_progress*

Value	Description
0	Default value. Don't report download progress
1..100	report download progress using `+SQNSUPGRADE: "downloading",` *<percent_downloaded>* URC.

command

Integer: 0..4

Table 39. *command*

Value	Description
0	Default value. Synchronous upgrade.
1	Asynchronous upgrade. The command launches the upgrade and returns immediately `OK` if upgrade is started correctly or `CME ERROR` (see below for specific error codes). The command report upgrade progress with `+SQNSUPGRADE` URC.
2	Cancel upgrade. Cancels the upgrade if any has started or does nothing, then returns `OK`. In case of a network initiated firmware upgrade, the network is notified with an upgrade cancelled error code.
3	Suspend upgrade. This command can be used to download the code in several chunks. The downloaded chunk is saved into non-volatile memory.
4	Resume upgrade. This is used in conjunction with the above command to resume a download after it has been suspended.

spId

Integer: 0..6. Security profile number (see `AT+SQNSPCFG` command) for *https* download

If the firmware is downloaded over a secure connection, SSL/TLS properties settings should be provided through a secure profile managed by `AT+SQNSPCFG`. In such a scenario, the user should clearly identify which configuration to use by adding the mandatory *<spId>* parameter. Any attempt to open a secure connection without a valid security profile will fail.

upgrade_state

String.

Table 40. *upgrade_state*

Value	Description
"cancelled"	The upgrade has been cancelled.
"connecting"	The device is currently waiting for the connection to be established.

Table 40. *upgrade_state* (continued)

Value	Description
"downloading"	Report the downloading progress. This state is followed with <percent_downloaded>. This information is displayed only if <report_progress> has not been set to 0.
"suspend"	Download has been paused, waiting for a resume command.
"idle"	No upgrade is ongoing.
"installed"	The upgraded is installed and will be effective after the next reboot.
“available”	A new firmware is available for download (network initiated firmware upgrade only).
“rebooting”	This notification is sent just before the device reboot which finalises the system upgrade.

percent_downloaded

Integer: 0..100. Percentage of image downloaded.

Example

```
AT+SQNSUPGRADE?
+SQNSUPGRADE: "idle"
OK
```

The following error codes may be returned with `+CME ERROR`. They are also listed in Mobile Termination Error Result Code: +CME ERROR *(on page 282)*

Table 41. AT+SQNSUPGRADE Specific Error Codes

Code	Description
528	Upgrade failed: General error
529	Upgrade failed: Corrupted image
530	Upgrade failed: Invalid signature
531	Upgrade failed: Network error
532	Upgrade failed: Upgrade already in progress
533	Upgrade cancel failed: No upgrade in progress

FOTA Client Configuration: AT+SQNFOTACFG

Syntax

Command	Possible Response(s)
AT+SQNFOTACFG=<*upg_profile*>[,<*mode*>[,<*report_state*>[,<*report_download*>[,<*fota_timer_sec*>[,<*download_to_sec*>[,<*certificateID*>]]]]]]	OK ERROR +CME ERROR: <*err*>
AT+SQNFOTACFG=?	+SQNFOTACFG: 32[,(0,1)[,(0-2)[,(0-100)[,(60-32000000)[,(60-65535)[,(11-19)]]]]]] OK
AT+SQNFOTACFG?	+SQNFOTACFG: <*upg_profile*>,<*mode*>,<*report_state*>,<*report_download*>,<*fota_timer_sec_requested*>,<*fota_timer_sec_actual*>,<*download_to_sec*>,<*certificateID*> OK

Description

The write command is used to configure FOTA client behaviour.

The FOTA client relies on an upgrade service profile identified by <*upg_profile*> parameter and providing following functions: device onboarding, software upgrade package availability check, software upgrade package download and optionally upgrade status reporting.

The FOTA client is built on top of the upgrade service to provide the user application with the following options:

- Trigger periodic (modem initiated) or on demand (device initiate) FOTA checks.
- Receive FOTA activity progress indications.

The FOTA client relies on *Firmware Update LWM2M Object* and the <*upg_profile*> parameter is assumed to reference a device management service profile declared and configured separately with AT+SQNDMCFG *(on page 43)* command under a <*dmProfile*> profile name equal to the <*upg_profile*> value. Thus, besides the FOTA client behaviour, the user application must configure the underlying device management service, which includes:

- Bootstrap information: URL, security material (PSK identify, PSK Secret, etc.).
- APN to be used for all communications with the FOTA server(s).

The level of interaction with the user application is configured by the <*mode*> parameter. Currently, only the default 'automatic' mode is available:

- "automatic" mode (default mode):
  - The FOTA client operates in the background, doing periodic checks, upgrade package download and installation as described in the LWM2M specification (including a module final reboot necessary to complete the upgrade procedure) whenever required, independently of the user application.

The user application is informed of the FOTA client activity using `+SQNFOTA` notifications after enabling reporting capabilities with the <*report_state*> and <*report_download*> parameters (optional parameters):

- <*report_state*>: specifies FOTA client state change indication (`+SQNFOTA`) reporting level.
- <*report_download*>: specifies software upgrade package download progress indication reporting percentage step.

Optionally, the user application can also override the default FOTA client behaviour by setting:

- <*fota_timer_sec*>: modem initiated FOTA check period (based on OMA registration lifetime resource value /1/x/1 for particular DM server). If the value is provided, the command relies on server-defined registration lifetime obtained during onboarding process.

  Note: This timer is volatile, and can be reset by the server at any time. If that happens, the URC notification communicates the new value. The read command `AT+SQNFOTACFG?` reports both requested and current values.

- <*download_to_sec*> Integer 60..65535. Download timeout in seconds (optional).
  - OUTBAND FOTA only: Maximum time in seconds allowed for the software package download. This timeout is typically useful to prevent sluggish downloads due to slow network or cellular connection going down during operation. The timer must be consistent with the estimated network speed capability to avoid aborting valid but slow operations. In case of timeout during an upgrade file data transfer and if the download protocol supports resume function (HTTP/HTTPS), the download will resume at the next FOTA timer or the next device download request. If the parameter is omitted, the download resume logic is applied.

The user can control the maximum FOTA client radio activity duration using the aforementioned timers, which may be mandatory if the device power supply architecture is only compatible with time-limited activity period.

FOTA client configuration is stored in non-volatile memory and is persistent against device reboot, software upgrade. The configuration update is applied at next module reboot. Any kind of reboot (`AT^RESET`, `AT+SQNSSHDN`, hardware reset) is acceptable.

The read command returns the FOTA client configuration applicable at next reboot (the currently active configuration is overridden by pending changes, if any).

The test command returns values supported as a compound value.

Defined Values

upg_profile

String. Upgrade service profile name.

- Maximum length is 32 characters
- When upgrade service is provided by a device management service, the profile name shall reference a valid device management configuration profile (see AT+SQNDMCFG).

mode

Integer: 0 (Automatic Mode Only).

- 0 (default): Automatic mode with FOTA client activity managed in background without user intervention.

report_state

Integer: 0, 1 or 2. FOTA client state change indication (+SQNFOTA) reporting level.

- 0: Notification disabled
- 1: state change reporting enabled
- 2(default) : state change and intermediate error reporting enabled

report_download

Integer: 0..100. Specifies software upgrade package download progress indication reporting percentage step.

- 0 (default): do not report download progress indication
- 1..100: download progress indication reported at each configured percentage step

fota_timer_sec

Integer: 60..32000000. FOTA periodic timer (optional).

- FOTA client periodic timer used to trigger FOTA check or resume a paused FOTA activity.
- This value is volatile and can be changed at any time by the server. The read command will display both the requested value and the value currently in use. If the value is omitted, the client will use the value provided by the server.

download_to_sec

Integer: 60..65535. Download timeout in seconds (optional).

- OUTBAND FOTA only: Maximum time in seconds allowed for the software package download. This timeout is typically useful to prevent infinite download due to slow network or cellular connection going down during operation. Timer shall be set consistently with estimated network speed capability to avoid aborting perfectly normal but slow operations. In case of timeout expiration during upgrade file data transfer and if download protocol supports resume function (HTTP/ HTTPS), download will be resumed next FOTA timer or next device download request.

certificateID

Integer: 11..19. Certificate index to be used for the authentication on FOTA repository server (certificate previously stored using `AT+SQNSNVW="certificate"` command).

FOTA Control Command: AT+SQNFOTA

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Not Available in Manufacturing Mode
Time-out	1 s
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNFOTA=<*action*>	OK ERROR +CME ERROR: <*err*>
AT+SQNFOTA=?	+SQNFOTA: (1-7) OK
AT+SQNFOTA?	+SQNFOTA: <*state*> OK
URC	+SQNFOTA: <*state*>[,<*event*>[,<*dl_percent*>]]

Description

This command can be used to control FOTA client during modem life cycle and FOTA activity to:

- Activate the service (one-off operation after each factory reset) in manual mode (= device initiated mode)
- Start/stop the service to enable FOTA check and firmware upgrade with authorisation to execute:
  - Periodic (modem initiated) FOTA check (see AT+SQNFOTACFG <*fota_timer_sec*> parameter).
  - On-demand (device initiated) FOTA check.
  - Network initiated FOTA triggered by FOTA server using underlying upgrade service (ex: LWM2M SMS registration update).
- Initiate a manual check (device initiated FOTA check).
- Authorise/resume/cancel FOTA critical steps (download, installation) execution in manual (interactive) mode (see FOTA Client Configuration: AT+SQNFOTACFG *(on page 78)*).

The FOTA control AT command execution is asynchronous, meaning the write command returns OK if the requested <*action*> is authorised, or ERROR otherwise. Then user application monitors the command execution using the AT+SQNFOTA read command to get the current FOTA client <*state*> (state polling mode) or enable FOTA reporting (see FOTA Client Configuration: AT+SQNFOTACFG *(on page 78)* <*report_state*> parameter) and receives +SQNFOTA indications (URC) generated at each FOTA state change and failure.

The 'activation' subcommand (<*action*>=1) is used to launch the FOTA activation procedure using the bootstrap server configured in the device management database (see Device Management Configuration: AT+SQNDMCFG *(on page 43)* command) under the upgrade profile name specified in the FOTA client configuration (see FOTA Client

Configuration: AT+SQNFOTACFG *(on page 78)* <*upg_profile*> parameter). The activation step is mandatory to allow further FOTA activity. It has two objectives:

- Declare the device (FOTA client) existence to FOTA server
- Provision the device (FOTA client) with unique credentials, security material and commercial server URL provided by FOTA bootstrap server.

After the activation request has been issued, the FOTA client connects to the FOTA bootstrap server to download the FOTA custom configuration. If the onboarding step (see FOTA Client Configuration: AT+SQNFOTACFG *(on page 78)*) fails, the FOTA client automatically retries it three times, then aborts the activation procedure and reports failure. The MCU must relaunch the activation procedure later.

Once the activation and registration is complete and successful, the FOTA client transitions to the IDLE state and the user application can use `AT+SQNFOTA` write command to check for firmware upgrade (or kill the FOTA client) .

When in running mode, the FOTA client periodically checks for the availability of software upgrade packages. The periodicity of this check is defined by <*fota_timer_sec*>, set with the FOTA Client Configuration: AT+SQNFOTACFG *(on page 78)* command:

- The periodic check can be disabled by using the 'stop' subcommand (<*action*>=3)

> **Notice:** When periodic check is enabled, the FOTA check schedule takes the FOTA activation date (`activationDate`) as a time reference and follows a simple rule (Note: FOTA service start time not used to build FOTA check schedule): $\texttt{checkDate}_n = \texttt{activationDate} + n * <\textit{fota\_timer\_sec}>$.

Besides periodic FOTA check (modem-initiated check), the user application can initiate a FOTA check (device-initiated check) at any time using the 'check' subcommand (<*action*>=4).

If a FOTA check detects a new software upgrade package, the FOTA client proceeds with the upgrade, reporting to the FOTA server if this was requested on the server's side .

In case of a download timeout (see FOTA Client Configuration: AT+SQNFOTACFG *(on page 78)* <*download_to_sec*> parameter) during the upgrade file download and if the download protocol supports the resume feature (HTTP/HTTPS), the download resumes automaticallyat the next FOTA window. Alternatively, the user application can manually resume the download using the `AT+SQNFOTA` write command with the 'download' subcommand (<*action*>=5).

When configured in manual mode (see FOTA Client Configuration: AT+SQNFOTACFG *(on page 78)* <*mode*> parameter), the user application must monitor `+SQNFOTA` notifications and trigger the various FOTA steps if their execution is compatible with the device state (enough battery, no emergency activity in progress, etc.):

- Upgrade package available (<*state*>=5)
  - The FOTA client is waiting for the download to start.
  - Use `AT+SQNFOTA` with 'download start/resume' subcommand (<*action*>=5) to continue.
- Download timeout (<*state*>=5, <*event*>=4)
  - The FOTA client is waiting for the download to resume.
  - Use `AT+SQNFOTA` with 'Download' subcommand (<*action*>=5) to continue.
- Download complete (<*state*>=6)
  - The FOTA client is waiting for the installation to start.
  - Use `AT+SQNFOTA` with 'install' subcommand (<*action*>=6) to continue.

Additionally, when in manual mode, the user application can cancel the upgrade procedure at will before the upgrade package installation starts using `AT+SQNFOTA` with the 'cancel' subcommand (<*action*>=7) (the 'cancel' request is rejected in every other case):

- Before starting / resuming the download or during the download (<*state*>=5).
- After the download is complete (<*state*>=6).

After the download is complete, and provided the module update is allowed, the FOTA client effects a LTE disconnection (`AT+CFUN=0`) before installing the upgrade package.

In case of confirmed download failure (all retries unsuccessful), download cancellation, installation failure (integrity / authentication error), installation cancellation, or after the update has successfully ended, the FOTA client reports the update status to the FOTA server, if requested. To that end, the FOTA client automatically turns the modem back on (`AT+CFUN=1`) after the final reboot and connects to the FOTA server. After this optional reporting to the server, the modem remains registered. The user application must disconnect the modem (`AT+CFUN=0`) if the device needs no network connectivity.

Should the FOTA server connection fail (LTE registration timeout, connection / reporting timeout), a retry procedure as defined in FOTA-PR-4 is performed.

Warning: Before starting any device-initiated action needing access to the radio network (FOTA activation, device-initiated check and download), the user application must switch the modem on (`AT+CFUN=1`) and wait until the modem registration is complete. Otherwise, the `AT+SQNFOTA` request terminates immediately with `ERROR`.

The read command displays the instant <*state*> of the FOTA client.

The test command returns the supported values as a compound value.

FOTA states:

- 'Inactive': the FOTA service is not operational.
  - The FOTA client is waiting for activation before the FOTA service can be used.
  - The only possible user action is 'Activate'.
- 'Onboarding': the FOTA service activation is in progress.
  - The FOTA client provisioning is ongoing.
  - After the provisioning completes, the FOTA client is activated and enters the 'idle' state. If the provisioning fails, the FOTA client returns to the 'inactive' state.
  - The onboarding session cannot be aborted.
- 'Stopped': the FOTA service is activated but not running (the LWM2M client is in the 'de-registered' protocol state).
  - This is the default FOTA client state after service activation
  - The only possible user action is 'Start'.
- 'Idle': the FOTA client is running but idle (no activity in progress).

- This is the default FOTA client state after service activation. The device is waiting for the next FOTA check session triggered by the FOTA timer, a device-initiated request (AT command) or a FOTA server request.
- The only possible user actions are 'Check' and 'Stop'.

• 'Checking': the software upgrade package availability check is in progress.

- In this state, the FOTA client tries to connect to the FOTA server to check for software upgrade package availability. If an upgrade is available, the FOTA client moves automatically to the 'downloading' state. Otherwise it goes back to the 'idle' state.
- The FOTA check session cannot be cancelled.

• 'Downloading': the software upgrade package download is pending or in progress.

- The FOTA client enters this state from the 'checking' state as soon as a software upgrade package is detected, requesting a download operation. The FOTA client remains in that state until the downloading process is terminated (successfully or not).
- If download progress indications are enabled (see FOTA Client Configuration: AT+SQNFOTACFG *(on page 78)* <*report_download*> parameter), the user application receives progress indications as specified.
- After the download is complete and successful, the FOTA client moves to 'downloaded' state.
- In case of a cancel request (<*action*>=7) or a download failure, the FOTA client aborts the FOTA procedure, deletes the partially downloaded upgrade package and optionally reports the error to the FOTA server.
- In manual mode, the user application must monitor the `+SQNFOTA` notifications to start/resume the download as needed using the download subcommand (<*action*>=5).
- During the download operation, the user application may use the radio interface for its own needs in parallel but must not do any modem reconfiguration that could break radio connectivity, or a download timeout can result.

• 'Downloaded': the module is ready for installation.

- The FOTA client enters this state after the upgrade file is confirmed to be entirely available and stored in non-volatile memory.
- This state is transient and the FOTA client moves immediately to 'updating' without possibility to reject or delay the upgrade, unless in manual mode.
- In manual mode, the FOTA client waits for installation start command (<*action*>=6) before moving to the 'updating' state. If it receives a 'cancel' subcommand (<*action*>=7) during this wait period, the FOTA client aborts FOTA procedure, removes the downloaded upgrade package, and optionally report the status to FOTA server.
- Following the 'downloaded' state entry notification, the user application must immediately suspend its activity with the modem, save key volatile data, stop peripherals and prepare for module reboot which completes the system update.

• 'Updating': the software upgrade package installation is in progress.

- In this state, the FOTA client performs a software upgrade package verification (integrity and authentication), then proceed with its installation. The FOTA client remains in that state until the installation process is complete.
- After the installation is complete (whatever the final status), the FOTA client removes the locally stored software upgrade package.

- If the installation has succeeded, FOTA client transitions to 'installed' state. Otherwise (verification failure or installation error) the module aborts the operation and optionally reports status to the FOTA server.
- This update phase cannot be cancelled.

- 'Installed': The module update has been successfully completed.
  - The FOTA client enters this state only after successful installation.
  - This is a transient state, and the FOTA client returns automatically to the 'idle' state

Note: If the factory bootstrap information is not provisioned, the FOTA activation command (<*action*>=1) execution request immediately returns `ERROR`.

Note: Requesting a FOTA activation (<*action*>=1) while FOTA is already activated (<*state*> ≥ 2) or onboarding procedure is in progress (<*state*>=2) immediately returns `ERROR`.

Note: Device-initiated FOTA check request (<*action*>=4) immediately returns `ERROR` if:

- The FOTA client is not activated (<*state*>=1)
- The FOTA client is stopped (<*state*>=2)
- The FOTA check already in progress (<*state*>=4)
- The radio network data connectivity is not available
- A software upgrade is already in progress on the modem.

Note: Proactive periodic (FOTA timer) modem-initiated FOTA check execution is delayed until radio network data connectivity becomes available again (triggered by the user application request or a modem internal need, such as Tracking Area Update activity). If the proactive periodic modem-initiated FOTA check execution is delayed and does not happen on time, the client is de-registered and the FOTA state changes from 'idle' to 'stopped'. User code must restart it using the 'start' subcommand, i.e. `AT +SNQFOTA=2`.

Note: As in any module upgrade, a device reboot is required to complete the firmware installation.

Note: The FOTA onboarding, check, and installation cannot be cancelled.

Note: After a (device) factory reset, the FOTA client state defaults to the 'inactive' state. Pending downloaded upgrade file (if any) and provisioned FOTA custom data are lost.

Defined Values

action

Integer 1..7

Control command.

- 1: "Activate"
- 2: "Start"
- 3: "Stop"
- 4: "Check" (device initiated)
- 5: "Download" (start/resume)
- 6: "Install"
- 7: "Cancel"

state

Integer 0..8

FOTA client state.

- 0: "Inactive". The FOTA service is not operational, waiting for activation command.
- 1: "Onboarding". The FOTA service activation is in progress.
- 2: "Stopped". The FOTA service is activated but not running.
- 3: "Idle": The FOTA client is running but idle (no activity in progress).
- 4: "Checking". The software upgrade package availability check in progress.
- 5: "Downloading". The software upgrade package download is pending or in progress.
- 6: "Downloaded". The module is ready for installation.
- 7: "Updating". The software upgrade package installation is in progress.
- 8: "Installed". The module update is complete and successful.

event

Integer 0..10

FOTA event.

- 0: Connection timeout.
- 1: Provisioning timeout.
- 2: Activation failure (no more retries).
- 3: Download in progress
- 4: Download timeout (download in pause if resume supported and max reties not reached).
- 5: Download failure (no more retries).
- 6: Upgraded package integrity failure.
- 7: Upgraded package authentication failure.
- 8: Installation failure.
- 9: Operation cancelled.
- 10: Operation aborted (following a "stop" action)

dl_percent

Integer 0..100

FOTA download progress status in percents.

Supplemental Specific Error Codes

Specific mobile termination error result code (+CME ERROR):

- 550: "Invalid configuration parameters"
- 551: "MT not registered and not searching"
- 552: "MT searching for network"
- 553: "MT out of coverage"
- 555: "Unknown network error"
- 601: "FOTA client already activated"
- 602 "FOTA client activation already in progress"
- 603 "FOTA client not activated"
- 604 "FOTA client stopped"
- 605 "FOTA client invalid request"
- 606: " Software upgrade already in progress"

Network Initiated Device Upgrade Configuration: AT +SQNSUPGRADECFG

Mode	LTE-M – NBIoT
Type	Synchronous or Asynchronous
Prerequisite	Not Available in Manufacturing Mode
Time-out	300 ms
Persistency	Non Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNSUPGRADECFG=*<mode>*,*<reportStage>*, *<reportProgress>*	OK +CME ERROR:*<err>*
AT+SQNSUPGRADECFG?	SQNSUPGRADECFG:*<mode>*,*<reportStage>*,*<reportProgress>*
AT+SQNSUPGRADECFG=?	SQNSUPGRADECFG:*(list of supported <mode>s)*, *(list of supported <reportStage>s)*, *(range of supported <reportProgress>)*

Description

The write command is used to configure the device behaviour in case of network-initiated firmware upgrade configuration. This is typically the case for OTADM FOTA. The mode of interaction with the user or the external host is configured by the *<mode>* parameter. Two modes are defined: automatic (default) and manual.

- In 'automatic' mode, the firmware upgrade will be done in background. After downloading the new firmware, the module automatically applies it then reboot. The user is notified of progress (firmware downloading, firmware installed, upgrade cancelled, rebooting...) by +SQNSUPGRADE unsolicited result code based on the debug level configured by *<reportStage>* and *<reportProgress>* parameters.
- In 'manual' mode, the firmware upgrade takes place under user control. As soon as a new firmware is available, an unsolicited result code +SQNSUPGRADE: "available" is sent. The user triggers the firmware download using the +SQNSUPGRADE command (without specifying any URL). The device then reboots (automatically or not, according to the +SQNSUPGRADE parameter).

Attention: Rebooting the device is necessary after every *<mode>* configuration change. Any form of reboot (AT^RESET, AT+SQNSSHDN, hardware reset) is acceptable.

Attention: The configuration set by this command is **lost** after the subsequent reboot. Therefore, this command must be used prior to every upgrade.

<reportStage> and *<reportProgress>* control the sending of the unsolicited result code +SQNSUPGRADE.

The read command returns the current configuration.

Test command returns values supported as a compound value.

Note: `+SQNSUPGRADECFG` configuration is per channel specific.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

Defined Values

mode

Integer: 0. Automatic mode. A network initiated firmware upgrade is fully transparent for the user. Note that an unforeseeable reboot can happen any time to complete the upgrade procedure.

reportStage

Integer

Table 42. *reportStage*

Value	Description
0	Default value. Do not report any upgrade status.
1	Activate upgrade status main step reporting (see *<upgrade_state>* values of `+SQNSUPGRADE` URC)

reportProgress

Integer

Table 43. *reportProgress*

Value	Description
0	Default value. Do not report download progress
1..100	Report download progress using `+SQNSUPGRADE: "downloading",` *<percent_downloaded>* URC.

Example Usage

```
AT+SQNSUPGRADECFG=?
+SQNSUPGRADECFG: 0,(0-1),(0-100)
OK
AT+SQNSUPGRADECFG?
+SQNSUPGRADECFG: 0,0,0
OK
AT+SQNSUPGRADECFG=0,1,1
OK
AT+SQNSUPGRADECFG?
+SQNSUPGRADECFG: 0,1,1
OK
```

Chapter 6. Dual Mode Commands

IoT Mode Activation: AT+SQNMODEACTIVE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=0
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNMODEACTIVE=<*n*>	OK +CME ERROR
AT+SQNMODEACTIVE?	+SQNMODEACTIVE:<*n*>
AT+SQNMODEACTIVE=?	+SQNMODEACTIVE:(list of supported <*n*>s)

Description

This command chooses the operating mode between LTE-M and NB-IoT on a device when both LTE-M and NB-IoT are allowed. This command can be run only if the device is in CFUN=0 state.

The setting persists at reboot and upgrade.

If the device is not dual mode capable, the active mode cannot be changed: `AT+SQNMODEACTIVE` (or `AT+SQNMODEACTIVE?`) returns the only allowed mode of operation and trying to set a value with `AT+SQNMODEACTIVE` fails and returns `+CME ERROR 589` (Dual mode not configured).

For devices dual mode capable, trying to set the mode of operation to the current value returns `OK` and does nothing. Trying to switch the mode of operation when in CFUN=1 *(on page 299)* state returns `+CME ERROR 591` (Device is in active state).

Defined Values

<*n*>: Integer: 1, 2 or 3. Indicates the active RAT.

Value	Description
1 (default)	LTE-M
2	NB-IoT
3	Reserved for future use

Specific error codes are listed in the +CME ERROR *(on page 282)* URC description.

Chapter 7. Hardware Functions Control Commands

Read ADC value: AT+SQNADC

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	ADC enabled (See Hardware Function Configuration: AT+SQNHWCFG *(on page 253)*)
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNADC=<*adc*>	+SQNADC=<*adc*>, <*voltage*> OK ERROR
AT+SQNADC=?	+SQNADC: (list of enabled <*adc*>*s*) OK

Description

The AT+SQNADC command controls the module's auxiliary Analogue-to-Digital Converter(s). The ADC(s) sample(s) the voltage of its(their respective) input pin(s). The command returns the instantaneous voltage in millivolts of the specified ADC channel input. If the specified ADC channel is invalid or disabled (See AT +SQNHWCFG *(on page 253)*), the command returns ERROR.

The test command returns the list of enabled ADC channels.

Defined Values

adc

String. Name of the ADC channel input. Please refer to the device's data sheet.

voltage

Integer: 0..1800. Voltage at the specified ADC channel input in mV.

RF Thermistor Measurement: AT+SMDTH

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	–

Syntax

Command	Possible response(s)
`AT+SMDTH[=]`	`AT+SMDTH:`*<temperature>* `+SMT ERROR:` *<err>*
`AT+SMDTH=?`	`OK`

Description

The command reads a thermistor value and translates it into a temperature.

Important: Performances and reliability are not guaranteed in the following conditions:

- Places where splashed water or dew condensation are likely.
- Places where corrosive or oxidising gases (Cl_2, H_2S, NH_3, SO_x, NO_x, etc.) can be present.

The set commands returns `ERROR`.

Defined Values

The following values are defined:

temperature

Measured temperature in °C. Precision is one tenth of degree.

err

Error list:

- NA: Temperature is not available on this model
- ONGOING: Measurement is under way

Chapter 8. IP Data Services Commands

Basic TCP-IP-ICMP Services Commands

Configure Ping Echo Request: AT+PINGCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+PINGCFG=<*command*>	OK
AT+PINGCFG=?	+PINGCFG:(0-2)
AT+PINGCFG?	+PINGCFG:<*mode*>[,<*downcount*>,<*IPaddr*>,<*len*> ,<*interval*>,<*timeout*>,<*ttl*>,<*cid*>]

Description

This command configures an operation mode of AT+PING. The ICMP echo request command can operate either in synchronous or asynchronous mode. The command also can be used to abort ping requests during asynchronous mode.

Test command returns values supported as a compound value.

Defined Values

command

Integer: 0, 1 or 2. Configuration command.

Table 44. *command*

Value	Description
0	Set synchronous operation mode
1	Set asynchronous operation mode
2	Stop pinging

mode

Integer: 0 or 1. Current operation mode.

Table 45. *mode*

Value	Description
0	Default. Synchronous mode
1	Asynchronous mode

downcount

Integer. Number of remaining ping echo requests. Applicable only for the asynchronous mode.

IPaddr

String. Remote host IP Address. Applicable only for the asynchronous mode.

len

Integer. Length of the ping echo request (default: 32). Applicable only for the asynchronous mode.

interval

Integer. Interval (in seconds) between each ping echo request (default: 1). Applicable only for the asynchronous mode.

timeout

Integer. Maximum delay of an echo reply in seconds (default: 10). Applicable only for the asynchronous mode.

ttl

Integer. TTL (time to live) parameter of the Echo Reply message. Applicable only for the asynchronous mode.

cid

Integer. PDP context identifier (default: Internet PDN). Applicable only for the asynchronous mode.

DNS Query: AT+SQNDNSLKUP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached
Time-out	Depends on the network response
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNDNSLKUP=<*hostName*>[,<*ipType*>]	+SQNDNSLKUP:<hostName>,<ipAddrress>
AT+SQNDNSLKUP=?	+SQNDNSLKUP:<hostName>[,(0,1)]

Description

The write form triggers a A/AAAA query to a DNS server to resolve the host name into an IP v4/v6 address.

If the data APN is configured in dual stack IP v4/v6 (see Define PDP Context: AT+CGDCONT *(on page 343)*), then the AAAA (IPv6) query is sent first. If that query is unsuccessful, an A query is used as fail-safe.

The user can force the type of DNS query by setting <*ipType*> parameter. This parameter is ignored in case of single stack data APN.

In case of successful DNS query, the host IP address is reported with the result code: `+SQNDNSLKUP: <hostName>,<ipAddress>`.

If no DNS information is available, the command returns `ERROR`.

The write command returns `ERROR` if the data APN is not yet activated (see Define PDP Context: AT+CGDCONT *(on page 343)*).

Defined Values

hostName

String. Domain name.

ipType

Integer: 0 or 1.

Table 46. *ipType*

Value	Description
0	IPv4 only (A request)
1	IPv6 only (AAAA request) (default value)

ipAddress

String. Host IP address.

The string is given as dot-separated numeric (0-255) parameter of the form `a1.a2.a3.a4` for IPv4 and `a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16` for IPv6.

Example

```
AT+SQNDNSLKUP="www.example.com"
+SQNDNSLKUP: www.example.com,38.6.40.0.2.32.0.1.2.72.24.147.37.200.25.70
OK
```

Hang-Up: ATH

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached
Time-out	20 s
Persistency	N/A

Syntax

Command	Possible Response(s)
ATH	OK

Description

This command releases all active and held calls.

Hangs up (exiting the PPP online mode). The command terminates all PPP sessions. It may be used from another AT command interface to kill any dial-up connection.

PPP calls a LCP Terminate procedure and is considered done after the `NO CARRIER` notification is sent.

Example

```
ATH
OK
```

Modem Ready for Data Traffic: AT+SQNDRDY

Mode	LTE-M – NBIoT
Type	Synchronous and asynchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNDRDY=<*enable*>	OK
AT+SQNDRDY=?	+SQNDRDY:(0-1) OK
AT+SQNDRDY?	+SQNDRDY:<*enable*> OK
(URC)	+SQNDRDY: <*ready*>

Description

The write form allows the UE to notify the user about radio link related issues. The modem indicates whether data is ready to be sent or not.

This configuration is volatile and lost after a device reboot, but persists through sleep mode.

The notification `+SQNDRDY:0` is sent only when the RRC is in RRC connected mode, and a detection of physical layer problems in RRC_CONNECTED occurs (3GPP 36.331 5.3.11.1 - start of T310 timer)

The notification `+SQNDRDY:1` is sent under recovery of physical layer problems (3GPP 36.331 5.3.11.2).

When the RRC exits the "RRC connected mode", `+SQNDRDY:1` is emitted, assuming `+SQNDRDY:0` has been previously sent, when:

- RRC performs the actions upon leaving RRC_CONNECTED as specified in 36.331 5.3.12;
- RRC detects a radio link failure (36.331 5.3.11.3).

No notification is sent once the UE is attached or at boot time.

Defined Values

enable

Integer: 0 or 1.

Table 47. *enable*

Value	Description
0	Turn the +SQNDRDY notification on

Table 47. *enable* (continued)

Value	Description
1	Turn the +SQNDRDY notification off

ready

Integer: 0 or 1.

Table 48. *ready*

Value	Description
0	The modem cannot send any data traffic (red flag)
1	The radio signal is considered good enough to enable data traffic (green flag).

Ping Echo Request: AT+PING

Mode	LTE-M – NBIoT
Type	Synchronous or asynchronous
Prerequisite	Device needs to be attached
Time-out	Variable
Persistency	See Configure Ping Echo Request: AT+PINGCFG *(on page 93)* below

Syntax

Command	Possible Response(s)
`AT+PING=`*<IPaddr>, <count>[,<len>[,<interval>[,<timeout>[,<ttl>[,<cid>]]]]]]*	`+PING:`*<replyId>,<IPaddr>,<time>,<ttl>*
`AT+PING=?`	`+PING: <IPaddr>[,(1-64)[,(32-1400)[,(1-600)[,(1-60)[,(1-255)[,(0-8)]]]]]]`
URC	`+PING:`*<replyId>,<IPaddr>,<time>,<ttl>*

Description

The goal of this command is to send ICMP Echo Request messages and to receive the corresponding Echo Reply.

Test command returns values supported as a compound value.

Note: When the Echo Request timeout expires (no reply within specified time), the response will contain `<time> = -1` and `<ttl> = -1`.

Defined Values

replyId

Integer. Echo reply number.

IPaddr

String. Remote host IP address. Any valid IPv4/v6 address or host name.

time

Integer. Measured round trip time (in ms).

count

Integer: 1..64. Number of Ping Echo Request to send (default: 4). Ping stops after sending *<count>* ECHO_REQUEST packets. With the deadline option, ping waits for *<count>* ECHO_REPLY packets, until the timeout expires.

len

Integer: 32..1400. Length of the ICMP Echo Request message (default: 32).

interval

Integer: 1..600. Interval (in seconds) between two consecutive ICMP Echo Request packets (default: 1)

timeout

Integer: 1..60. Time to wait for a Echo Reply (in seconds)(default: 10). The option only concerns time-out in absence of any responses. Otherwise, ping waits for two RTTs.

ttl

Integer. TTL (time to live) field of the Echo Reply message.

cid

Integer: 1..8. PDP context identifier (default: Internet PDN)

Examples

```
AT+CFUN=1
OK
+CEREG: 2
+CEREG: 1,"0002","01A2D002",7
AT+PING="sequans.com"
+PING: 1,184.106.55.83,210,49
+PING: 2,184.106.55.83,200,49
+PING: 3,184.106.55.83,200,49
+PING: 4,184.106.55.83,200,49
OK
AT+PING="google.com",2,1400,5,1,64,1
+PING: 1,2A00:1450:4001:816::200E,150,42
+PING: 2,2A00:1450:4001:816::200E,130,42
OK
AT+PING="8.8.4.4",2,1400,5,1,64,1
+PING: 1,8.8.4.4,300,44
+PING: 2,8.8.4.4,130,44
OK
AT+PING="2A00:1450:4001:816::200E",2
+PING: 1,2A00:1450:4001:816::200E,200,42
+PING: 2,2A00:1450:4001:816::200E,90,42
OK
AT+PING="nobody.nowhere.nothing"
+CME ERROR: no network service
```

Return to Online Data State: ATO

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
`ATO[<value>]`	*<result_code>* `OK`

Description

Causes the DCE to switch back to '`data mode`' and issue a `CONNECT` or `CONNECT <text>` result code. This command cannot be aborted.

This command resumes the `data mode` suspended after a `+++` escape sequence.

Important: The `+++` string will be interpreted as an escape sequence if it is issued at least 1 second after the last data exchange ended.

In a PPP context, the command resumes the PPP session previously suspended by `+++`.

This command performs the same actions as Enter Data State: AT+CGDATA *(on page 353)* without establishing the external network access.

Defined Values

value

Integer: 0. Represents 'return to data mode from command mode'.

Other values are reserved.

result_code

String. Result of the command.

Table 49. *result_code*

Value	Description
CONNECT	If connection is successfully resumed and X0 is selected
CONNECT *<text>*	If connection is successfully resumed and Xn is selected where "n" is any value other than 0
NO CARRIER	If connection cannot be resumed
ERROR	If *<value>* is not recognised or supported

Example

```
ATO
OK
```

Setup PPP Connection: ATD*99...#

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached
Time-out	10 s
Persistency	N/A

Syntax

Command	Possible Response(s)
ATD*99[*[<protocol>][*[<cid>]]]#	NO CARRIER ERROR +CME ERROR:<err>

Description

ATD*99…# establishes a PPP connection.

After a successful LCP negotiation, the host acquires the public PDP address(es) and the AT channel switches to data mode.

The user must use the escape sequence '+++' to suspend the data mode and switch back to the AT 'command mode'.

The module cannot enter deep sleep mode while a PPP connection is active.

Defined Values

protocol

String. The only supported value is "PPP".

cid

Integer: 1..8: Internet Primary Context ID.

COAP Related Commands

CoAP Context Close: AT+SQNCOAPCLOSE

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Device needs to be attached
Time-out	Depends on network
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNCOAPCLOSE=<*prof_id*>	OK
AT+SQNCOAPCLOSE=?	+SQNCOAPCLOSE:<*range or prof_if*>
URC	+SQNCOAPCLOSED:<*prof_id*>,<*reason*>

Description

This command closes a CoAP context.

See Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The test command returns the range of supported values/lengths for all the subparameters.

Once the connection is closed, the URC +SQNCOAPCLOSED is sent to the host. This URC may also be sent if the connection was closed unexpectedly.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier. If <*dtls_enabled*> was set to 1 in CoAP Context Create: AT+SQNCOAPCREATE *(on page 106)*, then this must be present.

reason

String. Reason why connection has been closed. Possible values:

Table 50. *reason*

Value	Description
USER	Connection closed at user's request
SERVER	Connection closed by remote server
NAT_TIMEOUT	Socket timeout
NETWORK	Network connection error

CoAP Context Create: AT+SQNCOAPCREATE

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Device needs to be attached
Time-out	Configurable in command
Persistency	Not persistent

Syntax

Command	Possible Response(s)
AT+SQNCOAPCREATE=*<prof_id>* *[,<server_address>* *[,<server_port>* *[,<local_port>* *[,<dtls_enabled>* *[,<timeout>* *[,<cid>* *[,<spId>]]]]]]]*	OK
AT+SQNCOAPCREATE?	+SQNCOAPCREATE: <prof_id1>, <server_address1>, <server_port1>, <local_port1>, <dtls_enabled1>, <timeout1>, <cid1>, <spId1> … +SQNCOAPCREATE:<prof_idN>, <server_addressN>, <server_portN>, <local_portN>, <dtls_enabledN>, <timeoutN>, <cidN>, <spIdN>
AT+SQNCOAPCREATE=?	+SQNCOAPCREATE: *[possible values or maximum length for each parameter]*
URC	+SQNCOAPCONNECTED:<prof_id> [,<server_address> [,<server_port> [,<local_port> [,<dtls_enabled>]]]]

Description

This command creates a CoAP context for a given profile. While this context is open the device can send commands to a remote server and can receive responses and requests from the server. The context shall be created before calling CoAP Send Data: AT+SQNCOAPSEND *(on page 111)*, CoAP Set Options: AT+SQNCOAPOPT *(on page 116)* or CoAP Receive Data: AT+SQNCOAPRCV *(on page 109)*.

If only the <*local_port*> is provided the context is created in listen mode waiting for an incoming connection. If <*server_address*> and <*server_port*> are provided, then the connection is initiated with a remote server. If none is provided, the command will return error.

Once the connection is established the URC `+SQNCOAPCONNECTED` is sent to the host.

If a configuration parameter of `+SQNCOAPCREATE` needs to change, the context needs to be closed first with CoAP Context Close: AT+SQNCOAPCLOSE *(on page 105)*.

See Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Read command returns the current settings for each profile.

Test command returns the range of supported values/lengths for all the parameters.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

server_address

String. IP address of the CoAP server. This parameter can be either:

- Any valid IPv4/v6 address;

- Any valid host name.

server_port

Integer: 0..65535. Numeric parameter indicating the UDP remote port of the CoAP server to connect to.

local_port

Integer: 0..65535. Numeric parameter indicating the UDP local port to use. If omitted, the UE will assign a randomly available port (recommended).

dtls_enabled

Integer: 0 or 1.

Table 51. *dtls_enabled*

Value	Description
0 (default)	DTLS encryption disabled
1	DTLS encryption enabled

timeout

Integer: 1..120. The time interval in seconds to wait for the response from the CoAP server before aborting the operation. This parameter is independent of the ACK_TIMEOUT used for retransmission. Default value is 20.

cid

Integer: 1..8. PDN Context Identifier. Default value is the operator internet PDN. It is not recommended to set this parameter except for advanced usage.

spId

Integer. The index of the secure profile previously set with SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* command. If *<dtls_enabled>* is set to 1, this must be present.

CoAP Receive Data: AT+SQNCOAPRCV

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached. +SQNCOAPRING URC received
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNCOAPRCV=<*prof_id*> ,<*msg_id*>[,*max_bytes*]	+SQNCOAPRCV:<prof_id>,<msg_id> [,<token>[,<req_resp>,<type>,<method/rsp_code>,<length> [<S3><S4><payload>]]] OK
AT+SQNCOAPRCV=?	+SQNCOAPRCV: *[possible values or maximum length for each parameter of write command]*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This message allows reading the contents of a CoAP message after a +SQNCOAPRING notification has been received.

If the message has no payload, length is zero.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

msg_id

Integer: 0..65535. The message ID of the CoAP header. This value can be retrieved from the URC +SQNCOAPRING.

token

String. Token from CoAP header in hexadecimal format. Maximum token length is 8 bytes (16 hexadecimal characters). It will be empty if no token is present in the header.

max_bytes

Integer: 0..1024. Default 1024.

For the possible values of the other parameters, please refer to: CoAP Send Data: AT+SQNCOAPSEND *(on page 111)*

CoAP Receive Options: AT+SQNCOAPRCVO

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached. URC +SQNCOAPRING received
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNCOAPRCVO=<*prof_id*>,<*msg_id*>, [*max_opt*]	+SQNCOAPRCVO:<prof_id>,<opt_code1> [,<opt_value1> [,<opt_value2> [,<opt_value3> [,<opt_value4> [,<opt_value5> [,<opt_value6>]]]]]] +SQNCOAPRCVO:<prof_id>,<opt_code2> [,<opt_value1> [,<opt_value2> [,<opt_value3> [,<opt_value4> [,<opt_value5> [,<opt_value6>]]]]]] … OK
AT+SQNCOAPRCVO=?	+SQNCOAPRCVO:*[possible values or maximum length for each parameter of write command]*

Description

This message allows reading the contents of a CoAP message after a +SQNCOAPRING notification has been received.

If the message does not have a payload, length will be null.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

msg_id

Integer: 0..65535. The message ID of the CoAP header. This value can be retrieved from the URC +SQNCOAPRING.

max_opt

Integer: 0..32. Maximum options that can be shown in the response. Default: 32.

For the possible values of the response, please refer to CoAP Set Options: AT+SQNCOAPOPT *(on page 116)*.

CoAP Send Data: AT+SQNCOAPSEND

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached. Prior call to CoAP Context Create: AT +SQNCOAPCREATE *(on page 106)*
Time-out	Network dependent
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNCOAPSEND=<*prof_id*>,<*type*>,<*method/rsp_code*>, [<*length*><S3><*payload*>]	OK ERROR +CME ERROR: <err>
AT+SQNCOAPSEND=?	+SQNCOAPSEND:*[possible values or maximum length for each parameter]*
URC	+SQNCOAPRING:<*prof_id*>, <*msg_id*>, <*req_resp*>, <*type*>, <*method/rsp_code*>, <*length*>
URC	+SQNCOAPRINGERR:<*prof_id*>, "Bad request" +SQNCOAPRINGERR:<*prof_id*>, "Unexpected mID",<*msg_id*> +SQNCOAPRINGERR:<*prof_id*>, "Unexpected token",<*tkn_hex*>

Note: <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3 *(on page 3)*

Description

This command sends data over CoAP. The <*payload*> is provided as binary data with <*length*> bytes. The behaviour is similar to AT+SQNSNVW command (see Write Data in NVM: AT+SQNSNVW *(on page 71)*). If no data is sent, length must be set to zero.

Test command returns the range of supported values/lengths for all the parameters.

For each profile, only one request-response exchange can be active with the server at a given time, if the client is still waiting for a response or the server is waiting for a response from the client, a new call to AT+SQNCOAPSEND *(on page 111)* returns an error. Token and message ids are managed automatically by the CoAP stack.

When the CoAP server sends a response or a request to the client, the URC +SQNCOAPRING will be triggered. The CoAP message then can be read with AT+SQNCOAPRCV. If the response or request is erroneous, the

+SQNCOAPRINGERR is sent instead, with a string explaining the reason of the error (see below for further elaboration).

See Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for information on <*err*> values.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

type

Integer: 0..3. See table below.

Table 52. *type*

Value	Description
0	CON
1	NON
2	ACK
3	RST

method

Integer: 1..4. See table below.

Table 53. *method*

Value	Description
1	GET
2	POST
3	PUT
4	DELETE

rsp_code

Integer. See table below.

Table 54. *rsp_code*

Value	Description
201	CREATED
202	DELETED
203	VALID
204	CHANGED
205	CONTENT
400	BAD_REQUEST
401	UNAUTHORIZED
402	BAD_OPTION
403	FORBIDDEN

Table 54. *rsp_code* (continued)

Value	Description
404	NOT_FOUND
405	METHOD_NOT_ALLOWED
406	NOT_ACCEPTABLE
412	PRECONDITION_FAILED
413	REQUEST_ENTITY_TOO_LARGE
415	UNSUPPORTED_MEDIA_TYPE
500	INTERNAL_SERVER_ERROR
501	NOT_IMPLEMENTED
502	BAD_GATEWAY
503	SERVICE_UNAVAILABLE
504	GATEWAY_TIMEOUT
505	PROXYING_NOT_SUPPORTED

length

Integer: 0..1024. The length of the payload.

payload

Binary data.

req_resp

Integer: 0 or 1. Provides information on whether a URC is a request or a response.

Table 55. *req_resp*

Value	Description
0	The URC is triggered by a request from a CoAP server.
1	The URC is triggered by a response from a CoAP server.

msg_id

Integer: 0..65535. The message ID of the CoAP header which is provided in the `+SQNCOAPRING` URC. This shall be used to read the data and options with the commands `AT+SQNCOAPRCV` and `AT+SQNCOAPRCVO`

tkn_hex

Integer in hexadecimal format. Token number.

+SQNCOAPRING/+SQNCOAPRINGERROR URC

When the CoAP server sends a response or a request to the client, the URC `+SQNCOAPRING` is triggered. `AT+SQNCOAPRCV` reads the CoAP message. If the response or request is erroneous, the `+SQNCOAPRINGERR` is sent instead, with a string explaining the reason of the error.

Three possible reasons for error are defined:

- `Bad request`: The server was unable to send the message to the client, or the parser was unable to analyse the message (bad format or void message).
- `Unexpected mID`: Unexpected message ID (not in the correct window).
- `Unexpected token`: The message's token is not what the client expected.

CoAP Set Header: AT+SQNCOAPHDR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached
Time-out	300 ms
Persistency	Not persistent

Syntax

Command	Possible Response(s)
AT+SQNCOAPHDR=<*prof_id*> [,<*msg_id*>][,<*token*>]	OK
AT+SQNCOAPHDR=?	+SQNCOAPHDR: <*range of prof_id*>[,<*range of message id*>][,<*token_hex_string*>]

Description

This optional command sets the CoAP header (message ID and token) for the next message to send with CoAP Send Data: AT+SQNCOAPSEND *(on page 111)*. The header value depends on these conditions:

- If this command is not used before CoAP Send Data: AT+SQNCOAPSEND *(on page 111)*, the CoAP client set both message ID and token to a random value;
- If only <*msg_id*> is set, the CoAP client sets <*token*> to a random value;
- If only <*token*> is set, the CoAP client sets <*msg_id*> to a random value. If <*token*> value is "NO_TOKEN", then no token is used in the header;
- If both <*token*> and <*msg_id*> are set and valid, they are used in the header.

Note: TKL (Token Length) is set to match the length of the token provided to AT+SQNCOAPHDR.

The test form returns the options supported.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

msg_id

Integer: 0..65535. The message ID of the CoAP header.

token

String. Token to be used in the CoAP header in hexadecimal format. Maximum token length is 8 bytes (16 hexadecimal figures). Special value NO_TOKEN indicates that the header lacks a token.

CoAP Set Options: AT+SQNCOAPOPT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device needs to be attached. Prior call to CoAP Context Create: AT+SQNCOAPCREATE *(on page 106)*
Time-out	300 ms
Persistency	Not persistent

Syntax

Command	Possible Response(s)
AT+SQNCOAPOPT=*<prof_id>*, *<action>*, *<opt_code>* *[,<opt_value1>* *[,<opt_value2>* *[,<opt_value3>* *[,<opt_value4>* *[,<opt_value5>* *[,<opt_value6>]]]]]]*	+SQNCOAPOPT:<prof_id>,<opt_code[,<opt_value1> [,<opt_value2> [,<opt_value3> [,<opt_value4> [,<opt_value5> [,<opt_value6>]]]]]] OK ERROR +CME ERROR: <err>

Command	Possible Response(s)
AT+SQNCOAPOPT?	+SQNCOAPOPT:<prof_id1>,<opt_code1> [,<opt_value1> [,<opt_value2> [,<opt_value3> [,<opt_value4> [,<opt_value5> [,<opt_value6>]]]]]] +SQNCOAPOPT:<prof_id1>,<opt_code2> [,<opt_value1> [,<opt_value2> [,<opt_value3> [,<opt_value4> [,<opt_value5> [,<opt_value6>]]]]]] … +SQNCOAPOPT:<prof_idN>,<opt_code1> [,<opt_value1> [,<opt_value2> [,<opt_value3> [,<opt_value4> [,<opt_value5> [,<opt_value6>]]]]]] +SQNCOAPOPT:<prof_idN>,<opt_code2> [,<opt_value1> [,<opt_value2> [,<opt_value3> [,<opt_value4> [,<opt_value5> [,<opt_value6>]]]]]]
AT+SQNCOAPOPT=?	+SQNCOAPOPT:*<range of prof_id>, (0,1), <list of possible values of opt_code>*

Description

This command allows configuring CoAP options for the next message to send with CoAP Send Data: AT +SQNCOAPSEND *(on page 111)*, such as:

- Configuring one option at a time by using *<action>* 0 (set) and providing both *<opt_name>* and *<opt_value>*. For options that are repeatable, up to six values can be provided (the option will be added up to 6 times in the CoAP message in the exact same order as entered in the command). An already configured option can be overwritten using *<action>* 0 (set);
- Deleting one option by using *<action>* 1 (delete) and the *<opt_code>* of the option that needs to be deleted;
- Deleting all options for a given profile by using *<action>* 1 (delete), setting *<opt_code>* to "" and omitting all values;
- Reading the value of a given option by using *<action>* 2 (read), setting *<opt_code>* to the name of the option to be read and omitting *<opt_value>* from the write command;
- Extending repeatable options that have previously been set by using *<action>* 3 (extend). This adds additional values to the existing ones.

The read form returns the list of all the options currently configured for each profile and the values set for each option.

The test form returns the options supported.

Note: Parameters of `AT+SQNCOAPOPT` are not saved to NVM, they are lost after a reboot.

See Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on the <*err*> value.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

action

Integer: 0..3. Action the command performs:

Table 56. *action*

Value	Description
0	set - set or overwrite an option.
1	delete - delete one or all options.
2	read - read a single option.
3	extend - allows adding more values to repeatable options.

opt_code

Integer: Option code following RFC 7252. Supported options are:

Table 57. *opt_code*

Value	Description	Repeatable
1	IF_MATCH	×
3	URI_HOST	
4	ETAG	×
5	IF_NONE_MATCH	
6	OBSERVE	
7	URI_PORT	
8	LOCATION_PATH	×
11	URI_PATH	×
12	CONTENT_TYPE	
14	MAX_AGE	
15	URI_QUERY	×
17	ACCEPT	
19	TOKEN	
20	LOCATION_QUERY	×

Table 57. *opt_code* (continued)

Value	Description	Repeatable
23	BLOCK2	
27	BLOCK1	
28	SIZE2	
35	PROXY_URI	
60	SIZE1	

opt_value

Integer. The value of the option. String of 256 characters max. For <*opt_code*> 12 or 17, the following <*opt_value*> are supported:

Table 58. *opt_value*

Value	Description
0	TEXT_PLAIN
1	TEXT_XML
2	TEXT_CSV
3	TEXT_HTML
21	IMAGE_GIF
22	IMAGE_JPEG
23	IMAGE_PNG
24	IMAGE_TIFF
25	AUDIO_RAW
26	VIDEO_RAW
40	APPLICATION_LINK_FORMAT
41	APPLICATION_XML
42	APPLICATION_OCTET_STREAM
43	APPLICATION_RDF_XML
44	APPLICATION_SOAP_XML
45	APPLICATION_ATOM_XML
46	APPLICATION_XMPP_XML
47	APPLICATION_EXI
48	APPLICATION_FASTINFOSET
49	APPLICATION_SOAP_FASTINFOSET
50	APPLICATION_JSON
51	APPLICATION_X_OBIX_BINARY
60	APPLICATION_CBOR

HTTP Related Commands

File Download: AT+SQNFGET

Mode	LTE-M – NBIoT
Type	Synchronous / Asynchronous
Prerequisite	DEBUG COMMAND ONLY! See below.
Time-out	Depends on network and data length
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNFGET=<*remote_url*>[,<*sync*>][,<*local_filename*>][,<*spId*>]]]	OK +CME ERROR:<*err*>
AT+SQNFGET?	+SQNFGET:"started" +SQNFGET:"downloading" +SQNFGET:"downloaded" +SQNFGET:"error" +SQNFGET:"complete" +SQNFGET: "not running" OK
AT+SQNFGET=?	+SQNFGET:<*remote_url*>[,<*sync*>][,<*local_filename*>] OK

Description

This command initiates a TFTP/FTP/HTTP connection in order to download a specified file.

To download a file over a secured connection, SSL/TLS settings should be provided through a secure profile managed by SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* command. The user must indicate the configuration to use by specifying the <*spId*> parameter. Any attempt to open a secured connection without a valid security profile fails.

For file downloading over a secured connection using a private key stored in a Hosted Cryptographic Engine (see SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* and HCE storage mode), asynchronous download mode is mandatory to enable signature AT command exchanges (Hosted Crypto Engine Signature: AT +SQNHCESIGN *(on page 157)*) during connection establishment with file server. Requesting a synchronous file download over a HCE secured connection fails.

File downloads over an unsecured connection or over a secured connection without HCE usage are allowed both in synchronous and asynchronous modes.

In asynchronous download mode, AT+SQNFGET command returns immediately 'OK' if the download configuration is valid or CME ERROR (see below for specific error codes). +SQNFGET: "started" notification is issued as soon as the connection to the file server is established. File download starts and the +SQNFGET notification is used to report progress ("downloading", "downloaded", etc.).

The read form returns the current connection status.

The test command returns a string which defines the command syntax.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

DANGER: The module enforces no limit on the size of the downloaded file. Large files can overwrite other files of the filesystem and cause the module to crash. Lost information might prevent the module to reboot, even after Device Reset to Factory State: AT+SQNSFACTORYRESET *(on page 484)* is attempted. Therefore **THIS COMMAND IS FOR DEBUG PURPOSES ONLY.**

Defined Values

remote_url

String type. URL of the remote file to download using TFTP/FTP/HTTP.

sync

Integer : 0 or 1. Download handling type.

Table 59. *sync*

Value	Description
0	Asynchronous: starts the download and returns immediately, reports download progress and result via the `+SQNFGETREPORT` URC. The command response indicates whether the download has been started successfully.
1	Synchronous. Return after the download has finished. (Default)

local_filename

String. File name to store the data into. If the <*local_filename*> is specified, the command saves the data as <*local_filename*> on to the device's file system. If the <*local_filename*> parameter is omitted, `AT+SQNFGET` switches the AT channel to data mode and outputs the downloaded binary octet stream to the host. In this case, the host handles error handling.

DANGER: This string **MUST NOT** be more than 64 bytes long, lest a fatal corruption of the file system occur which leads to an unrecoverable crash.

Note: If <*local_filename*> is not specified and <*sync*> is 0, then the received data is accumulated in 2524-byte internal buffers, that must be read using the Read Asynchronously Received data: AT+SQNFGETDATA *(on page 143)* command until the `+SQNFGETREPORT: "complete"` URC is received. If <*local_filename*> is not specified and <*sync*> is 0, every answer from the server triggers a `+SQNFGETRING` URC (see below).

spId

Integer in range 0..6: Security profile identifier (see SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)*) for secured file download.

Download Status URC: +SQNFGETREPORT

A URC is used to notify the host on current status of asynchronous mode.

Command	Possible Response(s)
URC	+SQNFGETREPORT:<*status*>

The possible values of <*status*> are listed below:

status

String. File download status:

Table 60. *status*

Value	Description
"started"	Request sent to server.
"downloading"	Server started the transfer
"downloaded"	Download completed successfully
"complete"	Download completed and read from a buffer (or saved to a file)
"error"	An error occurred during the download

Download Size URC: +SQNFGETRING

A URC is used to notify the host about the size of the requested URI in asynchronous mode.

Command	Possible Response(s)
URC	+SQNFGETRING:<*size*>

The possible values of <*size*> are listed below:

size

Integer. Size, in bytes, communicated by the server after the prior AT+SQNFGET request.

Example

```
AT+SQNFGET
+CME ERROR: Incorrect parameters
AT+SQNFGET=?
+SQNFGET=<remote_url>[,[(0-1)][,<local_filename>]]
OK
AT+SQNFGET="http://www.example.com/index.html"
<!doctype html>
<html>
<head>
    <title>Example Domain</title>
[... output omitted partly ...]
</head>
<body>
<div>
    <h1>Example Domain</h1>
    <p>This domain is established to be used for illustrative examples in documents.
    You may use this domain in examples without prior coordination or asking for permission.</p>
    <p><a href="http://www.iana.org/domains/example">More information...</a></p>
</div>
</body>
</html>
OK
AT+SQNFGET="tftp://example.com/index.html",1,"index.html"
OK
AT+SQNFGET="ftp://example.com/index.html",0,"index.html"
```

```
OK
+SQNFGETREPORT: "started"
+SQNFGETREPORT: "downloading"
+SQNFGETREPORT: "complete"
AT+SQNFGET?
+SQNFGET: "complete"
OK
```

File Upload: AT+SQNFPUT

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Prior call to HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)*
Time-out	Parametrable
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNFPUT=<*prof_id*>,<*command*>,<*resource*>,<*filename*> [,[<*post_param*>][,[<*extra_header_line*>][,[<*disconnect*>] [,<*max_to_sec*>]]]]	OK ERROR +CME ERROR:<*err*>
AT+SQNFPUT=?	+SQNFPUT:(0-2),(0-2),(1000),(256) [,[(1000)][,[(1500)][,[(0-1)] [,(0-65535)]]]] OK

Description

This command performs a HTTP POST or PUT request and attempts to send the contents of the file <*filename*> located in the module file system to the server.

Secure HTTP connections using a private key stored in a Hosted Cryptographic Engine (see SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* and HCE storage mode) require an asynchronous HTTP connection creation with HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)* before calling this command. If the connection is not already opened, ERROR is returned.

The command automatically opens unsecured connections, or connections secured without HCE usage, then proceeds with the HTTP data session.

The command returns OK. The +SQNHTTPRING:<prof_id>,<http_status_code>,<content_type>,<data_size> URC (when supported) is emitted when the HTTP response code, content type and size are available. See HTTP Response URC: +SQNHTTPRING *(on page 139)* for details.

The test command returns the range of supported values/lengths for all the parameters.

When an answer from the remote HTTP server is received, the +SQNHTTPRING URC is emitted.

If the <*disconnect*> parameter is set, the data session is automatically released on completion.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

prof_id

Integer: 0..2. HTTP configuration profile identifier.

command

Integer: 0 or 2. HTTP request type.

Table 61. *command*

Value	Description
0	POST
1	PUT
2	FTP_UPLOAD

resource

String. URI to send the data to. Maximum 1000 bytes.

filename

String. Name of the file to send. Maximum 256 bytes.

post_param

String. HTTP Content-Type identifier. Used only for POST requests, optionally followed by colon character (:) and a string <*extension*> that extends the identifier with sub-types. Other content–free strings corresponding to other content type and possible sub-types.

Table 62. *post_param*

Value	Description
0	application/x-www-form-urlencoded
1	text/plain
2	application/octet-stream
3	multipart/form-data
4	application/json

Notes:

For example, if <*post_param*> is set to "1:charset=us-ascii", then the request will contain a "Content-type: text/plain; charset=us-ascii" header line.

extra_header_line

String (max length 1500 characters). Optional HTTP header line.

max_to_sec

Integer: 1..65535. Maximum data transfer time-out in seconds. This is the maximum time in seconds allowed for the HTTP(S) connection establishment/completion (if needed) and the data transfer. This time-out prevents the host MCU from hanging indefinitely due to a slow network or a cellular connection dropped during operation. This timer shall be set according to the expected network performance to avoid aborting normal operations. The time-out value must be greater than the connection time-out value configured in HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)* <*cnx_to_sec*> parameter), otherwise the command returns a configuration `ERROR`. If not provided, the time-out value defined in the HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)* <*max_to_sec*> parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/disconnection

Table 63. *disconnect*

Value	Description
0	The connection remains open after completion.
1 (default)	The connection is closed after the HTTP transaction completes.

HTTP Configure: AT+SQNHTTPCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot persistent

Syntax

Command	Possible Response(s)
AT+SQNHTTPCFG=<*prof_id*> [,<*server_address*>] [,<*server_port*>] [,<*auth_type*>] [,<*username*>] [,<*password*>] [,<*ssl_enabled*>] [,<*max_to_sec*>] [,<*cid*>] [,<*spId*>,] [,<*cnx_to_sec*>,] [,<*inactivity_to*>]]]]]]]]]	+CME ERROR:<*err*> OK
AT+SQNHTTPCFG?	+SQNHTTPCFG:<prof_id1>,<server_address1>, <server_port1>,<auth_type1>,<username1>,<password1>, <ssl_enabled1>,<max_to_sec1>,<cid1>,<spId1>, <cnx_to_sec1>,<inactivity_to1> … +SQNHTTPCFG:<prof_idN>,<server_addressN>, <server_portN>,<auth_typeN>,<usernameN>,<passwordN>, <ssl_enabledN>,<max_to_secN>,<cidN>,<spIdN>, <cnx_to_secN>,<inactivity_toN> OK
AT+SQNHTTPCFG=?	+SQNHTTPCFG: (0-2)[,(1500)[,[(0-65535),[(0-1),[(100), [(100),[(0-1),[(0-65535),[(1-8),[(1-6),(1-120), (1-120)]]]]]]]]] OK

Description

This command sets the parameters needed to establish the HTTP connection. The configuration is persistent (survives device reboots and whatever modem power states) and changes are applied at the next HTTP session (HTTP Send: AT+SQNHTTPSND *(on page 140)*, HTTP Query: AT+SQNHTTPQRY *(on page 134)*).

The special form AT+SQNHTTPCFG=<prof_id> causes the values for the profile number <*prof_id*> to be reset to their default values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The read command returns the current settings for each defined profile.

The test command returns the range of supported values/lengths for all the parameters.

Note: A special form of the set command, `AT+SQNHTTPCFG=<prof_id>`, resets the profile number *<prof_id>* to default values.

`AT+SQNHTTPCFG` parameters are saved to NVM. They survive reboots.

Defined Values

prof_id

Integer: 0, 1 or 2. HTTP configuration profile identifier.

server_address

String (max: 1500 bytes). IP address of the HTTP server.

This parameter can be either:

- Any valid IP address (xx.xx.xx.xx);
- Any valid host name.

Default is "".

server_port

Integer: 0..65535. Remote TCP port number to connect to.

Default values are `80` for the first, second and third profiles.

auth_type

Integer: 0 or 1. HTTP authentication type.

Table 64. *auth_type*

Value	Description
0	(Default) No authentication
1	Basic authentication

username

String. Authentication user name for HTTP. Empty by default.

password

String. Authentication password for HTTP. Empty by default.

ssl_enabled

Integer: 0 or 1. SSL encryption status.

Table 65. *ssl_enabled*

Value	Description
0	(Default) SSL encryption disabled
1	SSL encryption enabled

max_to_sec

Integer: 0..65535. Maximum data transfer time-out in seconds. This is the maximum time in seconds allowed for the HTTP(S) connection establishment/completion (if needed) and the data transfer. This time-out prevents the host MCU from hanging indefinitely due to a slow network or a cellular connection dropped during operation. This timer shall be set according to the expected network performance to avoid aborting normal operations. The special value 0 disables the time-out.

This time-out starts with the AT command call and stops when the operation requested by the AT command has completed. This includes waiting for LTE connectivity, DNS lookup and TCP+(TLS)+HTTP session establishment (HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)*). In the case of HTTP Send: AT+SQNHTTPSND *(on page 140)*/HTTP Query: AT +SQNHTTPQRY *(on page 134)*, the HTTP connection (if needed) and the data transfer. This time-out value must be greater than <*cnx_to_sec*> value, or the AT command reports a configuration ERROR. Default time-out is 0 (no time-out).

cnx_to_sec

Integer: 1..120. Maximum time in seconds to wait for the HTTP server response. The time-out starts with the execution of the AT command (HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)*/HTTP Send: AT+SQNHTTPSND *(on page 140)*/HTTP Query: AT+SQNHTTPQRY *(on page 134)*) and stops when the response is received, taking into account any LTE latencies and DNS query overhead. If the connection has not been made when the time-out expires, the command returns ERROR. This time-out value must be less than <*max_to_sec*> or the command reports a configuration error. The default value is 60.

cid

Integer: 1..8. PDN Context Identifier. Default value is the PDN of the current operator.

spId

Integer: 1..6. Security Profile identifier to be used for HTTPS request if <*ssl_enabled*>=1. Default: 1.

inactivity_to

Integer: 0 or 7..120. If this parameter is not zero, it defines the longest permitted reduced throughput (< 1 Bps) period. If the throughput falls under the threshold and doesn't improve within this grace period, the modem kills the connection.

HTTP Connection Close: AT+SQNHTTPDISCONNECT

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNHTTPDISCONNECT=<*prof_id*>	OK ERROR
AT+SQNHTTPDISCONNECT=?	+SQNHTTPDISCONNECT:(0-2) OK
URC	+SQNHTTPDISCONNECT: <*prof_id*>

Description

This command closes a HTTP connection previously opened with the HTTP Connection Open: AT +SQNHTTPCONNECT *(on page 132)* command.

Since the HTTP disconnection is asynchronous, the AT+SQNHTTPDISCONNECT command returns immediately. Once the connection is closed, the +SQNHTTPDISCONNECT notification is issued.

Notes:

- Passing an invalid HTTP profile ID returns ERROR.
- If the connection is inactive, the command does nothing and returns OK.
- If the connection is being set up or a HTTP transaction is in progress, it is aborted.
- If the connection has already been closed, the command discards the request and returns OK.
- The +SQNHTTPDISCONNECT notification is only issued in response to an AT+SQNHTTPDISCONNECT command if the operation successes.

Defined Values

prof_id

Integer: 0, 1 or 2. HTTP profile identifier.

HTTP Connection Closing URC: +SQNHTTPSH

Syntax

Command	Possible Response(s)
	+SQNHTTPSH:<*prof_id*>,<*rc*>

Description

This URC is shown when the connection with the HTTP server is unexpectedly closed.

Defined Values

prof_id

Integer: 0..2. HTTP profile identifier

rc

A CURL error code. CURL error codes are available on the CURL public website.

HTTP Connection Open: AT+SQNHTTPCONNECT

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Prior call to HTTP Configure: AT+SQNHTTPCFG *(on page 127)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNHTTPCONNECT=<*prof_id*>	OK ERROR +CME ERROR:<*err*>
AT+SQNHTTPCONNECT=?	+SQNHTTPCONNECT:(0-2) OK
URC	+SQNHTTPCONNECT:<*prof_id*>,<*rc*>

Description

This command initiates a new HTTP connection previously configured using the HTTP Configure: AT +SQNHTTPCFG *(on page 127)* command.

Since the HTTP connection is **asynchronous**, the AT+SQNHTTPCONNECT command returns immediately. Once the connection is established the +SQNHTTPCONNECT notification is issued, reporting the connection result code <*rc*>. The MCU can decide to initiate data communication or to retry in case of failure.

After the HTTP connection is established, the MCU can send one or more POST, PUT, GET, HEAD or DELETE request(s) to HTTP server using HTTP Send: AT+SQNHTTPSND *(on page 140)*, File Upload: AT+SQNFPUT *(on page 124)* or AT+SQNHTTPQRY *(on page 134)* commands.

For secure HTTP connections using a private key stored in a Hosted Cryptographic Engine (see SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* and HCE storage mode), an asynchronous HTTP connection creation with AT+SQNHTTPCONNECT is mandatory before attempting any HTTP send and/or query commands. With unsecured connections or secure connections that do not use the HCE, AT+SQNHTTPSND *(on page 140)*, AT +SQNFPUT *(on page 124)* and HTTP Query: AT+SQNHTTPQRY *(on page 134)* automatically start the connection if it has not been established before.

Notes:

- Requesting a new HTTP connection while another HTTP connection is already active or being set up fails.
- The HTTP connection setup can take several seconds (DNS resolution, TCP connection, TLS connection, etc.), delaying the presentation of the +SQNHTTPCONNECT notification.
- The +SQNHTTPCONNECT notification is only issued if the HTTP connection setup has been requested with an AT+SQNHTTPCONNECT command.
- Some HTTP servers do not allow Keep-Alive connections (because it can lead to TCP flood attacks) and close the session after a few seconds of inactivity. If an asynchronous connection is used, the MCU shall

begin the data session as soon as possible after the +SQNHTTPCONNECT notification has been received to avoid a possible early connection loss. If the HCE is not used and the HTTP server applies very short connection time-outs, the MCU should use HTTP Send: AT+SQNHTTPSND *(on page 140)*, File Upload: AT+SQNFPUT *(on page 124)* and HTTP Query: AT+SQNHTTPQRY *(on page 134)*, which create the connection and immediately proceed with the HTTP data transfer.

Test command returns values supported as a compound value.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

rc

Integer. HTTP connection setup result code (list can be completed)

Table 66. *rc*

Value	Description
0	connection success
Other	A CURL error code (refer to CURL documentation)

HTTP Query: AT+SQNHTTPQRY

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Prior call to HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNHTTPQRY=*<prof_id>*,*<command>*,*<resource>* [,[*<extra_header_line>*][,[*<disconnect>*] [,*<max_to_sec>*]]]	+CME ERROR:*<err>*
AT+SQNHTTPQRY=?	+SQNHTTPQRY:(0-2),(0-2),1000[,[1500] [,[(0-1)][,(0-65535)]]] OK

Description

This command performs HTTP GET, HEAD or DELETE requests to the server.

Notes:

- Secure HTTP connections using a private key stored in a Hosted Cryptographic Engine (see AT+SQNSPCFG *(on page 159)* and HCE storage mode) require an asynchronous HTTP connection creation with HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)* before calling this command. If the connection is not already opened, ERROR is returned.
- The command automatically opens unsecured connections, or connections secured without HCE usage, then proceeds with the HTTP data session.
- OK is returned immediately if radio network connectivity is up, else ERROR. Then the HTTP Response URC: +SQNHTTPRING *(on page 139)* URC is emitted asynchronously with the HTTP response code, content type and size (see HTTP Response URC: +SQNHTTPRING *(on page 139)* URC description for details) as soon as the HTTP response header is received.
- After the HTTP data session is complete, the modem drops the HTTP connection automatically if the *<disconnect>* parameter is set.
- Requesting a new HTTP data session while another HTTP connection is already active or in progress returns ERROR.
- The HTTP request header contains the 'Connection: close' line if the *<disconnect>* flag is set.
- If the HTTP connection fails before the reception of the HTTP response, (HTTP request transmission error, HTTP time-out, etc.), the command returns ERROR. In such a case, the +SQNHTTPRING *(on page 139)* URC is also issued with a *<http_status_code>* value of 0 (special return code). Additionally, the +SQNHTTPSH URC is sent to notify of an unexpected HTTP connection failure.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

The test command returns the range of supported values/lengths for all the parameters.

Defined Values

prof_id

Integer: 0, 1 or 2. HTTP profile configuration identifier.

command

Integer: 0, 1 or 2. Command requested to HTTP server.

Table 67. *command*

Value	Description
0	GET
1	HEAD
2	DELETE

resource

String. HTTP resource (URI), object of the request. Maximum 1000 bytes.

extra_header_line

String. Optional HTTP header line. Maximum 1500 bytes.

max_to_sec

Integer: 1..65535. Maximum data transfer time-out in seconds. This is the maximum time in seconds allowed for the HTTP(S) connection establishment/completion (if needed) and the data transfer. This time-out prevents the host MCU from hanging indefinitely due to a slow network or a cellular connection dropped during operation. This timer shall be set according to the expected network performance to avoid aborting normal operations. The time-out value must be greater than the connection time-out value configured in HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)* <*cnx_to_sec*> parameter), otherwise the command returns a configuration `ERROR`. If not provided, the time-out value defined in the HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)* <*max_to_sec*> parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/disconnection

Table 68. *disconnect*

Value	Description
0	Connection remains open after the HTTP request completion
1 (default)	Connection is closed at the end of the HTTP request

HTTP Receive: AT+SQNHTTPRCV

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNHTTPRCV=<*prof_id*>[,<*max_bytes*>]	OK ERROR +CME ERROR:<*err*>
AT+SQNHTTPRCV=?	+SQNHTTPRCV:(0-2)[,(0,64-1500)] OK

Description

This command reads the HTTP response content data received with the last HTTP response (the HTTP response reception advertised by the HTTP Response URC: +SQNHTTPRING *(on page 139)* notification, see HTTP Response URC: +SQNHTTPRING *(on page 139)*).

Important: This command is synchronous. HTTP Connection Close: AT+SQNHTTPDISCONNECT *(on page 130)* cannot be used to abort it.

After the command is sent to the modem, the host receives a three chevron sequence <<< (<*less_than*><*less_than*><*less_than*> (IRA 60, 60, 60)) followed by the data. If the reading ends successfully, the response is OK; otherwise an error code is reported.

If no data are pending for the specified HTTP connection (because the HTTP transaction is complete and all received bytes have already been read, or the HTTP response has not yet arrived), the command returns ERROR.

Because the HTTP response may not have been entirely received when the HTTP Response URC: +SQNHTTPRING *(on page 139)* URC is emitted, the command grabs the AT interface until the requested number of bytes to read (<*max_bytes*>) is received, the HTTP response message reception is complete or a HTTP error (time-out, connection unexpected dropped, etc.) happens. In this case of a HTTP transaction error, the command returns ERROR.

If the application's reception buffer is small, it is possible to chain several calls to AT+SQNHTTPRCV with an acceptable <*max_bytes*> value until the entire HTTP response body is transferred (total received bytes equal to the HTTP Response URC: +SQNHTTPRING *(on page 139)* <*data_size*> parameter) or ERROR is received.

Note: The response is buffered in the modem volatile memory until it is read. Buffer size is 2524 bytes.

Note: Buffered data are lost if the modem enters deep sleep.

Note: Buffered data are flushed when a new HTTP transaction begins.

If a large HTTP response is expected and the MCU is unable to read the already received bytes fast enough, the HTTP client suspends the HTTP response reception, and resumes it after the buffer has been read. To avoid unexpected HTTP session termination during the on-hold period, the maximum data transfer time-out must be set to a value that takes into account the estimated network speed, the expected HTTP message sizes and the MCU processing capability (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)*/HTTP Send: AT+SQNHTTPSND *(on page 140)*/QRY *(on page 134)* <*max_to_sec*> parameter).

Note: When reading large packets, hardware flow control should be used to minimise the risk of data loss.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Test command returns values supported as a compound value.

Defined Values

prof_id

Integer: 0, 1 or 2. Numeric parameter indicating the profile identifier.

max_bytes

Integer: 0 or 64..1500. Max number of bytes to read at a time. The default, 0, means no limit.

Note: If <*max_byte*> is unspecified, the server data is transferred in one go. If the data are not present or if the HTTP Response URC: +SQNHTTPRING *(on page 139)* <*http_status_code*> parameter is 0, an error code is reported.

Note: If the specified <*max_byte*> value is less than the <*data_size*> parameter provided in the HTTP Response URC: HTTP Response URC: +SQNHTTPRING *(on page 139)*, then the host application has to use the `AT+SQNHTTPRCV` command multiple times to read all the data

Note: To ensure optimal system performance, the `AT+SQNHTTPRCV` command must be sent soon after the HTTP Response URC: +SQNHTTPRING *(on page 139)* URC is received.

http_status_code

Integer. Status code, as received from the server (see RFC 2616).

Examples

- Setting `www.w3.org` as remote server.

```
AT+SQNHTTPCFG=1,"www.w3.org"
OK
```

- Perform HTTP GET request to "/Summary.html" page.

```
AT+SQNHTTPQRY=1,0,"/Summary.html"
OK
```

- The HTTP Response URC: +SQNHTTPRING *(on page 139)* URC is received. The status code is 200 (OK), the content type has an extension and the content-length is 5223 bytes.

```
+SQNHTTPRING: 1,200,"text/html; charset=iso-8859-1",5223
```

- Perform a size-unlimited reading of the server's response.

```
AT+SQNHTTPRCV=1
<<<<HTML>
<HEAD>
... output omitted ...
</ADDRESS></BODY>
</HTML>
OK
```

HTTP Response URC: +SQNHTTPRING

Syntax

Command	Possible Response(s)
URC	`+SQNHTTPRING:`*<prof_id>,<http_status_code>,<content_type>,<data_size>*

Description

This URC is emitted when:

- An answer from a HTTP server is received.
- A HTTP response has timed-out (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)* *<max_to_sec>* timeout parameter).

In the former case, the URC contains the HTTP response code, the content type and size. HTTP Receive: AT +SQNHTTPRCV *(on page 136)* retrieves the HTTP response data. Buffer size is 2524 bytes.

In the latter case, the *<http_status_code>* value is set to 0 (special return code).

Note: The HTTP response may not have been completely received when the `+SQNHTTPRING` URC presentation time. Consequently, the HTTP Receive: AT+SQNHTTPRCV *(on page 136)* command blocks the AT interface until the requested number of bytes is received, the HTTP response message reception is complete or an HTTP error (timeout, connection unexpected closure, etc.) is reported.

Defined Values

prof_id

Integer: 0, 1 or 2. HTTP profile identifier.

http_status_code

0: the HTTP request timed out.

3-digit Integer: The HTTP status code received from the server.

content_type

String: The `“Content-Type”` header line received from the server.

data_size

String: The `"Content-Length:"` header line received from the server.

HTTP Send: AT+SQNHTTPSND

Syntax

Command	Possible Response(s)
AT+SQNHTTPSND=<*prof_id*>,<*command*>,<*resource*>,<*data_len*>[,[<*post_param*>][,[<*extra_header_line*>][,[<*disconnect*>][,<*max_to_sec*>]]]]	>>> +CME ERROR:<*err*>
AT+SQNHTTPSND=?	+SQNHTTPSND: (0-2),(0-1),(1000),(0-16777215)[,[(1000)][,[(1500)][,[(0-1)][,(0-65535)]]]] OK

Description

This command performs a POST or PUT request to a HTTP server and sends it the data. The device must wait for the three chevron sequence >>> (<*greater_than*><*greater_than*><*greater_than*> (IRA 62, 62, 62)) before <*data_len*> bytes of data can be entered.

Secure HTTP connections using a private key stored in a Hosted Cryptographic Engine (see SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* and HCE storage mode) require an asynchronous HTTP connection creation with HTTP Connection Open: AT+SQNHTTPCONNECT *(on page 132)* before calling this command. If the connection is not already opened, ERROR is returned.

The command automatically opens unsecured connections, or connections secured without HCE usage, then proceeds with the HTTP data session.

When the HTTP response header is received, the HTTP Response URC: +SQNHTTPRING *(on page 139)* URC (when supported) is emitted on the serial port. See HTTP Response URC: +SQNHTTPRING *(on page 139)* for details.

Notes:

- Requesting a new HTTP data session while another HTTP connection is already active or in progress returns ERROR.
- The HTTP request header contains the 'Connection: close' line if the <*disconnect*> flag is set.
- If the HTTP connection fails before the reception of the HTTP response, (HTTP request transmission error, HTTP time-out, etc.), the command returns ERROR. In such a case, the +SQNHTTPRING *(on page 139)* URC is also issued with a <*http_status_code*> value of 0 (special return code). Additionally, the +SQNHTTPSH URC is sent to notify of an unexpected HTTP connection failure.
- The command returns before prompting for data ('>>>') if it detects a HTTP error while establishing the transport layer (TCP+TLS) connection (including a DNS lookup).

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The test command returns the values supported as a compound value.

Defined Values

prof_id

Integer: 0, 1 or 2. HTTP configuration profile identifier.

command

Integer: 0 or 1. Command sent to the HTTP server:

Table 69. *command*

Value	Description
0	POST
1	PUT

resource

String. HTTP resource (URI), object of the request. Maximum size 1000 bytes.

data_len

24-bit integer: 0..16777215. Length of input data in bytes.

Important: Reliable data input is possible only when hardware flow control is enabled. If not, some data are likely to be dropped, leading to a corrupted input. As a result, the AT command may hang waiting for additional data while the application has finished sending them.

post_param

String. HTTP Content-Type identifier. Maximum 1000 bytes.

Used only in POST commands, optionally followed by a colon character (:) and a string *<extension>* that extends the identifier with sub-types. Other content–free string corresponding to other content type and possible sub-types.

Table 70. *post_param*

Value	Description
0[:extension]	"application/x-www-form-urlencoded" with optional extension
1[:extension]	"text/plain" with optional extension
2[:extension]	"application/octet-stream" with optional extension
3[:extension]	"multipart/form-data" with optional extension
4	"application/json"

extra_header_line

String. Optional HTTP header line. Maximum 1500 bytes.

max_to_sec

Integer: 1..65535. Maximum data transfer time-out in seconds. This is the maximum time in seconds allowed for the HTTP(S) connection establishment/completion (if needed) and the data transfer. This time-out prevents the host MCU from hanging indefinitely due to a slow network or a cellular connection dropped during operation. This timer shall be set according to the expected network performance to avoid aborting normal operations. The time-out value must be greater than the connection time-out value configured in HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)* *<cnx_to_sec>* parameter), otherwise the command returns a configuration ERROR. If not provided, the time-out value defined in the HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG *(on page 127)* *<max_to_sec>* parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/disconnection

Table 71. *disconnect*

Value	Description
0	Connection remains open after completion of the transaction
1 (default)	Immediate disconnection after the HTTP transaction ends

Read Asynchronously Received data: AT+SQNFGETDATA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to File Download: AT+SQNFGET *(on page 120)*
Time-out	Depends on data length
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNFGETDATA=<*max_bytes*>	OK +CME ERROR:<*err*>
AT+SQNFGETDATA=?	+SQNFGETDATA:[<*max_bytes*>] OK

Description

This command dumps the internal buffer where the file received after an File Download: AT+SQNFGET *(on page 120)* command in asynchronous mode with no <*local_filename*> specified has been stored.

The buffer is dumped by chunks of adjustable size. Each chunk begins where the previous one left off.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

max_bytes

Integer: either 0 or 64..1500: number of bytes to read at a time. The actual number of bytes transmitted may be less than asked for if EOF is reached.

Table 72. *max_bytes*

Value	Description
0	Read all the buffer. (Default)
64..1500	Read the specified quantity of bytes.

Example

```
AT+SQNFGET="tftp://example.com/index.html",0
OK
+SQNFGETREPORT: "started"
AT+SQNFGETDATA=64
+CME ERROR: Operation temporary not allowed
+SQNFGETRING: 120
+SQNFGETREPORT: "downloading"
AT+SQNFGETDATA=64
[... output omitted ...]
OK
AT+SQNFGETDATA=129
```

```
[... output omitted ...]
OK
AT+SQNFGETDATA=1501
+CME ERROR: Incorrect parameters
AT+SQNFGETDATA
[... output omitted ...]
OK
+SQNFGETREPORT: "complete"
AT+SQNFGETDATA?
+CME ERROR: operation not supported
AT+SQNFGETDATA=?
+SQNFGETDATA:[(0,64-1500)]
OK
```

MQTT Related Commands

Client Disconnect: AT+SQNSMQTTDISCONNECT

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Prior call to Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)*
Time-out	Depends on network
Persistency	N/A

Syntax

Command	Possible Response(s)
`AT+SQNSMQTTDISCONNECT=`*<id>*	`OK` `ERROR`
`AT+SQNSMQTTDISCONNECT=?`	`+SQNSMQTTDISCONNECT:`*<id>*
URC	`+SQNSMQTTDISCONNECT:`*<id>*,*<rc>*

Description

This command disconnects from a broker. Connection must have been previously initiated with the Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)* command.

Note: This command initiates the disconnection.

The URC `+SQNSMQTTONDISCONNECT:<id>,<rc>` notifies about the release of the MQTT connection of client with *<id>*.

<rc> provides the disconnection reason: `0` if disconnection was initiated by user, otherwise an error occurred during the connection.

Defined Values

id

Integer: 0. The id of MQTT client.

Note: The only supported value is 0 (only one client is supported).

rc

Integer: Disconnection return code.

Table 73. *rc*

Value	Description
0	SQNSMQTT_ERR_SUCCESS

Table 73. *rc* (continued)

Value	Description
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVAL
-4	SQNSMQTT_ERR_NO_CONN
-5	SQNSMQTT_ERR_CONN_REFUSED
-6	SQNSMQTT_ERR_NOT_FOUND
-7	SQNSMQTT_ERR_CONN_LOST
-8	SQNSMQTT_ERR_TLS
-9	SQNSMQTT_ERR_PAYLOAD_SIZE
-10	SQNSMQTT_ERR_NOT_SUPPORTED
-11	SQNSMQTT_ERR_AUTH
-12	SQNSMQTT_ERR_ACL_DENIED
-13	SQNSMQTT_ERR_UNKNOWN
-14	SQNSMQTT_ERR_ERRNO
-15	SQNSMQTT_ERR_EAI
-16	SQNSMQTT_ERR_PROXY
-17	SQNSMQTT_ERR_UNAVAILABLE

Initiate a Client Configuration: AT+SQNSMQTTCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not reboot persistent

Syntax

Command	Possible Response(s)
AT+SQNSMQTTCFG=<*id*>,<*client_id*>[,*username*][,*password*][,*sp_id*]	OK ERROR
AT+SQNSMQTTCFG=?	+SQNSMQTTCFG:<*id*>,<*client_id*>[,*username*] [,*password*] [,*sp_id*]

Description

This command configure the MQTT stack with the client id, user name and password (if required) for the remote broker, and the CA certificate name to use for server authentication.

Note: This command should be executed before any other AT+SQNSMQTT series command.

Defined Values

id

Integer: 0

Note: The only supported value is 0 (only one client is supported).

client_id

String: the unique client id string used when connecting to the broker.

CAUTION: String must not be empty.

user name

String: user name for broker authentication.

password

String: password for broker authentication.

sp_id

Integer: the index of the secure profile previously set with the SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* command.

Important: If not specified, the modem does not establish a secure connection.

Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Prior call to Initiate a Client Configuration: AT+SQNSMQTTCFG *(on page 147)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
`AT+SQNSMQTTCONNECT=`*<id>,<host>[,port][,keepalive]*	`OK` `ERROR`
`AT+SQNSMQTTCONNECT=?`	`+SQNSMQTTCONNECT:`*<id>,<host>[,port][,keepalive]*
URC	`+SQNSMQTTONCONNECT:`*<id>,<rc>*

Description

This command is used to create new client connection to an external bridge or a broker.

Note: This command only initiates a new connection to the MQTT broker.

The URC `+SQNSMQTTONCONNECT<id>,<rc>` notifies that the connection for the client with *<id>* has completed.

<rc> is `0` if the connection was successful, or an error occurred and connection was not established. See more values below.

Note: As DNS queries can take up to 120 seconds, and some might already be pending, it can take up to several DNS max. resolve time for the URC to be sent.

Note: If the MQTT connection was dropped by the server and automatically resumed by the modem, the latter sends a `+SQNSMQTTONCONNECT:0,0` URC to the host CPU. If the MCU had subscribed to the reception of MQTT messages from the server, the MCU must re-subscribe to carry on receiving MQTT messages.

Defined Values

id

Integer: 0

Note: The only supported value is 0 (only one client is supported).

host

String: Bridge or broker host name or IP address.

port

Integer: Port for TLS connection. Port 8883 is used by default if a TLS certificate is provided, otherwise port 1883 is used for non-TLS connection.

keepalive

Integer: Maximum period (in seconds) allowed between communications with the broker.

If no other messages are being exchanged, this parameter controls the rate at which the client sends ping messages to the broker. Default value is 60 seconds.

rc

Integer: Return code of the URC `+SQNSMQTTONCONNECT`.

Table 74. *rc*

Value	Description
0	SQNSMQTT_ERR_SUCCESS
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVAL
-4	SQNSMQTT_ERR_NO_CONN
-5	SQNSMQTT_ERR_CONN_REFUSED
-6	SQNSMQTT_ERR_NOT_FOUND
-7	SQNSMQTT_ERR_CONN_LOST
-8	SQNSMQTT_ERR_TLS
-9	SQNSMQTT_ERR_PAYLOAD_SIZE
-10	SQNSMQTT_ERR_NOT_SUPPORTED
-11	SQNSMQTT_ERR_AUTH
-12	SQNSMQTT_ERR_ACL_DENIED
-13	SQNSMQTT_ERR_UNKNOWN
-14	SQNSMQTT_ERR_ERRNO
-15	SQNSMQTT_ERR_EAI
-16	SQNSMQTT_ERR_PROXY
-17	SQNSMQTT_ERR_UNAVAILABLE

Publish to a Topic: AT+SQNSMQTTPUBLISH

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Prior call to Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)

`AT+SQNSMQTTPUBLISH=`*<id>,<topic>[,qos]*
,<length><S3><payload>
	(prompt to payload)`+SQNSMQTTPUBLISH:`*<pmid>*
	`OK`
	`ERROR`

`AT+SQNSMQTTPUBLISH=?`	`+SQNSMQTTPUBLISH:`*<id>,<topic>[,qos]* *,<length><S3><S4><payload>*
URC	`+SQNSMQTTONPUBLISH:`*<id>,<pmid>,<rc>*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command is used to publish a payload into a topic on to a broker host. It starts the publishing operation.

The *<payload>* is provided as binary data of *<length>* bytes. The behaviour is similar to the Write Data in NVM: AT+SQNSNVW *(on page 71)* command.

Important: The connection must have been established with the `+SQNSMQTTCONNECT` command. The command must be used after reception of the `+SQNSMQTTONCONNECT` URC with *<rc>=0*.

The `+SQNSMQTTONPUBLISH:<id>,<pmid>,<rc>` URC notifies that the publishing operation asked by client *<id>* is done.

<pmid> provides the publishing message id. *<rc>* provides the publishing result code: `0` if success, otherwise an error code, in which case the message is not published.

Defined Values

id

Integer: 0. The id of MQTT client.

Note: The only supported value is 0 (only one client is supported).

topic

String. The topic the client wants to subscribe to.

qos

Integer: 0, 1 or 2. The quality of service level to request for the subscription.

Table 75. *qos*

Value	Description
0	At most once (default value)
1	At least once
2	Exactly once

length

Integer: 1..65535: Indicates the amount of bytes to publish.

payload

String. the actual multi-line message to send.

pmid

Integer: 0..65535. Publishing message ID. The message ID after 65535 winds back to 0. This ID is local to the modem.

rc

Integer: Publishing return code.

Table 76. *rc*

Value	Description
0	SQNSMQTT_ERR_SUCCESS
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVAL
-4	SQNSMQTT_ERR_NO_CONN
-5	SQNSMQTT_ERR_CONN_REFUSED
-6	SQNSMQTT_ERR_NOT_FOUND
-7	SQNSMQTT_ERR_CONN_LOST
-8	SQNSMQTT_ERR_TLS
-9	SQNSMQTT_ERR_PAYLOAD_SIZE
-10	SQNSMQTT_ERR_NOT_SUPPORTED
-11	SQNSMQTT_ERR_AUTH
-12	SQNSMQTT_ERR_ACL_DENIED
-13	SQNSMQTT_ERR_UNKNOWN
-14	SQNSMQTT_ERR_ERRNO
-15	SQNSMQTT_ERR_EAI
-16	SQNSMQTT_ERR_PROXY
-17	SQNSMQTT_ERR_UNAVAILABLE

Example

```
AT+SQNSMQTTPUBLISH=?
+SQNSMQTTPUBLISH:(0),<topic>[,(0-2)],(1-65535)<S3><S4><payload>
OK
AT+SQNSMQTTPUBLISH=0,"sqn/test",,5
> Test message 1
+SQNSMQTTPUBLISH:2
OK
+SQNSMQTTONPUBLISH:0,2,0
```

Receive a Message: AT+SQNSMQTTRCVMESSAGE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSMQTTRCVMESSAGE=*id,topic[,mid][,max_length]*	OK ERROR
AT+SQNSMQTTRCVMESSAGE=?	+SQNSMQTTRCVMESSAGE:*<id>,<topic>[,<mid>][,<max_length>]*
URC	+SQNSMQTTONMESSAGE:*<id>,<topic>,<msg_length>,<qos>[,<mid>]*

Description

This command delivers a message selected by its id or the last received message if *<qos>=0*. The device must have been connected using the Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)* command.

Note: This command should be used after reception of the URC `+SQNSMQTTONMESSAGE:<id>,<topic>,<msg_length>,<qos>,<mid>`

The `+SQNSMQTTONMESSAGE:<id>,<topic>,<msg_length>,<qos>,<mid>` URC notifies about a newly received message stored into the internal message cache of the client `<id>`.

Defined Values

id

Integer: 0. Id of MQTT client.

Note: The only supported value is 0 (only one client is supported).

topic

String: Topic name given in the `+SQNSMQTTONMESSAGE` URC (name of subscribed topic the message was published in).

mid

Integer: Id of the message to read. *<mid>* is generated by the broker.

A maximum of 100 messages are saved in the FIFO after `+SQNSMQTTONMESSAGE` is emitted. If the queue overflows, the URC `+SQNSMQTTMEMORYFULL` is sent and the oldest messages are lost.

A message with <*qos*>=*0* doesn't have a <*mid*>, as this type of message is overwritten every time a new message arrives. No <*mid*> value is to be given to read a message with <*qos*>=*0*.

max_length

Integer 1..4096 (default: 4096): Maximum length to read from the message. Currently only messages with payloads up to 4096 characters are supported.

qos

Integer: 0, 1 or 2. Quality of service level to request for the subscription.

Table 77. *qos*

Value	Description
0	At most once
1	At least once
2	Exactly once

msg_length

Integer: Size of the message payload.

Subscribe to a Topic: AT+SQNSMQTTSUBSCRIBE

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Prior call to Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
`AT+SQNSMQTTSUBSCRIBE=`*<id>,<topic>[,qos]*	`OK` `ERROR`
`AT+SQNSMQTTSUBSCRIBE=?`	`+SQNSMQTTSUBSCRIBE:`*<id>,<topic>[,qos]*
URC	`+SQNSMQTTONSUBSCRIBE:`*<id>,<topic>,<rc>*

Description

This command subscribes to a topic on a broker host previously contacted with Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)*. This command performs the actual subscription.

The `+SQNSMQTTONSUBSCRIBE:<id>,<topic>,<rc>` URC notifies that the subscription has completed for the client *<id>*.

<topic> provides the topic name. *<rc>* provides the subscription result code: 0 if success, otherwise an error occurred and the client's request has been rejected.

Note: This command must be used after the reception of the Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT *(on page 148)* URC with *<rc>*=0, confirming that the connection is established.

Defined Values

id

Integer: 0.

Note: The only supported value is 0 (only one client is supported).

topic

String. the topic that the client wants to subscribe to.

qos

Integer: 0, 1 or 2. Quality of service level requested for the subscription.

Table 78. *qos*

Value	Description
0	At most once
1	At least once
2	Exactly once

rc

Integer. Subscription return code.

Table 79. *rc*

Value	Description
0	SQNSMQTT_ERR_SUCCESS
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVAL
-4	SQNSMQTT_ERR_NO_CONN
-5	SQNSMQTT_ERR_CONN_REFUSED
-6	SQNSMQTT_ERR_NOT_FOUND
-7	SQNSMQTT_ERR_CONN_LOST
-8	SQNSMQTT_ERR_TLS
-9	SQNSMQTT_ERR_PAYLOAD_SIZE
-10	SQNSMQTT_ERR_NOT_SUPPORTED
-11	SQNSMQTT_ERR_AUTH
-12	SQNSMQTT_ERR_ACL_DENIED
-13	SQNSMQTT_ERR_UNKNOWN
-14	SQNSMQTT_ERR_ERRNO
-15	SQNSMQTT_ERR_EAI
-16	SQNSMQTT_ERR_PROXY
-17	SQNSMQTT_ERR_UNAVAILABLE

Security Related Commands

Hosted Crypto Engine Signature: AT+SQNHCESIGN

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSHCESIGN=<*ctxId*>,<*statusCode*> [,<*signatureLen*>,<*signatureData*>]	OK +CME ERROR:<*err*>
AT+SQNSHCESIGN=?	+SQNHCESIGN:<ctxId>,<statusCode> [,<signatureLen>,<signatureData>]<S3><S4>

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command is used to send back the HCE (Hardware Crypto Engine) computed signature to the modem.

Defined Values

ctxId

Integer. Signature context ID (token).

This token corresponds to the *ctxId* sent by the modem using an +SQNHCESIGN URC (see below).

statusCode

Integer. Signature process status code.

Table 80. *statusCode*

Value	Description
0	Success
1	Failure

signatureLen

Integer. Signature length in bytes.

signatureData

Data. Raw binary signature data in hexadecimal encoding (from 00 to FF). Format depends on signature algorithm.

- RSA signature: Big-endian unsigned integers in hexadecimal encoding without the '0x' prefix (For a 2048-bit RAS key, signature size is 2048÷8 = 256 bytes = 512 hex digits).
- ECDSA signature: Concatenated R and S pair presented as Big-endian unsigned integers in hexadecimal encoding without '0x'(128 hex digits total, or 64 bytes).

+SQNHCESIGN URC

Command	Possible Response(s)
	+SQNHCESIGN:<*ctxId*>,<*clientPrivateKeyId*>,<*msgLen*>,<*msgData*>

ctxId

Integer. Signature context ID.

ID generated by the module, to be used as a token for the response (see above).

clientPrivateKeyId

Integer. Private key ID. Identifies which private key ID to use on the HCE side.

msgLen

Integer. Message length in bytes.

msgData

Data. Raw binary message data in hexadecimal encoding (from 00 to FF) without the '0x' C-style prefix.

SSL/TLS Security Profile Configuration: AT+SQNSPCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	1 s
Persistency	Reboot Persistant

Syntax

Command	Possible Response(s)
AT+SQNSPCFG=<*spId*> [,<*version*>, [<*cipherSpecs*>, [<*certValidLevel*>, [<*caCertificateID*>, [<*clientCertificateID*>, [<*clientPrivateKeyID*>, [<*psk*>, [<*pskIdentity*>, [<*storageId*>, [<*resume*>, [<*lifetime*>]]]]]]]]]	+SQNSPCFG:<*spId*>, <*version*>, <*cipherSpecs*>, <*certValidLevel*>, <*caCertificateID*>, <*clientCertificateID*>, <*clientPrivateKeyID*>, <*psk*>, <*pskIdentity*>, <*storageId*>, <*resume*>, <*lifetime*> +CME ERROR:<*err*> OK
AT+SQNSPCFG	+SQNSPCFG:1,<*version1*>, <*cipherSpecs1*>, <*certValidLevel1*>, <*caCertificateID1*>, <*clientCertificateID1*>, <*clientPrivateKeyID1*>, <*psk1*>, <*pskIdentity1*>, <*storageId1*>, <*resume1*>, <*lifetime1*><S3><S4> … +SQNSPCFG:6,<*version6*>, <*cipherSpecs6*>, <*certValidLevel6*>, <*caCertificateID6*>, <*clientCertificateID6*>, <*clientPrivateKeyID6*>, <*psk6*>, <*pskIdentity6*>, <*storageId6*>, <*resume6*>, <*lifetime6*> OK
AT+SQNSPCFG=?	+SQNSPCFG: (1-6),(0-4),*(list of supported cipher suites)*, (0x00-0xFF),(1-19),(1-19),(1-19),,,(0,1),(0,1),(0-UINT_MAX) OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command sets the security profile parameters required to configure subsequent SSL/TLS connections.

A security profile is identified by a unique ID <*spId*>. Up to 6 security profiles can be configured. Each security profile cover the following SSL/TLS connections properties:

1. SSL/TLS protocol <*version*> to use:
   - TLS v1.0
   - TLS v1.1
   - TLS v1.2
   - TLS v1.3
2. List of cipher suites (<*cipherSpecs*>) to be used for SSL/TLS connection security settings negotiation.

   CAUTION: If the remote server supports none of the cipher suites configured in the <*cipherSpecs*> list, the handshake fails.

   Note: For security reasons, it is recommended to keep the list as short as possible and include only the strongest suites.
3. Server certificate validation level <*certValidLevel*>:
   - No certificate validation
   - Certificate validation done against a specific or a list of imported trusted root certificates and against validity period
   - Server URL verified against a certificate common name field
4. Certificate to be used for server authentication (stored using Write Data in NVM: AT+SQNSNVW *(on page 71)* command):
   - <*caCertificateID*> (num): The trusted Certificate Authority certificate
5. Certificate to be used for client authentication (stored using Write Data in NVM: AT+SQNSNVW *(on page 71)* command):
   - <*clientCertificateID*> (num): The client certificate
6. Private key to be used for client authentication (stored using Write Data in NVM: AT+SQNSNVW *(on page 71)* command):
   - <*clientPrivateKeyID*> (num): The client private key (password protected keys are not supported)
7. Pre-shared key <*psk*> used for connection (when a `TLS_PSK_*` cipher suite is used).
8. Pre-shared key identity <*pskIdentity*> used for connection (when a `TLS_PSK_*` cipher suite is used).
9. <*storageId*> used to identify whether the private key is stored in NVM or HCE (Hardware Crypto Engine).
10. <*resume*>: (For socket connections only) When session resumption is enabled (this is disabled by default for backward compatibility), the module attempts to resume the previous security session if possible. If the option is disabled, the module starts a new security session at each data connection establishment.
11. <*lifetime*>: The security profile user has the capability to configure a maximum <*lifetime*>. The TLS client enforces a TLS session restart after <*lifetime*> even if the TLS server allows a longer session lifetime.

To reset all the parameters of the <*spId*> security profile, use `AT+SQNSPCFG=<spId>,255`.

When passed only a security profile ID (`AT+SQNSPCFG=`<*spId*>), the command outputs the requested security profile.

To display all configuration profiles, use the 'exec' command (`AT+SQNSPCFG`).

Examples:

```
+SQNSPCFG:1,0,"0x2f;0x3C;0x35;0x3D",0,,,,"","",0
+SQNSPCFG:1,3,"0x3D",3,1,2,3,"","",1
```

The exhaustive list of supported cipher suites can be extracted from the test form (3rd parameter).

Defined Values

spId

Integer: 1..6: Security Profile identifier,

version

Integer: 0..3 or 255: SSL/TLS version.

Table 81. *version*

Value	Description
0	TLS 1.0
1	TLS 1.1
2	(default): TLS 1.2
3	TLS 1.3
255	Special code to reset the profile

cipherSpecs

String. The list of the available cipher suites, coded as 16-bit hexadecimal "0x" prefixed IANA numbers, separated by semicolons. An empty string means 'any of the supported suites'.

Cipher suites are identified by their IANA (Internet Assigned Numbers Authority) TLS Cipher Suite Registry number.

The factory default value is an empty string, any of the supported cipher can be used.

Ciphering is implemented using the *WolfSSL* library. The following ciphering suites are currently supported, but additional suites are added with each new release. Always use `AT+SQNSPCFG=?` to get the actual list of cipher suites supported by the module.

- 0x1301: TLS_AES_128_GCM_SHA256
- 0x1302: TLS_AES_256_GCM_SHA384
- 0x1303: TLS_CHACHA20_POLY1305_SHA256
- 0x1304: TLS_AES_128_CCM_SHA256
- 0x1305: TLS_AES_128_CCM_8_SHA256
- 0x000A: SSL_RSA_WITH_3DES_EDE_CBC_SHA
- 0x002F: TLS_RSA_WITH_AES_128_CBC_SHA
- 0x0035: TLS_RSA_WITH_AES_256_CBC_SHA
- 0x0033: TLS_DHE_RSA_WITH_AES_128_CBC_SHA
- 0x0039: TLS_DHE_RSA_WITH_AES_256_CBC_SHA

- 0x00AB: TLS_DHE_PSK_WITH_AES_256_GCM_SHA384
- 0x00AA: TLS_DHE_PSK_WITH_AES_128_GCM_SHA256
- 0x00A9: TLS_PSK_WITH_AES_256_GCM_SHA384
- 0x00A8: TLS_PSK_WITH_AES_128_GCM_SHA256
- 0x00B3: TLS_DHE_PSK_WITH_AES_256_CBC_SHA384
- 0x00B2: TLS_DHE_PSK_WITH_AES_128_CBC_SHA256
- 0x00AF: TLS_PSK_WITH_AES_256_CBC_SHA384
- 0x00AE: TLS_PSK_WITH_AES_128_CBC_SHA256
- 0x008C: TLS_PSK_WITH_AES_128_CBC_SHA
- 0x008D: TLS_PSK_WITH_AES_256_CBC_SHA
- 0xC0A6: TLS_DHE_PSK_WITH_AES_128_CCM
- 0xC0A7: TLS_DHE_PSK_WITH_AES_256_CCM
- 0xC0A4: TLS_PSK_WITH_AES_128_CCM
- 0xC0A5: TLS_PSK_WITH_AES_256_CCM
- 0xC0A8: TLS_PSK_WITH_AES_128_CCM_8
- 0xC0A9: TLS_PSK_WITH_AES_256_CCM_8
- 0xC0A0: TLS_RSA_WITH_AES_128_CCM_8
- 0xC0A1: TLS_RSA_WITH_AES_256_CCM_8
- 0xC0AC: TLS_ECDHE_ECDSA_WITH_AES_128_CCM
- 0xC0AE: TLS_ECDHE_ECDSA_WITH_AES_128_CCM_8
- 0xC0AF: TLS_ECDHE_ECDSA_WITH_AES_256_CCM_8
- 0xC013: TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA
- 0xC014: TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA
- 0xC009: TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA
- 0xC00A: TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA
- 0xC012: TLS_ECDHE_RSA_WITH_3DES_EDE_CBC_SHA
- 0xC008: TLS_ECDHE_ECDSA_WITH_3DES_EDE_CBC_SHA
- 0x003C: TLS_RSA_WITH_AES_128_CBC_SHA256
- 0x003D: TLS_RSA_WITH_AES_256_CBC_SHA256
- 0x0067: TLS_DHE_RSA_WITH_AES_128_CBC_SHA256
- 0x006B: TLS_DHE_RSA_WITH_AES_256_CBC_SHA256
- 0x009C: TLS_RSA_WITH_AES_128_GCM_SHA256
- 0x009D: TLS_RSA_WITH_AES_256_GCM_SHA384
- 0x009E: TLS_DHE_RSA_WITH_AES_128_GCM_SHA256
- 0x009F: TLS_DHE_RSA_WITH_AES_256_GCM_SHA384

- 0xC02F: TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- 0xC030: TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
- 0xC02B: TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
- 0xC02C: TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384
- 0xC02: TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- 0xC023: TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256
- 0xC028: TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- 0xC024: TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384
- 0xCCA8: TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256
- 0xCCA9: TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256
- 0xCCAA: TLS_DHE_RSA_WITH_CHACHA20_POLY1305_SHA256
- 0xCC13: TLS_ECDHE_RSA_WITH_CHACHA20_OLD_POLY1305_SHA256
- 0xCC14: TLS_ECDHE_ECDSA_WITH_CHACHA20_OLD_POLY1305_SHA256
- 0xCC15: TLS_DHE_RSA_WITH_CHACHA20_OLD_POLY1305_SHA256
- 0xC037: TLS_ECDHE_PSK_WITH_AES_128_CBC_SHA256
- 0xCCAB: TLS_PSK_WITH_CHACHA20_POLY1305_SHA256
- 0xCCAC: TLS_ECDHE_PSK_WITH_CHACHA20_POLY1305_SHA256
- 0xCCAD: TLS_DHE_PSK_WITH_CHACHA20_POLY1305_SHA256
- 0x0016: TLS_DHE_RSA_WITH_3DES_EDE_CBC_SHA

Example: `<cipherSpecs>="0x8C;0x8D;0xAE;0xAF"`

Warning: If the remote server supports none of the cipher suites configured in the `<cipherSpecs>` list, the handshake fails.

certValidLevel

Bit field: 8 bits wide (`00..FF`): Server certificate validation.

Configuration bits:

- All 0 (default): certificate not validated
- Bit 0 set to 1: certificate validation done against a specific or a list of imported trusted root certificates and against validity period
- Bit 1: unused
- Bit 2 set to 1: server URL verified against certificate common name field (on top of bit 0)
- Bit 3-7 are reserved for future use

For instance, to activate certification verification including validity period check, `<certValidLevel>=0x01`

caCertificateID

Integer: 0..19: Trusted Certificate Authority certificate ID.

The exact CA certificate to use to validate server certificate ID. The CA certificate must be imported with the Write Data in NVM: AT+SQNSNVW *(on page 71)* command. When this parameter is omitted (default), no certificate is referenced.

clientCertificateID

Integer: 0..19: Client certificate ID,

The client certificate serves to authenticate the client when mutual authentication is requested. The client certificate must be imported with Write Data in NVM: AT+SQNSNVW *(on page 71)* command. When this parameter is omitted (default), no certificate is referenced.

clientPrivateKeyID

Integer: 0..19: Client private key ID.

The client's private key is used to authenticate when mutual authentication is requested. The Client's private key should be imported with the Write Data in NVM: AT+SQNSNVW *(on page 71)* command. When the parameter is omitted (default), no key is referenced.

Note: Password protected keys are not supported.

psk

String. Pre-shared key used for connection (when a `TLS_PSK_*` cipher suite is used). The value must be specified as a string of hexadecimal numbers (e.g. "734c61425224655f…")

The factory default value is an empty string, meaning no pre-shared key defined.

pskIdentity

String (Optional). Pre-shared key identity used for connection (when a `TLS_PSK_*` cipher suite is used).

The factory default value is an empty string, meaning empty key identity defined

storageId

Integer: 0, 1 or 2. Private key storage id used to identify whether key stored on NVM or HCE.

Table 82. *storageId*

Value	Description
0	(default): Embedded non-volatile memory (see `AT+SQNSNVW`)
1	Hosted Crypto Engine (host MCU acting as storage proxy)]
2	For future use

resume

Integer: 0 or 1. Session resumption feature enable.

Table 83. *resume*

Value	Description
0	Session resumption feature disabled (default)
1	Session resumption feature enabled

lifetime

Integer. Maximum TLS client session duration in seconds.

Table 84. *lifetime*

Value	Description
0	No limit. The server can set its own expiration value, advertised in the session ticket lifetime expiration mechanism
>0	Maximum duration of a given TLS session. This parameter takes precedence over the server own value

SSL/TLS Security Introduction

This section is a brief introduction to SSL/TLS.

`Transport Layer Security` (TLS) and its predecessor, `Secure Sockets Layer` (SSL), both frequently referred to as 'SSL', are cryptographic protocols that provide communications security over a computer network. Several versions of the protocols are currently widely used:

- TLS Protocol Version 1.0: RFC 2246 - https://www.ietf.org/rfc/rfc2246.txt
- TLS Protocol Version 1.1: RFC 4346 - https://www.ietf.org/rfc/rfc4346.txt
- TLS Protocol Version 1.2: RFC 5246 - https://www.ietf.org/rfc/rfc5246.txt
- TLS Protocol Version 1.3: IETF draft #21 - https://tools.ietf.org/html/draft-ietf-tls-tls13-21

The Transport Layer Security protocol provides privacy and data integrity between two communication entities. When secured by TLS, connections between a client and a server have one or more of the following properties:

- The connection is private (or secure) because symmetric cryptography is used to encrypt the data transmitted. The keys for symmetric encryption are regenerated at each connection and are based on a shared secret negotiated at the start of the session (TLS handshake protocol). The server and client negotiate which encryption algorithm and cryptographic keys to use before the first byte of data is transmitted. The negotiation of a shared secret is both secure (the negotiated secret is unavailable to eavesdroppers and cannot be obtained, even by an attacker in the middle of the connection) and reliable (no attacker can modify the payloads during the negotiation without being detected).
- The identity of the communicating parties can be authenticated using public-key cryptography. This authentication is optional, but generally required and should be mutual (both device and server are authenticated).
- The connection ensures integrity because each message transmitted includes a message integrity check using a hash code to prevent loss or alteration of the data during transmission.

TLS supports many different methods for exchanging keys, encrypting data, and authenticating message integrity. The set of algorithms used to negotiate the security settings of an SSL/TLS connection is known as a cipher suite. Cipher suites are identified by their IANA (Internet Assigned Numbers Authority) TLS Cipher Suite Registry number (https://www.iana.org/assignments/tls-parameters/tls-parameters.xhtml#tls-parameters-4), and include:

- A key exchange algorithm used for authentication during the handshake: RSA, PSK, RSA_PSK...
- The encryption algorithm used to encrypt the message: AES_128_CBC, AES_256_CBC...
- The hash function ensuring data integrity (HMAC: Hash Message Authentication Code): SHA, SHA256, SHA384...

Digital certificates can also be used to provide:

- Server authentication: the server certificate is checked against a specific trusted certificate or a trusted certificates list
- Client authentication: use of the client certificate and the corresponding private key

The security details used in the active connection are negotiated at connection establishment based on the security capabilities of the communicating entities. The client security profile must be carefully adjusted to meet the security level requested by the user application.

Note: Security best practices require to configure mutual authentication TLS connections, even though this results in an increased overhead and power consumption.

In order to configure every parameter of the SSL/TLS security protocol, several AT commands must be used:

- Read Data in NVM: AT+SQNSNVR *(on page 57)* and Write Data in NVM: AT+SQNSNVW *(on page 71)*: Read/write X.509 certificates and private keys from/to the non-volatile (NV) memory. Up to 20 certificates/keys can be stored.
- SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)*: SSL/TLS connection security profile configuration. Up to 6 security profiles can be configured.

Any secure connection must refer to a security profile ID to exploit the corresponding SSL/TLS configuration:

- Secure Socket Configuration: AT+SQNSSCFG *(on page 172)*: Secure socket configuration
- Initiate a Client Configuration: AT+SQNSMQTTCFG *(on page 147)*: MQTT protocol over TLS
- HTTP Configure: AT+SQNHTTPCFG *(on page 127)*: HTTP protocol over TLS
- Device Initiated Upgrade: AT+SQNSUPGRADE *(on page 74)*
- CoAP Context Create: AT+SQNCOAPCREATE *(on page 106)*
- File Download: AT+SQNFGET *(on page 120)*

Socket Related Commands

Close Socket: AT+SQNSH

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+SQNSL *(on page 195)* or AT+SQNSLUDP *(on page 193)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSH=<*connId*>	OK ERROR +CME ERROR:<*err*>
AT+SQNSH=?	+SQNSH:(1-6) OK
(URC)	+SQNSH:<*connId*>

Description

This command closes a socket connection.

Note: Socket connections can be closed only in suspended mode (even if data is pending). Trying to close active socket connections fails with an error.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

Example

```
AT+SQNSH=?
+SQNSH: (1-6)
OK
AT+SQNSH=1
OK
```

Extended Send Data In Command Mode: AT+SQNSSENDEXT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Dial: AT+SQNSD *(on page 186)*
Time-out	Depends on network and data length
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSSENDEXT=<*connId*>,<*bytesToSend*> [,<*RAI*>, <*IPAddr*>, <*rPort*>]	Intermediate result code: >` OK ERROR NO CARRIER +CME ERROR:`<*err*>
AT+SQNSSENDEXT=?	+SQNSSENDEXT: (1-6),(1-16*1024*1024)[,(0-2)] OK

Description

This command allows to send binary data on a connected socket while the module is in '`command mode`'.

The device responds to the command with the prompt '`> `' (<greater_than> sign and <space> character) and waits for the data to be sent.

When <*bytestosend*> bytes have been sent, the operation is automatically completed.

If the data are successfully sent by the modem, the response is `OK`. If data transmission fails, an error code is reported. The response is sent regardless of the processing at the network/eNB level.

Notes:

1. Input data format is raw binary by default. Refer to the Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)* command to change it to hexadecimal bytes (e.g. "AEB764008B…")
2. The maximum number of bytes to send is 16777216 (i.e. 16*1024*1024).
3. It is possible to use `AT+SQNSSENDEXT` only if the connection was opened using AT+SQNSD *(on page 186)*.
4. All special characters, for example `BS`, are sent as regular data.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

bytesToSend

Integer: 1..16777216. Number of bytes to send.

RAI

Note: This parameter applies only for NB-IoT applications.

Integer: 0, 1 or 2. RAI field (Release Assistance Information, Release 13). The UE uses RAI to notify the MME that no further data transmissions are expected (RAI=1), or that only a single downlink data transmission is expected (RAI=2)

Table 85. *RAI*

Value	Description
0	No information
1	No further uplink or downlink data transmissions are expected
2	Only a single downlink data transmission is expected

IPaddr

String. Address of the remote host. It can be any valid IP address or host name. If <*IPaddr*> parameter is not passed, its value is inferred from the AT+SQNSD *(on page 186)* command.

Note: This parameter is present only if <*acceptAnyRemote*>=2.

rPort

Integer: 0..65535. Remote host port to connect to. If <*rPort*> parameter is not passed, its value is inferred from the Socket Dial: AT+SQNSD *(on page 186)* command.

Note: This parameter is present only if <*acceptAnyRemote*>=2.

Example

```
AT+SQNSSENDEXT=1,11
>hello again
```

Receive Data in Command Mode: AT+SQNSRECV

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+SQNSL *(on page 195)* or AT+SQNSLUDP *(on page 193)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSRECV=*<connId>,<maxByte>*	+SQNSRECV:*<connId>,<maxByte>* *[,<IPaddr>,<rPort>]*<S3><S4>*<data>* OK ERROR +CME ERROR:*<err>*
AT+SQNSRECV=?	+SQNSRECV:(1-6), (1-1500) OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command dumps the data received on a connected socket while the module is in 'command mode'. The module is notified of these data by a Socket Activity Notification: +SQNSRING *(on page 178)* URC, whose presentation format depends on the last Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)* setting.

Notes:

1. Attempting AT+SQNSRECV when no data is buffered raises an error.
2. *<IPaddr>* and *<rPort>* are shown only if *<acceptAnyRemote>*=2.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

maxByte

Integer: 1..1500. Maximum number of bytes to read.

Example

```
AT+SQNSRECV=?
+SQNSRECV: (1-6),(1-1500)
OK
AT+SQNSRECV=1,5
```

```
+SQNSRECV: 1,5
hello+OK
```

Secure Socket Configuration: AT+SQNSSCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Configuration: AT+SQNSCFG *(on page 183)* (and optionally Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)*)
Time-out	1 s
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNSSCFG=<*connId*>,<*enable*>,<*spId*>	+SQNSSCFG:<*connId*>,<*enable*>,<*spId*> +CME ERROR:<*err*> OK
AT+SQNSSCFG?	+SQNSSCFG:1,<*enable1*>,<*spId1*><S3><S4> … +SQNSSCFG:6,<*enable6*>,<*spId6*> OK
AT+SQNSSCFG=?	+SQNSSCFG:(1-6),(0-1),(1-6) OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command enables or disables SSL/TLS over a TCP or UDP socket.

The configuration of the SSL/TLS properties is provided with an SSL/TLS profile set using SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)*.

The <*spId*> parameter is present in the informational text response to the read command only if SSL/TLS is enabled on the specified socket.

Notes:

1. SSL/TLS configuration is available for both TCP and UDP sockets.
2. SSL/TLS is not supported on sockets configured in listen mode (Socket Listen: AT+SQNSL *(on page 195)* command).
3. Enabling/disabling or modifying the security profile must be performed when the socket is not active (socket dial with Socket Dial: AT+SQNSD *(on page 186)* command).

4. Any attempt to change the security configuration on an active socket fails.
5. After security activation, any attempt to create a socket in listen mode (Socket Listen: AT+SQNSL *(on page 195)*, Socket Listen UDP: AT+SQNSLUDP *(on page 193)*) will fail.

Defined Values

spId

Integer: 1..6. Security profile identifier. See SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* for security profile details.

connId

Integer: 1..6. Socket connection identifier.

enable

Integer: 0 or 1. Security enable status.

Table 86. *state*

Value	Description
0	No security (default value).
1	Activate SSL/TLS on the socket.

Example

- Write configuration:

```
AT+SQNSSCFG=1,1,1
OK
```

- Read configurations:

```
AT+SQNSSCFG
+SQNSSCFG: 1,1,1
+SQNSSCFG: 2,0,1
+SQNSSCFG: 3,0,1
+SQNSSCFG: 4,0,1
+SQNSSCFG: 5,0,1
+SQNSSCFG: 6,0,1
OK
```

- Test command:

```
AT+SQNSSCFG=?
Possible response(s):
+SQNSSCFG:(1-6),(0-1),(1-6)
OK
```

Send Data in Command Mode: AT+SQNSSEND

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Dial: AT+SQNSD *(on page 186)*
Time-out	Depends on host
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSSEND=<*connId*> [,<*IPaddr*>,<*rPort*>,<*RAI*>]	Intermediate result code: OK ERROR NO CARRIER +CME ERROR:<*err*>
AT+SQNSSEND=?	+SQNSSEND:(1-6),[<IPaddr>,(0-65535),(0-2)] OK

Description

This command sends data through a connected socket when the module is in 'command mode'. The device responds to the command with the prompt `>' (<greater_than><space>) and waits for the data to be sent.

Ctrl-Z char (0x1A in hexadecimal) validates the data. An ESC char (0x1B in hexadecimal) cancels the operation.

CAUTION: The commands replies OK when the data input is over and the data has been stored in the module's internal RAM. It does not signal that the data have been correctly delivered.

Notes:

1. The maximum number of bytes to send is 1500.
2. It is possible to use AT+SQNSSEND only if the connection was opened using Socket Dial: AT+SQNSD *(on page 186)*.
3. The BS character (0x08) erases the previous byte. The BS character itself is never sent.
4. If <*IPaddr*> and <*rPort*> parameters are not passed, their values are inferred from the Socket Dial: AT +SQNSD *(on page 186)* command

Defined Values

connId

Integer: 1..6. Socket connection identifier.

IPaddr

String. Address of the remote host. It can be any valid IP address or host name. If <*IPaddr*> parameter is not passed, its value is inferred from the AT+SQNSD *(on page 186)* command.

Note: This parameter is present only if <*acceptAnyRemote*>=2.

rPort

Integer: 0..65535. Remote host port to connect to. If <*rPort*> parameter is not passed, its value is inferred from the Socket Dial: AT+SQNSD *(on page 186)* command.

Note: This parameter is present only if <*acceptAnyRemote*>=2.

RAI

Note: This parameter applies only for NB-IoT applications.

Integer: 0, 1 or 2. RAI field (Release Assistance Information). The UE uses RAI to notify the MME that no further data transmissions are expected (RAI=1), or that only a single downlink data transmission is expected (RAI=2)

Table 87. *RAI*

Value	Description
0	No information
1	No further uplink or downlink data transmissions are expected
2	Only a single downlink data transmission is expected

Example

```
AT+SQNSSEND=?
+SQNSSEND:(1-6),[<IPaddr>,(0-65535),(0-2)]
OK
AT+SQNSDEND=1
>hello
OK
```

Socket Accept: AT+SQNSA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Listen: AT+SQNSL *(on page 195)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSA=<*connId*>[,<*connMode*>]	Possible intermediate response: CONNECT OK ERROR NO CARRIER +CME ERROR:<*err*>
AT+SQNSA=?	+SQNSA: (1-6)[,(0-1)]

Description

This command accepts an incoming socket connection after an unsolicited result code +SQNSRING:<connId>. Note that this Socket Activity Notification: +SQNSRING *(on page 178)* URC is the consequence of the creation of a 'socket listen' (Socket Listen: AT+SQNSL *(on page 195)*).

Trying to execute this command before receiving a Socket Activity Notification: +SQNSRING *(on page 178)* URC results in an ERROR indication, with indication that a connection request has not yet been received.

Use Close Socket: AT+SQNSH *(on page 167)* command to reject the connection.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The test command returns the range of supported values for all the parameters.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

connMode

Integer: 0 or 1. Connection mode (optional). Default is 0.

Table 88. *connMode*

Value	Description
0	Default. Online data mode.
1	Command mode.

Example

- General syntax:

```
AT+SQNSA=?
+SQNSA: (1-6)[,(0-1)]
OK
AT+SQNSA=1
CONNECT
AT+SQNSA=2,1
OK
```

- Begin listening on a TCP socket on port 1234.

```
AT+SQNSL=1,1,1234
OK
```

- `+SQNSRING` URC indicates here that there is an incoming connection on socket #1.

```
+SQNSRING: 1
```

- Accept connection in command mode.

```
AT+SQNSA=1,1
OK
```

- Check socket status while connected to a remote host on `192.168.15.135:41829`.

```
AT+SQNSS
+SQNSS: 1,2,192.168.15.1,1234,192.168.15.135,41829,0
+SQNSS: 2,0
+SQNSS: 3,0
+SQNSS: 4,0
+SQNSS: 5,0
+SQNSS: 6,0
OK
```

- The `+SQNSRING` URC indicates that some data is received on socket #1.

```
+SQNSRING: 1
```

- Receive up to ten bytes from the first socket. Six bytes are actually received.

```
AT+SQNSRECV=1,10
+SQNSRECV: 1,6
Test!
OK
```

- Send some text to socket. Note the final `<Ctrl+Z>` before `<S3>` (See Command Line Termination Character: ATS3 *(on page 3)*).

```
AT+SQNSSEND=1
> Some text <Ctrl+Z>
OK
```

- Shutdown connection.

```
AT+SQNSH=1
OK
```

Socket Activity Notification: +SQNSRING

Syntax

Unsolicited Response(s)
URC • When AT+SQNSCFGEXT parameter <*srMode*> is set to 0 (default), or for an incoming TCP connection:+SQNSRING:<*connId*> • When AT+SQNSCFGEXT parameter <*srMode*> is set to 1:+SQNSRING:<*connId*>,<*recData*> • When AT+SQNSCFGEXT parameter <*srMode*> is set to 2:+SQNSRING:<*connId*>,<*recData*>,<*data*>

Description

Unsolicited response that can be received in 'command mode' only. It can notify of data arrival or of an incoming TCP connection, if a listening socket has been created with the Socket Listen: AT+SQNSL *(on page 195)* command.

Note:

- After a data arrival notification, the received bytes must be read using the Receive Data in Command Mode: AT+SQNSRECV *(on page 170)* command.
- The internal buffering is limited and the +SQNSRING notification stops until the host starts reading the data with the Receive Data in Command Mode: AT+SQNSRECV *(on page 170)* command. The URC will be sent again if enough data has been read and if new data keeps coming.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

recData

Integer: 1..1500. Maximum number of bytes to read.

data

Data to read.

Example

```
AT+SQNSCFGEXT=1,0,0,0,0,0,0,0
OK
(...)
+SQNSRING: 1
+SQNSRING: 1
+SQNSRING: 1
+SQNSRING: 1
+SQNSRING: 1
AT+SQNSCFGEXT=2,1,0,0,0,0,0,0
 OK
(...)
+SQNSRING: 2,1500
AT+SQNSCFGEXT=3,2,0,0,0,0,0,0
OK(...)
```

```
+SQNSRING: 3,264,fdkkkkkkkkkkkkkkmoSDQFfdd...
+SQNSRING: 3,264,fgiojnerogijoijopfdsqpioiop...
+SQNSRING: 3,168,gGgGgGgGgGgGgGgGgGgGgGgGgU...
AT+SQNSL?
+SQNSL: 4
OK
+SQNSRING: 4
```

Socket Configuration Extended: AT+SQNSCFGEXT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot persistent

Syntax

Command	Possible Response(s)
AT+SQNSCFGEXT=*<connId>*,*<srMode>*,*<recvDataMode>*,*<keepalive>*[,*<listenAutoRsp>*][,*<sendDataMode>*[,*<unused_A>*[,*<unused_B>*]]]	OK ERROR +CME ERROR:*<err>*
AT+SQNSCFGEXT?	+SQNSCFGEXT:*<connId1>*,*<srMode1>*, *<recvDataMode1>*,*<keepalive1>*, *<listenAutoRsp1>*,*<sendDataMode1>*, *<unused_A1>*,*<unused_B1>*<S3><S4> … +SQNSCFGEXT: *<connId6>*, *<srMode6>*, *<recvDataMode6>*,*<keepalive6>*, *<listenAutoRsp6>*,*<sendDataMode6>*, *<unused_A6>*,*<unused_B6>* OK
AT+SQNSCFGEXT=?	+SQNSCFGEXT:(1-6),(0-2),(0-1),(0-240)[,(0-1)[,(0-1)[,(0)[,(0)]]]] OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command sets the socket configuration extended parameters.

Note: These values are automatically saved in the device's NVRAM.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

srMode

Integer: 0, 1 or 2. Socket Activity Notification: +SQNSRING *(on page 178)* URC mode.

Table 89. *srMode*

Value	Description
0	Normal mode (default), SQNSRING:<*connId*>
1	Data amount mode, SQNSRING:<*connId*>,<*recData*>
2	Data view mode, SQNSRING:<*connId*>,<*recData*>,<*data*>

recvDataMode

Integer: 0 or 1. "Received data view mode" presentation format.

Table 90. *recvDataMode*

Value	Description
0	Data represented as text or raw binary (default)
1	Data represented as a sequence of hexadecimal bytes (from 00 to FF). Note that this parameter changes the presentation of the `SQNSRING` URC but not `SQNSSEND`. No conversion is done on the data before sending them on the network.

keepalive

Integer: 0..240. Currently unused.

listenAutoRsp

Integer: 0 or 1. 'Listen auto-response mode', that affects the Socket Listen: AT+SQNSL *(on page 195)* command.

Table 91. *listenAutoRsp*

Value	Description
0	Disabled (default). Use Socket Accept: AT+SQNSA *(on page 176)* to accept incoming TCP connections.
1	Activated. Incoming TCP connections are automatically accepted. The modem remains in command mode.

sendDataMode

Integer: 0 or 1. 'Sent data view mode' presentation format.

Table 92. *sendDataMode*

Value	Description
0	Data represented as text (default) when using Send Data in Command Mode: AT+SQNSSEND *(on page 174)*, or as a raw binary flow when using Extended Send Data In Command Mode: AT+SQNSSENDEXT *(on page 168)*.
1	Data represented as a sequence of hexadecimal bytes (from 00 to FF).

Example

```
AT+SQNSCFGEXT=?
+SQNSCFGEXT: (1-6),(0-2),(0-1),(0-240),(0-1),(0-1),(0),(0)
OK
AT+SQNSCFGEXT?
+SQNSCFGEXT: 1,0,0,0,0,0,0,0
+SQNSCFGEXT: 2,0,0,0,0,0,0,0
+SQNSCFGEXT: 3,0,0,0,0,0,0,0
+SQNSCFGEXT: 4,0,0,0,0,0,0,0
+SQNSCFGEXT: 5,0,0,0,0,0,0,0
+SQNSCFGEXT: 6,0,0,0,0,0,0,0
OK
AT+SQNSCFGEXT=1,0,0,0
OK
```

Socket Configuration: AT+SQNSCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot persistent

Syntax

Command	Possible Response(s)
AT+SQNSCFG=<*connId*>,<*cid*>,<*pktSz*>,<*maxTo*>,<*connTo*>,<*txTo*>	OK ERROR +CME ERROR:<*err*>
AT+SQNSCFG?	+SQNSCFG:<*connId1*>, <*cid1*>, <*pktSz1*>, <*maxTo1*>, <*connTo1*>, <*txTo1*><S3><S4> … +SQNSCFG:<*connId6*>, <*cid6*>, <*pktSz6*>, <*maxTo6*>, <*connTo1*>, <*txTo6*> OK
AT+SQNSCFG=?	+SQNSCFG:(1-6), (0-6), (0-1500), (0-65535), (0, 10-1200), (0-255) OK

Note: <*S3*> and <*S4*> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command sets the socket configuration parameters.

Note: These values are automatically saved in the device's NVRAM.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

cid

Integer: 0..6. Context socket identifier.

pktSz

Integer: 0..1500. Packet size to be used by the TCP/UDP/IP stack for data sending. Used for online data mode only.

CAUTION: UDP packets can be up to 65,535 byte long, but the current implementation truncates UDP packets to 1,500 bytes. All additional data are lost.

Table 93. *pktSz*

Value	Description
0	Automatically chosen by the device (default: 300)
1..1500	Packet size in bytes.

maxTo

Integer: 0..65535. Exchange timeout. if there is no data exchange within this timeout period, then the connection is closed. *<maxTo>* is started after the socket connection establishment. This timer is restarted after any traffic (Tx or Rx) on the socket.

Note: This value is ignored if the socket is in the listening state.

Table 94. *maxTo*

Value	Description
0	No timeout.
1..65535	Timeout value in seconds (default: 90 s.).

connTo

Integer: either 0 or 10..1200. Connection timeout. If a connection to the remote host cannot be established within this period, then an error is generated. *<connTo>* starts with the `AT+SQNSD` execution and stops once the connection is established (thereby excluding any TLS overhead).

After the connection is established, *<connTo>* is restarted and serves as timeout for establishing the TLS layer.

Table 95. *connTo*

Value	Description
0	No timeout.
10..1200	Timeout value in tenths of second (default: 600)

txTo

Integer: 0..255. Data sending timeout. The data are sent after this delay, regardless of their size. Used for online data mode only.

Table 96. *txTo*

Value	Description
0	No timeout.
1..255	Timeout value in tenths of second (default 50).

Example

```
AT+SQNSCFG=?
+SQNSCFG: (1-6),(0-5),(0-1500),(0-65535),(0,10-1200),(0-255)
OK
AT+SQNSCFG?
+SQNSCFG: 1,1,300,90,600,50
+SQNSCFG: 2,1,300,90,600,50
+SQNSCFG: 3,1,300,90,600,50
+SQNSCFG: 4,1,300,90,600,50
+SQNSCFG: 5,1,300,90,600,50
+SQNSCFG: 6,1,300,90,600,50
OK
AT+SQNSCFG=1,3,0,90,600,50
OK
```

Socket Dial: AT+SQNSD

Mode	LTE-M – NBIoT
Type	Synchronous / Asynchronous
Prerequisite	Prior call to Socket Configuration: AT+SQNSCFG *(on page 183)* (and optionally Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)*)
Time-out	Configurable
Persistency	N / A

Syntax

Command	Possible Response(s)
AT+SQNSD=<*connId*>,<*txProt*>,<*rPort*>,<*IPaddr*> [,<*closureType*>[,<*lPort*>[,<*connMode*> [,<*acceptAnyRemote*>[,<*connSetup*>]]]]]	Possible intermediate responses: CONNECT OK ERROR NO CARRIER +CME ERROR:<*err*>
AT+SQNSD=?	+SQNSD: (1-6), (0-1), (0-65535),<IPaddr> [, (0,255)[, (0-65535)[, (0-1)[, (0-2)]]]] OK
URC	+SQNSD: <*rc*>

Description

This commands opens a remote connection using a socket.

The connection can be synchronous (default) or asynchronous as specified by the <*connSetup*> parameter:

- If a synchronous set up is requested, the AT+SQNSD command releases the AT channel once the connection is complete.
- If an asynchronous set up is requested, the AT+SQNSD command returns OK immediately and the +SQNSD notification is issued once the connection is complete. The +SQNSD notification reports a connection result code <*rc*> The MCU can proceed with data communication or retry the initialisation phase in case of failure.

Important: The +++ string is interpreted as an escape sequence if it is sent at least one second after the last data exchange concluded.

Notes:

1. The UE always ends data received with the \r\n sequence.
2. If <*connMode*> is set to online mode connection and the command is successful, then the module enters the ' *online data mode*' and sends the intermediate result code CONNECT. After the CONNECT, the opened channel to the socket connection can be temporarily released using the escape sequence (+++). The socket remains open. The module returns to the ' *command mode*' and the final result code OK is sent after the suspension. After such a release, it is possible to resume at any moment (unless the socket inactivity timer time-outs,

see Socket Configuration: AT+SQNSCFG *(on page 183)*) by using the Socket Restore: AT+SQNSO *(on page 197)* command with the proper <*connId*>.

3. If <*connMode*> is set to 'command mode' and the command is successful, the socket is opened, the module remains in '`command mode`' and transmits the result code `OK`.
4. If data arrive on a connected socket that are not forwarded because the module entered '`command mode`' (after an escape sequence or after Socket Dial: AT+SQNSD *(on page 186)* has been issued with <*connMode*> set to '`command mode`' connection), these data are buffered and the Socket Activity Notification: +SQNSRING *(on page 178)* URC is sent (Socket Activity Notification: +SQNSRING *(on page 178)* presentation format depends on the last Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)* setting). It is possible to read these data later with Receive Data in Command Mode: AT+SQNSRECV *(on page 170)*. Under the same conditions, it is possible to send data while in '`command mode`' using Send Data in Command Mode: AT+SQNSSEND *(on page 174)*.

Notes on Asynchronous Connection:

1. An asynchronous connection setup is preferred since the establishment phase can last several seconds (DNS resolution, TCP connection, TLS connection, etc.), time during which the AT channel is not available.
2. An asynchronous connection setup mode (<*connSetup*>=1) is mandatory if the socket is secured (see Secure Socket Configuration: AT+SQNSSCFG *(on page 172)*) and the security profile uses a private key stored in a Hosted Cryptographic Engine (see SSL/TLS Security Profile Configuration: AT+SQNSPCFG *(on page 159)* and HCE storage mode). If the asynchronous connection setup is disabled (<*connSetup*>=0) while HCE is enabled, the `AT+SQNSD` command fails.
3. Online connection mode (<*connMode*>=0) is not compatible with an asynchronous connection setup configuration (<*connSetup*>=1). In this case `AT+SQNSD` dial-up command returns `ERROR`. When <*connSetup*>=1, the MCU can still use online mode: the MCU first initiates the connection in command mode (<*connMode*>=1), then enters online mode after the connection setup is complete (`+SQNSD: <connId>,0`) using the socket restoration command Socket Restore: AT+SQNSO *(on page 197)*.
4. While connection setup is in progress, whatever <*connSetup*> mode, the socket status reported by Socket Status: AT+SQNSS *(on page 198)* command is 'Socket in opening process'.
5. Calling socket `AT+SQNSD` dial-up command while an asynchronous connection setup is in progress returns `ERROR`.
6. The `+SQNSD` notification is only issued once after an asynchronous connection setup request.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

txProt

Integer: 0 or 1. Transmission protocol

Table 97. *txProt*

Value	Description
0	TCP
1	UDP

rPort

Integer: 0..65535. Remote host port to contact.

IPaddr

String type. Address of the remote host.

Any valid IPv4/v6 address or host name.

closureType

Integer: 0 or 255. Socket closure behaviour for TCP (no effect for UDP connections).

Important: The `+++` string is interpreted as an escape sequence if it is issued at least one second after the last data exchange ended.

Table 98. *closureType*

Value	Description
0	Local host hangs up immediately after remote does (default)
255	Local host closes after an escape sequence (+++)

lPort

Integer: 0..65535. UDP connection local port, ignored for TCP connections.

connMode

Integer: 0 or 1. Connection mode.

Table 99. *connMode*

Value	Description
0	Online mode connection (default)
1	Command mode connection

acceptAnyRemote

Integer: 0, 1 or 2. Determines whether receive/send datagrams from/to another address than `<IPaddr>:<rPort>` or not.

Note: This parameter is applicable to UDP connection only.

Table 100. *acceptAnyRemote*

Value	Description
0	Disabled (default)
1	The modem accepts data from any host besides `<IPaddr>:<rPort>`
2	The modem receives data from any host besides `<IPaddr>:<rPort>` and can send data to any address besides `<IPaddr>:<rPort>` in the same socket family using the `AT+SQNSSEND` command.

connSetup

Integer: 0 or 1. Connection setup mode

Table 101. *connSetup*

Value	Description
0 (default)	Synchronous connection setup (default)
1	Asynchronous connection setup

rc

Integer. Connection setup result code. The list given below is **not** exhaustive.

Table 102. *rc*

Value	Description
0	Connection OK
-1	Connection Failure: No Carrier
-2	Connection Failure: Unknown
-3	Connection Failure: Connection Refused
-4	Connection Failure: Authentication Rejected
-5	Connection Failure: TLS Error

Examples

```
AT+SQNSD=?
+SQNSD: (1-6),(0-1),(0-65535),<IPaddr>[,(0,255)[,(0-65535)[,(0-1)[,(0-2)]]]]
OK
AT+SQNSD=1,0,7,"10.10.10.4",0,0,0
CONNECT
AT+SQNSD=1,0,80,"www.example.com",0,0,1
OK
```

Socket Information: AT+SQNSI

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Listen: AT+SQNSL *(on page 195)* or Socket Listen UDP: AT +SQNSLUDP *(on page 193)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT +SQNSI=*<connId>[,<ack_notif>]*	+SQNSI:*<connId>,<sent>,<received>,<buff_in>,<ack_waiting>[,<ack_notif>]* OK ERROR NO CARRIER +CME ERROR:*<err>*
AT+SQNSI	+SQNSI:*<connId1>,<sent1>,<received1>,<buff_in1>,<ack_waiting1>[,<ack_notif1>]*<S3><S4> … +SQNSI:*<connId6>,<sent6>,<received6>,<buff_in6>,<ack_waiting6>[,<ack_notif6>]* OK
AT+SQNSI=?	+SQNSI:(1-6)

URC
+SQNSI:*<connId>*,0

If *<ack_notif>* is enabled for a given *<connId>*, a +SQNSI: <connId>, 0 URC is issued when no more acknowledgement is expected.

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command reports information about the socket data traffic.

The test command reports the possible range for the parameter <connId>.

Note: On an encrypted connection, the returned data traffic information does not include the encryption overhead.

Note: A bare `AT+SQNSI<CR>` causes getting information about data traffic of all the sockets, the response format is:

```
+SQNSI: <connId1>, <sent1>, <received1>, <buff_in1>, <ack_waiting1>,<ack_notif1><S3><S4>
…
+SQNSI: <connId6>, <sent6>, <received6>, <buff_in6>, <ack_waiting6>,<ack_notif6><S3><S4>
```

Defined Values

connId

Integer: 1..6. Socket connection identifier.

sent

Integer. Total amount (in bytes) of sent data since the last time the socket number *<connId>* has been opened.

received

Integer. Total amount (in bytes) of received data since the last time the socket connection number *<connId>* has been opened.

buff_in

Integer. Total amount (in bytes) of data just arrived through the socket connection number *<connId>* and currently waiting to be read.

ack_waiting

Integer. Total amount (in bytes) of sent and not yet acknowledged data since the last time the socket connection number *<connId>* has been opened.

Note: Data not yet acknowledged is available only for TCP connections. The value *<ack_waiting>* is always zero for UDP connections.

ack_notif

Integer: 0 or 1. Enables (1) or disables (0) the URC emitted when no more acknowledgement is expected. If the URC is disabled for a given *<connID>*, the read command will not return any value, so as to maintain compatibility with previous software versions.

Examples

- Test Command

```
AT+SQNSI=?
+SQNSI: (1-6)
OK
```

- Read Command

```
AT+SQNSI
+SQNSI: 1,32,75,8,0
+SQNSI: 2,0,0,0,0
+SQNSI: 3,0,0,0,0
+SQNSI: 4,0,0,0,0
+SQNSI: 5,0,0,0,0
+SQNSI: 6,0,0,0,0
OK
```

- Set connection 1

```
AT+SQNSI=1
+SQNSI: 1,0,0,0,0
OK
```

Socket Listen UDP: AT+SQNSLUDP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Configuration: AT+SQNSCFG *(on page 183)* (and optionally Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)*)
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSLUDP=<*connId*>,<*listenState*>[,<*listenPort*>]	OK ERROR +CME ERROR:<*err*>
AT+SQNSLUDP?	+SQNSLUDP:<*connId1*> … +SQNSLUDP:<*connIdN*> OK
AT+SQNSLUDP=?	+SQNSLUDP: (1-6),(0-2),(0-65535)

Description

This command opens/closes a socket listening for an incoming UDP connection on a specified port.

If successful, the command returns OK. When the connection is established, the unsolicited result code +SQNSRING *(on page 178)*: <connId> is received.

Since UDP is connection-less protocol, there's no need to accept incoming connection with an Socket Accept: AT+SQNSA *(on page 176)* command. To prevent datagrams from different sources from mixing on the same socket, the address and port of first incoming datagram is stored. Subsequent datagrams received from other sources are discarded.

Note: The remote server must never change the port used to send its datagrams, or they will be lost.

If the socket is closed by the network, the modem sends the +SQNSLUDP: ABORTED URC.

The read command returns all the currently listening sockets.

The test command returns values supported as a compound value.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

CAUTION: UDP packets can be up to 65,535 byte long, but the current implementation truncates UDP packets to 1,500 bytes. All additional data are lost.

Defined Values

connId

Integer 1..6: Socket connection identifier.

listenState

Integer: 0, 1 or 2: Open or close the listening socket.

Table 103. *listenState*

Value	Description
0	Close listening socket
1	Open a listening IPv4 socket (If PDN has no IPv4 address then IPv6 is used)
2	Open a listening IPv6 socket (If PDN has no IPv6 address then IPv4 is used)

listenPort

Integer 0..65535: The UDP port the socket listens to.

Example

```
AT+SQNSLUDP=?

+SQNSLUDP: (1-6),(0-2),(0-65535)

OK

AT+SQNSLUDP?

OK

AT+SQNSLUDP=1,1,456

OK

AT+SQNSLUDP?

+SQNSLUDP: 1

OK
```

Use of listening and dial socket

If a listening socket is used simultaneously with another dial socket, ensure that the option <*acceptAnyRemote*> is set to 0 on the dial socket, so that the incoming datagrams for the listening socket arrive on the correct socket.

Socket Listen: AT+SQNSL

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Configuration: AT+SQNSCFG *(on page 183)* (and optionally Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)*)
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSL=<*connId*>,<*listenState*>,<*listenPort*> [,<*closureType*>]	OK ERROR +CME ERROR:<*err*>
AT+SQNSL?	+SQNSL:<*connId1*><S3><S4> … +SQNSL:<*connIdN*>
AT+SQNSL=?	+SQNSL:(1-6),(0-2),(0-65535),(0,255)

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command opens or closes a socket listening for an incoming TCP connection on a specified port.

If successful, the command returns OK. When there is an incoming connection on the local port, the Socket Activity Notification: +SQNSRING *(on page 178)*:<connId> URC is sent.

The user can use Socket Accept: AT+SQNSA *(on page 176)* to accept the connection or Close Socket: AT+SQNSH *(on page 167)* to reject it. <*listenPort*> is optional when closing the socket.

If the *ListenAutoRsp* flag of the Socket Configuration Extended: AT+SQNSCFGEXT *(on page 180)* command has been set, incoming TCP connections requests on the port are automatically accepted: the CONNECT URC is sent and the modem enters '`online data mode`'.

If the socket is closed by the remote host, the modem sends the Close Socket: AT+SQNSH *(on page 167)*: <connId> URC.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The read command returns a list of listening TCP sockets.

The test command returns the range of supported values for all the parameters.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

listenState

Integer: 0, 1 or 2. Open or close the listening socket.

Table 104. *listenState*

Value	Description
0	Close listening socket
1	Open a listening IPv4 socket. (If PDN does not have an IPv4 address then IPv6 is used)
2	Open a listening IPv6 socket. (If PDN does not have an IPv6 address then IPv4 is used)

listenPort

Integer: 0..65535. Local listening TCP port.

closureType

Integer: 0..255. Termination cause, optional.

Important: The +++ string is interpreted as an escape sequence if it sent at least one second after the last data exchange ended.

Table 105. *closureType*

Value	Description
0	Default value. Hang up after remote disconnection.
255	Socket is closed after an escape sequence (+++) or after the remote host disconnection.

Example

```
AT+SQNSL=?
+SQNSL: (1-6),(0-2),(0-65535)[,(0,255)]
OK
AT+SQNSL?
OK
AT+SQNSL=1,1,99
OK
AT+SQNSL=2,1,555
OK
AT+SQNSL?
+SQNSL: 1
+SQNSL: 2
OK
```

Socket Restore: AT+SQNSO

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+SQNSL *(on page 195)* or AT+SQNSLUDP *(on page 193)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSO=*<connId>*	Possible intermediate response: CONNECT OK ERROR NO CARRIER +CME ERROR:*<err>*
AT+SQNSO=?	+SQNSO: (1-6) OK

Description

This command resumes a socket connection suspended after an escape sequence. A CONNECT URC is sent as an acknowledgement.

Important: The +++ string is interpreted as an escape sequence if it is emitted at least 1 second after the last data exchange ended.

Note: After a CONNECT URC, the MCU can suspend the socket connection (the socket remains open) using the escape sequence (+++). The device re-enters 'command mode' and a final result code OK is sent after the suspension.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

Example

```
AT+SQNSO=?
+SQNSO: (1-6)
OK
AT+SQNSO=1
CONNECT
```

Socket Status: AT+SQNSS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to Socket Listen: AT+SQNSL *(on page 195)* or Socket Listen UDP: AT+SQNSLUDP *(on page 193)*
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSS	+SQNSS:<*connId1*>,<*state1*>,<*locIP1*>,<*locPort1*>,<*remIP1*>,<*remPort1*>,<*txProt1*><S3><S4> … +SQNSS:<*connId6*>,<*state6*>,<*locIP6*>,<*locPort6*>,<*remIP6*>,<*remPort6*>,<*txProt6*><S3><S4> OK
AT+SQNSS?	+SQNSS:<*connId1*>,<*state1*>,<*locIP1*>,<*locPort1*>,<*remIP1*>,<*remPort1*>,<*txProt1*><S3><S4> … +SQNSS:<*connId6*>,<*state6*>,<*locIP6*>,<*locPort6*>,<*remIP6*>,<*remPort6*>,<*txProt6*><S3><S4> OK
AT+SQNSS=?	OK

Note: If a channel is closed (<*state*> value 0), then <*locIP*>, <*locPort*>, <*remIP*>, <*remPort*> and <*txProt*> parameters are omitted.

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command reports the current status of the sockets.

Note: If the corresponding socket is closed (<*state*> has value 0), then the <*locIP*>,<*locPort*>,<*remIP*>,<*remPort*> parameters are omitted.

Defined Values

connId

Integer: 1..6. Socket connection identifier.

state

Integer: 0..6. Current state of the socket.

Table 106. *state*

Value	Description
0	Socket Closed.
1	Socket with an active data transfer connection.
2	Socket suspended, no pending data.
3	Socket suspended with pending data.
4	Socket listening.
5	Socket with an incoming connection. Waiting for user acceptance or shutdown command.
6	Socket in opening process. The socket is not in Closed state but still not in Active or Suspended or Suspended with pending data state.

locIP

IP address the socket can be reached at.

locPort

One of the following:

- The listening port if the socket is in listen mode.
- The local port of the connection if the socket is connected.

remIP

Remote IP address when the device is connected.

remPort

Port the socket is connected to.

txProt

Integer: 0 or 1. Transmission protocol.

Table 107. *state*

Value	Description
0	TCP
1	UDP

Example

```
AT+SQNSS
+SQNSS: 1,2,192.168.6.8,36419,65.52.116.180,80,0
+SQNSS: 2,4,0.0.0.0,888,,0,0
+SQNSS: 3,0
+SQNSS: 4,5,192.168.9.2,999,10.10.10.6,45133,0
+SQNSS: 5,3,192.168.6.2,57037,10.10.10.4,7,1
+SQNSS: 6,0
AT+SQNSS?
+SQNSS: 1,0
+SQNSS: 2,0
+SQNSS: 3,0
+SQNSS: 4,0
+SQNSS: 5,0
+SQNSS: 6,0
```

```
OK
AT+SQNSS=?
OK
```

Chapter 9. IoT Low Power Optimisation Commands

C-DRX Configuration Display: AT+SQNCDRX

Syntax

Command	Possible Response(s)
AT+SQNCDRX=<*enabled*>,<*verbose*>	OK ERROR
AT+SQNCDRX=?	+SQNCDRX:(0,1), (0,1)
AT+SQNCDRX	+SQNCDRX:<*status*>,[<*cycle*>,<*onTimer*>,<*inactivityTimer*>,<*retxTimer*>,<*sCyc* OK

Description

This command returns the C-DRX (*Connected Mode Discontinuous Reception*) activation status and configuration pushed by the network during the latest RRC connection, if the feature has been activated.

C-DRX activation status and configuration information are updated at each RRC (re)connection and saved in volatile memory. The configuration is kept during modem low power states but lost when the modem is powered off. Thus, after a power cycle or a software reset and before the modem registers to the network for the first time, the C-DRX configuration is unknown.

Defined values

enabled

Integer: 0 or 1.

- 0: Disable the URC.
- 1: Enable the URC.

verbose

Integer: 0 or 1.

- 0: Terse mode: only the C-DRX status is output.
- 1: Verbose mode: all parameters are output.

status

Integer: 0 or 1

- 0: C-DRX is not activated.
- 1: C-DRX has been activated during the last RRC (re)connection.

cycle

Integer. DRX cycle period, in ms.

onTimer

Integer. Duration of 'ON time' during the DRX cycle, in ms.

inactivityTimer

Integer. Specify how long the UE must remain active after the reception of a PDCCH, in ms.

retxTimer

Integer. Maximum number of consecutive PDCCH subframes the UE should remain active to wait for an incoming retransmission after the first available retransmission time.

sCycle

Integer. Duration of a 'short' DRX cycle that can take place during the 'OFF' period of a 'long' DRX cycle, in ms.

sCycleTimer

Integer. Duration of the 'short' DRX which takes places after the DRX inactivity timer fires, in ms.

Notice: If *<status>* is 0 , none of the other parameters is displayed.

Coverage Enhancement Mode Information: AT+CEINFO

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CEINFO=<*Reporting*>	OK
AT+CEINFO?	+CEINFO: <*Reporting*>, <*CE Enabled*>, <*UE State*>, <*Downlink Repetition Factor*>, <*Uplink Repetition Factor*>, <*RSRP*>, <*CINR*> ERROR
AT+CEINFO=?	+CEINFO: (0,1)
URC	+CEINFO:<*Reporting*>, <*CE Enabled*>, <*UE State*>, <*Downlink Repetition Factor*>, <*Uplink Repetition Factor*>, <*RSRP*>, <*CINR*>

Description

The set command subscribes *Coverage Enhancement* (CE) notifications and reads the current parameters.

When AT+CEINFO=1 is received, an unsolicited report +CEINFO is sent immediately to report the current status if the modem is in RRC Idle, RACH or Connected state.

When enabled, after the initial report, further unsolicited reports are sent when:

- <*CE Enabled*> is changed;
- <*UE State*> is changed;
- <*Downlink Repetition Factor*> is changed;
- <*Uplink Repetition Factor*> is changed.

The query command returns the current *Coverage Enhancement* (CE) mode information when modem in RRC Idle, RACH or Connected state. If the <*UE State*> is not one of these three states, the query command returns `ERROR` (`CME ERROR` code 570: 'Coverage enhancement mode information not available').

Defined Values

Reporting

Integer: 0 or 1. Unsolicited notifications activation status.

Table 108. *Reporting*

Value	Description
0	Disable unsolicited report `+CEINFO`
1	Enable unsolicited report `+CEINFO`

CE Enabled

Integer: 0 or 1. *CE mode A/B* serving cell capability .

Table 109. *CE Enabled*

Value	Description
0	The serving cell does not support CE mode A/B
1	The serving cell supports CE mode A/B

UE State

String. *User Equipment* (UE) state at the time of the report (not reported between double quotes).

Table 110. *UE State*

Value	Description
I	Idle
R	RACH
C	Connected

Downlink Repetition Factor

Integer. Indicates downlink repetition factor

- If <*UE state*> is Idle or RACH, it is set to:

  - `mpdcch-NumRepetition` according to current radio condition (i.e. RSRP) and `prach-ParametersListCE-r13` in SIB2 if access technology is LTE-M;

  - `npdcch-NumRepetitions` according to current radio condition and `NPRACH-Parameters-NB-r13` in SIB2-NB if access technology is NBIoT.

- If <*UE state*> is Connected, it is set to:

  - `mpdcch-NumRepetition` for the radio bearer if access technology is LTE-M;

  - `npdcch-NumRepetitions` for the radio bearer if access technology is NBIoT.

Uplink Repetition Factor

Integer. Indicates uplink repetition factor

- If <*UE state*> is Idle, it is set to `numRepetitionPerPreambleAttempt`, according to the current radio condition.
- If <*UE state*> is RACH, it is set to the `numRepetitionPerPreambleAttempt` selected by the UE.
- If <*UE state*> is Connected, it is set to:

  - The repetition number of PUSCH if the access technology is LTE-M;

  - The repetition number of NPUSCH if the access technology is NBIoT.

Note: The repetition number is the maximum number of repetitions allowed by the cell.

RSRP

Integer in dBm. Current Reference Signal Received Power (RSRP) level at time of report. The value 255 means Unknown or not detectable.

CINR

Integer in dBm. Current CINR level at time of report. Value is 127 for Unknown or not detectable

Example

```
AT+CEINFO=1
OK
+CEINFO:1,1,R,8,1,-88,25
+CEINFO:1,1,I,8,1,-89,15
+CEINFO:1,1,C,8,1,-88,20
```

Device-Initiated Data Inactivity Monitoring: AT+SQNDIT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNDIT=*<enable>[,<data_inactivity_timer>][,<RAT>]*	OK
AT+SQNDIT=?	+SQNDIT: (0-1), (30-65535),*(list of supported RATs)* OK
AT+SQNDIT?	+SQNDIT:*<enable>,<data_inactivity_timer>* OK
AT+SQNDIT	+SQNDIT:*<enable>,<data_inactivity_timer>,<RAT1>* +SQNDIT:*<enable>,<data_inactivity_timer>,<RAT2>* OK

Description

This command is used to configure device-initiated data inactivity monitoring feature. This feature is enabled by default, with the data inactivity timer set to 2 minutes (120 minutes).

Data inactivity monitoring feature has been introduced in 3GPP release 14 and might not be configured by eNB. This command enables the modem to activate this feature by setting a custom data inactivity timer value, in case eNB does not support data inactivity feature. Note that device-initiated data inactivity monitoring feature is not 3GPP compliant and its activation will have to be agreed on with the operator before usage. In case eNB advertises data inactivity feature support, the eNB configuration takes precedence over the AT+SQNDIT user configuration.

*<data_inactivity_timer>*is unaltered by device reboots and modem power state changes. Changes are applied at the next reconnection to the network (CFUN=1).

Important: It is strongly recommended to enable this feature as it will guarantee that the device recovers in poor RF condition when release messages from the network may not be received.

Important: Device-initiated data inactivity monitoring feature is not 3GPP compliant. The timer configuration must match the eNB RRC inactivity timer to avoid a configuration conflict. Sequans's recommendation is to set the timer value to three times the eNB RRC inactivity timer (too short a value may trigger a local RRC connection release while the eNB still considers the connection as active, leading to a modem desynchronisation). **The owner is responsible for any configuration change.**

Defined Values

enable

Integer: 0 or 1. Device-initiated data inactivity monitoring enable

Table 111. *enable*

Value	Description
0	Device-initiated data inactivity monitoring is disabled (default).
1	Device-initiated data inactivity monitoring is enabled.

data_inactivity_time

Integer: 30..65535. Custom data inactivity timer in seconds. Default is 120 seconds when the feature is activated.

RAT

Integer: 1 or 2. Radio Access Technology. 1: LTE-M; 2: NB-IoT.

Dynamic Power Reduction Mode Configuration: AT+SQNDPR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+SQNTXPWR *(on page 214)*
Time-out	300 ms
Persistency	Reboot Persistent (see text)

Syntax

Command	Possible Response(s)
AT+SQNDPR=<*mode*>[,<*state*>][,<*RAT*>]	OK
AT+SQNDPR?	+SQNDPR=<mode>, <state> OK
AT+SQNDPR=?	+SQNDPR=(0-1), (0-1), *(list of supported RATs)* OK
AT+SQNDPR	+SQNDPR=<mode1>, <state1>, <RAT1> +SQNDPR=<mode2>, <state2>, <RAT2> OK

Description

The command configures the dynamic power reduction (DPR) feature. Dynamic power reduction values are specified using the AT+SQNTXPWR *(on page 214)* command.

Two <*mode*>s are available: 'manual' and 'automatic'.

- In manual mode, the MCU dynamically enables / disables power reduction using the AT+SQNDPR command (with the <*state*> parameter);
- Automatic mode is currently not supported.

If the <*RAT*> parameter is absent, the setting is applied to the current RAT.

The read form returns the DPR application <*mode*> as well as the instant back-off application <*state*> for the current RAT. To get the settings for both RATs, use the command form AT+SQNDPR.

The DPR <*mode*> selected is stored in non-volatile memory and persist through device reboots and software upgrades. In manual mode, the instant DPR <*state*> is volatile but kept through modem low power states. DPR <*mode*> and <*state*> configuration changes are applied on the fly (no need to reboot).

Defined Values

mode

Integer: 0 or 1. Dynamic power reduction mode.

Table 112. *mode*

Value	Description
0 (Default)	Manual
1	Automatic (not yet supported)

state

Integer: 0 or 1. Dynamic power reduction state.

Table 113. *state*

Value	Description
0 (Default)	DPR disabled
1	DPR enabled

RAT

Integer: 1 or 2. Radio Access Technology. 1: LTE-M; 2: NB-IoT.

eDRX Read Dynamic Parameters: AT+CEDRXRDP

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CEDRXRDP	+CEDRXRDP: <*AcT-type*> [, <*Requested_eDRX_value*> [, <*NW-provided_eDRX_value*> [, <*Paging_time_window*>]]]
AT +CEDRXRDP=?	OK

Description

The execution command returns <*AcT-type*> and <*Requested_eDRX_value*>, <*NW-provided_eDRX_value*> and <*Paging_time_window*> if eDRX is used for the cell that the MS is currently registered at.

If the cell that the MS is currently registered at is not using eDRX, AcT-type=0 is returned.

Defined Values

AcT-type

Integer: 0..5. Indicates the type of access technology. This AT-command is used to specify the relationship between the type of access technology and the requested eDRX value.

Table 114. *AcT-type*

Value	Description
0	Access technology is not using eDRX. This parameter value is only used in the unsolicited result code.
1	EC-GSM-IoT (A/Gb mode)
2	GSM (A/Gb mode)
3	UTRAN (Iu mode)
4	E-UTRAN (WB-S1 mode)
5	E-UTRAN (NB-S1 mode)

Requested_eDRX_value

String: nibble. The eDRX value refers to bits 4 to 1 of octet 3 of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008. The default value, if available, is manufacturer specific.

NW-provided_eDRX_value

String: nibble. The eDRX value refers to bit 4 to 1 of octet 3 of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

Paging_time_window

String: nibble. The paging time window refers to bit 8 to 5 of octet 3 of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

eDRX Settings: AT+CEDRXS

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+CEDRXS=[<*mode*> [, <*AcT-type*> [, <*Requested_eDRX_value*>]]]	+CME ERROR: <*err*>
AT+CEDRXS?	[+CEDRXS: <*AcT-type*>, <*Requested_eDRX_value*> [<S3><S4>+*CEDRXS:*<*AcT-type*>, <*Requested_eDRX_value*> [...]]]
AT+CEDRXS=?	+CEDRXS: (*list of supported* <*mode*>*s*), (*list of supported* <*AcT-type*>*s*), (*list of supported* <*Requested_eDRX_value*>*s*)

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command controls the setting of the UEs eDRX parameters. It controls whether the UE wants to apply eDRX or not, as well as the requested eDRX value for each specified type of access technology.

It also controls the presentation of an unsolicited result code +CEDRXP:<AcT-type>[, <Requested_eDRX_value>[, <NW_eDRX_value>[, <Paging_time_window>]]] when <*mode*>=*2* and there is a change in the eDRX parameters provided by the network.

A special form of the command can be given as +CEDRXS=3. In this form, eDRX is disabled and data for all parameters in the command +CEDRXS are voided or, if possible, set to the manufacturer specific default values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The read command returns the current settings for each defined value of <*AcT-type*>.

The test command returns the supported <*mode*>s and the value ranges for the access technology and the requested eDRX value as compound values.

Defined Values

mode

Integer: 0, 1, 2 or 3. Whether to disable or enable the use of eDRX in the UE. This parameter is applicable to all specified types of access technologies, i.e. the most recent setting of `<mode>` takes effect for all specified values of `<AcT>`.

Table 115. *mode*

Value	Description
0	Disable the use of eDRX
1	Enable the use of eDRX
2	Enable the use of eDRX and enable the unsolicited result code `+CEDRXP:<AcT-type>[, <Requested_eDRX_value>[, <NW_eDRX_value>[,<Paging_time_window>]]]`
3	Disable the use of eDRX and discard all parameters for eDRX or, if available, reset to the manufacturer specific default values.

AcT-type

Integer: 0..5. Indicates the type of access technology. This AT-command is used to specify the relationship between the type of access technology and the requested eDRX value.

Table 116. *AcT-type*

Value	Description
0	Access technology is not using eDRX. This parameter value is only used in the unsolicited result code.
1	EC-GSM-IoT (A/Gb mode)
2	GSM (A/Gb mode)
3	UTRAN (Iu mode)
4	E-UTRAN (WB-S1 mode)
5	E-UTRAN (NB-S1 mode)

Requested_eDRX_value

String: nibble. The eDRX value refers to bit 4 to 1 of octet 3 of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008. The default value, if available, is manufacturer specific.

NW_eDRX_value

String: nibble. The eDRX value refers to bit 4 to 1 of octet 3 of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

Paging_time_window

String: nibble. The paging time window refers to bit 8 to 5 of octet 3 of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

Maximum Transmission Power Configuration: AT+SQNTXPWR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNTXPWR=<*rat*>, <*band*> [,<*maxTxPwr*> [,<*dprBackoff*>]]	+SQNTXPWR:<*rat*>, <*band*>, <*maxTxPwr*>, <*dprBackoff*> OK ERROR
AT+SQNTXPWR=?	+SQNTXPWR:*(list of supported <rat>s), (list of supported <band>s), (range of <maxTxPwr>), (range of <drpBackoff>)* OK
AT+SQNTXPWR?	+SQNTXPWR:<*rat_1*>,<*band_1*>,<*maxTxPwr_1*>,<*dprBackoff_1*> … +SQNTXPWR:<*rat_n*>,<*band_n*>,<*maxTxPwr_n*>,<*dprBackoff_n*> OK

Description

By default, the maximum transmission power is set depending on 3GPP device power class definition (23 dBm for power class 3) and dynamic power reduction is set to 0 dB.

With this command, the device manufacturer can customize the maximum transmission power per 4G LTE <*band*> for a given radio access technology (<*rat*>). The dynamic power backoff can also be configured and used for various purposes such as regulatory FCC SAR rule implementation (proximity protection), power saving or thermal mitigation.

The dynamic power reduction application mode is configured using the AT+SQNDPR *(on page 208)* command.

If neither <*maxTxPwr*> nor <*dprBackoff*> is given, the command resets both parameters to their default value, 2300 and 0 respectively.

Trying to configure a <*rat*> or a <*band*> not supported by a product variant results in the AT command rejecting the configuration request and responding with an ERROR message.

The test command reports the list of supported <*rat*>*s* and <*band*>*s* (hardware capabilities).

The read command reports the list of custom transmission power configuration per <*rat*> and <*band*>, one {<*rat*>; <*band*>} per line.

The custom transmission power configuration is stored in non-volatile memory and persists through device reboots and software upgrades. Update are applied when the device registers itself to the network (CFUN=1).

Important: Any change to the transmission power configuration should be carefully evaluated as it may impact regulatory certification, and is the device manufacturer's sole responsibility.

Note: The FCC requires cell phone manufacturers to ensure that their phones comply with its objective limits for safe exposure. Any cell phone at or below the SAR levels (that is, any phone legally sold in the U.S.) is a 'safe' phone, according to the standard. The FCC SAR limit for public exposure to cellular telephones is 1.6 watts per kilogram (1.6 W/kg). See the FCC's regulations for more information.

Defined Values

rat

Integer 0..1: Radio Access Technology

Table 117. *rat*

Value	Description
0	LTE Cat M1
1	LTE Cat NB1

band

Integer. Band number as defined by 3GPP standard TS 36.101

maxTxPwr

Integer: 0..2300. Maximum transmission power. Power unit is in hundredths of dBm. Default: the maximum transmission power as defined by the device power class (2300 for class 3 devices)

dprBackoff

Integer: 0..2000: Dynamic power reduction. Back-off unit is in hundredths of dB. Default value is 0

Example

- To customize band 2 with 8 dB backoff on a class 3 category M1 device:

```
AT+SQNTXPWR=0,2,,800
+SQNTXPWR: 0,2,2300,800
OK
```

- To customize band 4 maximum transmission power to 20.5 dBm on category M1 device:

```
AT+SQNTXPWR=0,4,2050
+SQNTXPWR: 0,4,2050,0
OK
```

- To dump custom transmission power configuration:

```
AT+SQNTXPWR?
+SQNTXPWR: 0,2,2300,800
+SQNTXPWR: 0,4,2050,0
```

Power Saving Mode Setting: AT+CPSMS

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CPSMS=*[<mode>* *[,<Requested_Periodic-RAU>* *[,<Requested_GPRSREADYtimer>* *[,<Requested_Periodic-TAU>* *[,<Requested_Active-Time>]]]]]*	OK +CME ERROR: *<err>*
AT+CPSMS?	+CPSMS: *<mode>* *[, <Requested_Periodic- RAU>]* *[, <Requested_GPRS-READYtimer>]* *[, <Requested_Periodic-TAU>]* *[, <Requested_Active-Time>]*
AT+CPSMS=?	+CPSMS:*(list of supported <mode>s),* *(list of supported <Requested_Periodic-RAU>s),* *(list of supported <Requested_GPRS-READY-timer>s),* *(list of supported <Requested_Periodic-TAU>s),* *(list of supported <Requested_Active-Time>s)*
AT+CPSMS	+CPSMS:*<mode>[, <Requested_Periodic-RAU>]* *[, <Requested_GPRS-READY-timer>][, <Requested_Periodic-TAU>]* *[, <Requested_Active-Time>], <RAT1>* +CPSMS:*<mode>[, <Requested_Periodic-RAU>]* *[, <Requested_GPRS-READY-timer>][, <Requested_Periodic-TAU>]* *[, <Requested_Active-Time>], <RAT2>*

Description

The set command alters the UEs power saving mode (PSM) parameters. The command controls whether the UE wants to apply PSM or not, as well as the requested extended periodic RAU value and the requested GPRS READY timer value in GERAN / UTRAN, the requested extended periodic TAU value in E-UTRAN and the requested Active Time value. See the unsolicited result codes provided by +CEREG for the Active Time value and the extended periodic TAU value that are allocated to the UE by the network in E-UTRAN. If the setting is done without providing a RAT value, it is applicable to the current RAT.

A special form of the command can be given as +CPSMS=2. In this form, PSM is disabled and the value of all parameters listed in the command +CPSMS are cleared or, if possible, set to the manufacturer specific default values.

The read command returns the current parameters' values.

The execute command returns the parameters set for both RATs.

The test command returns the supported <*mode*>s and the value ranges for the requested extended periodic RAU value and the requested GPRS READY timer value in GERAN/UTRAN, the requested extended periodic TAU value in EUTRAN and the requested Active Time value as compound values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

mode

Integer: 0, 1 or 2. Indication to disable or enable the use of PSM in the UE.

Table 118. *mode*

Value	Description
0	Disable the use of PSM
1	Enable the use of PSM
2	Disable the use of PSM and discard all parameters for PSM or, if available, reset to the manufacturer specific default values.

Requested_Periodic-RAU

String: one byte in an 8 bit format. Requested extended periodic RAU value (T3312) to be allocated to the UE in GERAN/UTRAN. The requested extended periodic RAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. '01000111' equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.060 [47]. The default value, if available, is manufacturer specific.

Requested_GPRS-READY-timer

String: one byte in an 8 bit format. Requested GPRS READY timer value (T3314) to be allocated to the UE (byte 2) of the GPRS Timer information element coded as bit format (e.g. '01000011' equals 3 'decihours' or 18 minutes). For the coding and the value range, see the GPRS Timer IE in 3GPP TS 24.008 [8] Table 10.5.172/3GPP TS 24.008. See also 3GPP TS 23.060 [47]. The default value, if available, is manufacturer specific.

Requested_Periodic-TAU

String: one byte in an 8 bit format. Requested extended periodic TAU value (T3412) to be allocated to the UE in E-UTRAN. The requested extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. '01000111' equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82]. The default value is set to 180 s.

Requested_Active-Time

String: one byte in an 8 bit format. Requested Active Time value (T3324) to be allocated to the UE. The requested Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. '00100100' equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 [8] Table 10.5.163/3GPP TS 24.008. See also 3GPP TS 23.682 [149], 3GPP TS 23.060 [47] and 3GPP TS 23.401 [82]. The default value is set to 60 s.

RAT

Integer: 1 or 2. 1: LTE-M; 2: NB-IoT.

Ready for Release: AT+SQNRFR

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	Release Assistance must be enable using prior call to AT+SQNRACFG
Time-out	Configurable
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNRFR=*[<timeout>]*	ERROR +CME ERROR: <err> OK

Description

AT+SQNRFR instructs the LTE modem to trigger a release request to the LTE network. In order for this AT command to work, *Release Assistance* must be enabled (see Release Assistance Configuration: AT+SQNRACFG *(on page 220)*), otherwise the command will return an error. This AT command can be typically used as a one-time override of the default timeout setting set with AT+SQNRACFG *(on page 220)*.

When this AT command is used, the modem will request a radio connection release to the network when it has no more data to send and <*timeout*> milliseconds have passed.

This AT command can only be used when the modem is in a connected state, typically just after sending data to the modem. If the modem is not in a connected state, this command will return an error (NO_CONNECTION if the command is emitted when the modem is not in connected state or NO_RAI if RAI is not activated or the network does not support this feature).

Notes:

1. Using this AT command with an aggressive <*timeout*> when using request/response-based protocols or TCP-based protocols could result in unnecessary signalling to the LTE network if the connection release is requested before all data is received or acknowledged. The network side implements its own timeout before releasing the connection after a release request. This can provide some additional protection but the value of the network timeout can vary from one LTE network to another.
2. Other applications inside the LTE modem such as LWM2M or SIM OTA may prevent the request of the radio connection release if they are in the middle of a data operation. In this case, the release request will be delayed until their completion.

Defined Values

timeout

Integer: 0..10000. Timeout in milliseconds. Default value is 1000 (1 s). This optional parameter adds a timeout before requesting to the network the release of the connection when the modem has no more data to send. A 0 value requests an immediate release. The maximum value is set to 10 s, as this is the typical delay after which the network always releases the connection if there is no activity (Idle inactivity timer).

err

Specific error code:

`NO_CONNECTION`: the modem is not in connected state.

`NO_RAI`: RAI is not activated / the network does not support this feature.

Release Assistance Configuration: AT+SQNRACFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior configuration setting with AT+SQNCTM
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNRACFG=*<rat>, <operator>, <rai_en>, [<rai_timeout>]*	+SQNRACFG:<rat>, <operator>, <rai_en>, <rai_timeout> OK
AT+SQNRACFG?	+SQNRACFG:<rat1>, <operator1>, <rai_en1>, <rai_timeout1> +SQNRACFG:<rat1>, <operator1>, <rai_en2>, <rai_timeout2> … +SQNRACFG:<rat2>, <operator1>, <rai_en3>, <rai_timeout3> +SQNRACFG:<rat2>, <operator2>, <rai_en4>, <rai_timeout4> …
AT+SQNRACFG=?	+SQNRACFG:*(list of supported <rat>s),* *(list of supported <operator>s),* *(0, 1),* *(0-10000)*

Description

This AT command allows configuring the Release Assistance Indication (RAI), Release 14, for the modem. Both Radio Access Technologies (*<rat>s*) and identified *<operator>* are configurable. Available *<operator>* names correspond to names as defined in Conformance Test Mode: AT+SQNCTM *(on page 40)*. By default, release assistance is disabled for all operators.

Release Assistance Indication configuration is stored in non-volatile memory and persists through device reboots. For the Release assistance configuration to take effect, a reboot is required. Also note that the active *<operator>* profile is controlled via Conformance Test Mode: AT+SQNCTM *(on page 40)*.

Note: Using this AT command with an aggressive *<timeout>* when using request/response-based protocols or TCP-based protocols could result in unnecessary signalling to the LTE network if the connection release is requested before all data is received or acknowledged. The network side implements its own timeout before releasing the connection after a release request. This can provide some additional protection but the value of the network timeout can vary from one LTE network to another.

Note: Other applications inside the LTE modem such as LWM2M or SIM OTA may prevent the request of the radio connection release if they are in the middle of a data operation. In this case, the release request will be delayed until their completion.

Defined Values

rat

Integer: 0 or 1. Radio Access Technology.

Table 119. *rat*

Value	Description
0	LTE Cat M
1	NB-IoT

operator

String. Operator mode as defined with `AT+SQNCTM`.

Table 120. *operator*

Value	Description
“standard”	Standard 3GPP mode
"3gpp-conformance"	Standard 3GPP mode to pass conformance tests
”<operator_name>”	Operational mode related to a specific supported operator *”<operator_name>”*

rai_en

Integer: 0 or 1.

Table 121. *rai_en*

Value	Description
0	RAI is disabled (default)
1	RAI is enabled

rai_timeout

Integer: 0..10000. Timeout in milliseconds. Default is 1000 (1 s). This optional parameter adds a timeout before requesting the release of the connection to the network when the modem has no more data to send. A null value requests an immediate release. The maximum value is set to 10 s, as this is the typical delay after which the network always releases the connection if there is no activity (Idle inactivity timer). <*rai_timeout*> is ignored if <*rai_en*> is set to 0.

Retrieve TAU Value: AT+SQNPTAU

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Device must be attached to the network
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNPTAU?	+SQNPTAU: <mode>, <periodicTAU> OK
AT+SQNPTAU=<*unit*>	+SQNPTAU: <mode>, <periodicTAU>, <unit> OK
AT+SQNPTAU=?	+SQNPTAU: *(list of supported units)*

Description

This command displays the PSM status and Periodic Tracking Area Update timer provided by the network, T3412 (or T3412-extended, if PSM is activated) when UE is registered to the network:

- When using AT+SQNPTAU? the TAU value is displayed only in format GPRS Timer3. This format is suitable only when PSM is activated.
- When using AT+SQNPTAU=<*unit*> the TAU value is displayed either in format GPRS Timer3 (if <*unit*>=T3), or in seconds (if <*unit*>=s).

When the PSM status is unknown, it is recommended to use AT+SQNPTAU=<*unit*> with <*unit*> in seconds.

The AT+SQNPTAU? command is kept for backward compatibility.

Defined Values

mode

Integer: 0 or 1.

- 0: PSM is not active
- 1: PSM is active

PeriodicTAU

String.

- If the UE is registered to the network: return TAU value.
- If UE is not registered to the network: returns an empty string.

unit

String: "T3" or "s".

- "T3": single byte coded as byte 3 of the GPRS Timer 3 information element (e.g. '01000111' equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82].
- "s": seconds.

Specific eDRX Settings: AT+SQNEDRX

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNEDRX=*<mode>[,<AcT-type>][,<Requested_eDRX_value>][,<Requested_ptw_value>][,<enforce_uicc_deactivation>]*	+CME ERROR:*<err>*
AT+SQNEDRX?	+SQNEDRX: *<mode>,<AcT-type>[,<Requested_eDRX_value>,<Requested_ptw_value>,<enforce_uicc_deactivation>[,<uicc_deactivation>]]*
AT+SQNEDRX=?	+SQNEDRX:(0-3),(4-5),("0000"-"1111"),("0000"-"1111"),(0-1)

Description

This command controls whether the UE wants to apply eDRX or not, as well as the requested eDRX value and the *ptw* (paging window size) value for each specified type of access technology.

To allow the modem to enter deep sleep mode, UICC deactivation must be permitted, which requires the UICC to support eDRX (see "extended DRX cycle" capability in the Administrative Data Element File) and PIN must be disabled. For backward compatibility with old SIM card profiles, it is possible to enforce the UICC deactivation support independently of the UICC effective feature support status by setting the *<enforce_uicc_deactivation>* configuration parameter.

The read command returns eDRX *<mode>*, the requested eDRX period (*<Requested_eDRX_value>*), the paging windows size (*<Requested_ptw_value>*), the UICC deactivation override feature status (*<enforce_uicc_deactivation>*) and the UICC deactivation during eDRX feature support status (*<uicc_deactivation>*) read from UICC when UICC is present.

This command behaves as eDRX Settings: AT+CEDRXS *(on page 212)*, returning *<mode>* on read command.

Defined Values

mode

Integer: 0, 1, 2 or 3. Indicates to disable or enable the use of eDRX in the UE. This parameter is applicable to all specified types of access technology, i.e. the most recent setting of *<mode>* will take effect for all specified values of *<AcT>*.

Table 122. *mode*

Value	Description
0	Disable the use of eDRX
1	Enable the use of eDRX
2	Enable the use of eDRX and enable the unsolicited result code `+CEDRXP:<AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_w`
3	Disable eDRX and clear all eDRX parameters or, if available, reset them to the manufacturer specific default values.

AcT-type

Integer: 0..5. Indicates the type of access technology. This AT-command is used to specify the relationship between the type of access technology and the requested eDRX value.

Table 123. *AcT-type*

Value	Description
0	Access technology is not using eDRX. This parameter value is only used in the unsolicited result code.
1	EC-GSM-IoT (A/Gb mode)
2	GSM (A/Gb mode)
3	UTRAN (Iu mode)
4	E-UTRAN (WB-S1 mode)
5	E-UTRAN (NB-S1 mode)

Requested_eDRX_value

String: nibble. The eDRX value corresponds to bits 4 to 1 of the third byte of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008. The default value, if available, is manufacturer specific.

Requested_ptw_value

String: nibble. The paging time window corresponds to bits 8 to 5 of the third byte of the *Extended DRX parameters information element* (see sub-clause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the *Extended DRX parameters information element* in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

enforce_uicc_deactivation

Integer: 0 or 1. Enforce UICC deactivation support independently of UICC effective feature support status

uicc_deactivation

Integer: 0 or 1. UICC deactivation during eDRX feature support status (read from UICC). Empty if no UICC.

Chapter 10. Location Services

GNSS Commands

GNSS Approximate Position Assistance: AT+LPGNSSAPPROXPOS

Syntax

Command	Possible Response(s)
AT+LPGNSSAPPROXPOS="*<lat>*","*<long>*"[,"*<alt>*"]	If success: OK If error: ERROR Or +CME ERROR: *<err>*
AT+LPGNSSAPPROXPOS?	+LPGNSSAPPROXPOS: "*<lat>*","*<long>*","*<alt>*" OK
AT+LPGNSSAPPROXPOS=?	+LPGNSSAPPROXPOS: format of *<lat>*,format of *<long>* [, format of *<alt>*] OK

Description

This AT command is used to set the GNSS approximate position as a hint for the next fix. It must be accurate within 100 km if *<acq_mode>* configuration is set to hot start by AT+LPGNSSCFG *(on page)* command.

Unless set by this command, the default values after power-on/reset are those of Paris (latitude: 48.8616948, longitude: 2.3469252, altitude: 15).

For subsequent fixes, unless overridden by this command, the last successful fix is taken as the approximate position.

Defined Values

lat

String. Approximate latitude in decimal degree (DD) format. Range is -90..90.

long

String. Approximate longitude in decimal degree (DD) format. Range is -180..180.

alt

String. Approximate elevation in metres. Range is -500..10000. This parameter is optional, but recommended.

GNSS Assistance Download From Cloud: AT+LPGNSSASSISTANCE

Syntax

Command	Possible Response(s)
AT+LPGNSSASSISTANCE=<*type*>,[*"<UTC_time>"*]	If success: OK +LPGNSSASSISTANCE=<*type*> If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSASSISTANCE?	+LPGNSSASSISTANCE: 0, <*availability*>, <*last_update*>, <*time_to_update*>, <*time_to_expiration*> +LPGNSSASSISTANCE: 1, <*availability*>, <*last_update*>, <*time_to_update*>, <*time_to_expiration*> +LPGNSSASSISTANCE: 2, <*availability*>, <*last_update*>, <*time_to_update*>, <*time_to_expiration*> OK
AT+LPGNSSASSISTANCE=?	+LPGNSSASSISTANCE: possible values of <*type*>, format of <*UTC_time*> OK

Description

This AT command is used to set the GNSS assistance:

- The write command triggers a connection to the GNSS cloud, downloads the almanac or the ephemeris files and stores them in persistent memory. This AT command only works with an available LTE connection.
- The read command is used to verify the status of the assistance, or to check if an update is required. If both the real-time and predicted ephemeris are valid when a fix is requested, the real-time ephemeris takes precedence.

In case of error, the command returns a +LPGNSSASSISTANCE: <*err*> notification, where <*err*> is a string and has the possible following values:

- "NOT_ATTACHED": the device is not attached to the LTE network.
- "COULD_NOT_DOWNLOAD_FILE_FROM_CLOUD": an error occurred during assistance file download.
- "WRONG_FILE_SIZE_FOR_GPS_EPHEMERIS": the size of the assistance file is wrong.
- "UTC_TIME_NOT_IN_ISO8601_FORMAT": if <*UTC_time*> is not in ISO 8601 format.

Defined Values

type

Integer: 0, 1 or 2. Type of assistance: 0 = almanac (almanac assistance is not needed for assisted on-device GNSS operation); 1 = real-time ephemeris; 2 = predicted ephemeris.

UTC_time

String. Optional. UTC time in ISO 8601 format. Used to select and fetch a time-specific assistance file from the GNSS cloud. If not specified, the current time is used and the latest assistance file is fetched.

availability

Integer: 0 or 1. 0: assistance unavailable; 1: assistance available.

last_update

Integer. Time (in seconds) elapsed since the last download of assistance data.

time_to_update

Integer. Time (in seconds) before the current assistance data become stale (still usable but with degraded accuracy).

time_to_expiration

Integer. Time (in seconds) before the current assistance data become invalid (not usable for fix computation any more).

GNSS Assistance Payload Request: AT+LPGNSSASSISTANCEPAYLOAD

Syntax

Command	Possible Response(s)
AT+LPGNSSASSISTANCEPAYLOAD=<*type*>, [”<*UTC_time*>”]	If success: OK +LPGNSSASSISTANCEPAYLOAD=<*assistance_payload*> If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSASSISTANCEPAYLOAD=?	+LPGNSSASSISTANCEPAYLOAD: possible values of <*type*>, format of <*UTC_time*> OK

Description

This AT command it used when assistance data is fetched by the host, rather than the modem. It provides the assistance request payload to send to the GNSS cloud.

In case of error, the command returns a +LPGNSSASSISTANCEPAYLOAD: <*err*> notification, where <*err*> is a string and has the possible following values:

- “UTC_TIME_NOT_IN_ISO8601_FORMAT”: if <*UTC_time*> is not in ISO 8601 format.

Defined Values

type

Integer: 0, 1 or 2. Type of assistance: 0 = almanac (almanac assistance is not needed for assisted on-device GNSS operation); 1 = real-time ephemeris; 2 = predicted ephemeris.

UTC_time

String. Optional. UTC time in ISO 8601 format. Used to select and fetch a time-specific assistance file from the GNSS cloud. If not specified, the current time is used and the latest assistance file is fetched.

assistance_payload

String. Base64. Value of the field "assistancePayload" of the JSON object handed out in the POST request for assistance data.

GNSS Cloud Server Name: AT+LPGNSSCLOUDSEL

Syntax

Command	Possible Response(s)
AT+LPGNSSCLOUDSEL="<*hostname*>"	If success: OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSCLOUDSEL?	+LPGNSSCLOUDSEL: <*hostname*>,<*API_version*> OK
AT+LPGNSSCLOUSEL=?	+LPGNSSCLOUDSEL: format of <*hostname*> OK

Description

This AT command sets the name of the server the assistance data is downloaded from. The name is saved and preserved at reboot/reset.

Defined Values

hostname

String. Server's hostname.

API_version

String. Version of the API the server runs.

GNSS Configuration: AT+LPGNSSCFG

Syntax

Command	Possible Response(s)
AT+LPGNSSCFG=[<*loc_mode*>,[<*fix_sensi*>,[<*urc_settings*>,[<*reserved*>,[<*metrics*>,[<*acq_mode*>,[<*early_abort*>]]]]]]]	If success: +LPGNSSCFG: <*loc_mode*>, <*fix_sensi*>, <*urc_settings*>,<*reserved*>, <*metrics*> OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSCFG?	+LPGNSSCFG: <*loc_mode*>, <*fix_sensi*>, <*urc_settings*>, <*reserved*>, <*metrics*> OK
AT+LPGNSSCFG=?	+LPGNSSCFG: possible values of <*loc_mode*>, possible values of <*fix_sensi*>, possible values of <*urc_settings*>, <*reserved*>, possible values of <*metrics*>, possible values of <*acq_mode*>, possible values of <*early_abort*> OK

Description

This AT command sets the GNSS subsystem configuration. It can be called at any time, and takes effect immediately (at the next fix). The configuration is preserved at reboot/reset.

Defined Values

loc_mode

Integer: 0 or 1. GNSS location mode: 0 = the GNSS code computes the location, speed, error circle as well as the satellite C/N (default); 1 = reserved.

fix_sensi

Integer: 0, 1, 2 or 3. 0, 1 = reserved; 2 = eco-positioning mode (default); 3 = high-reliability (HR) mode.

urc_settings

Integer: 0, 1 or 2. This value sets the +LPGNSSFIXREADY *(on page)* URC behaviour: 0 = notification disabled (batch mode); 1 = short notification (default), only the fix id is printed (default); 2 = full notification.

reserved

This parameter is reserved.

metrics

Integer: 0 or 1. 1: CN0 values are reported by the +LPGNSSFIXREADY *(on page)* URC. 0: No CN0 information (default).

acq_mode

Integer: 0 or 1. 0: Warm-up mode, the approximate position is unknown or not valid. 1: The approximate position is valid (the true location is within 100 km of this value).

early_abort

Integer: 0 or 1. 1: Enables fast error report if satellite reception is too poor. 0: No early abort (default).

GNSS Ephemeris Validity: AT+LPGNSSPEPHDUR

Syntax

Command	Possible Response(s)
AT+LPGNSSPEPHDUR=<*validity*>	If success: OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSPEPHDUR?	+LPGNSSPEPHDUR: <*validity*> OK
AT+LPGNSSPEPHDUR=?	+LPGNSSPEPHDUR: possible values of <*validity*> OK

Description

This AT command sets the predicted ephemeris validity. This setting is preserved at reboot.

Defined Values

validity

Integer: 1, 3 or 7. Validity of the predicted ephemeris information in days. 7 is the default.

GNSS Fix Programming: AT+LPGNSSFIXPROG

Syntax

Command	Possible Response(s)
AT+LPGNSSFIXPROG=<*action*>	If success: +LPGNSSFIXPROG=<*action*> OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSFIXPROG?	+LPGNSSFIXPROG: <*action*> OK
AT+LPGNSSFIXPROG=?	+LPGNSSFIXPROG: possible values of <*action*> OK

Description

This AT command programs or cancels a GNSS fix.

The command may return an extended error message <*err*>, with the following meaning:

- NO_RTC: There is no RTC available (no LTE connection). Attach to the LTE network to synchronise the clock and try again.
- LTE_CONCURRENCY: The GNSS fix cannot be performed because the device is currently connected to the LTE network. Disconnect using AT+CFUN=0 *(on page 299)*.
- FIX_IN_PROGRESS: Another fix is already being processed.
- NO_VALID_EPHEMERIS_FOR_ON-DEVICE_NAVIGATION: No ephemeris is available and <*loc_mode*> has been set to "on-device location" by AT+LPGNSSCFG *(on page 231)*.

Defined Values

action

String: "single" or "stop".

- "single": programs a fix.
- "stop": cancels a previously programmed fix.

.

GNSS Fix Results: AT+LPGNSSGETFIX

Syntax

Command	Possible Response(s)
AT+LPGNSSGETFIX=<*fix_id*>	If success: +LPGNSSGETFIX: <*fix_id*>, <*timestamp*>, <*ttf*>, <*confidence*>, <*la*> <*north_speed*>, <*east_speed*>, <*down_speed*>, <*raw_meas*>[,(<*sat1_n*> OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSGETFIX	If success: +LPGNSSGETFIX: <*fix_id0*>, <*timestamp*>, <*ttf*>, <*confidence*>, <*lat*>, <*long*>, <*elev*>, <*north_speed*>, <*east_speed*>, <*down_speed*>, <*raw_meas*>[,(<*sat1_num*>, <*sat1_cn0*>), (<*sat_2_num*>,<*sat2_cn0*>), … , (<*satN_num*>,<*satN_cn0*>)] +LPGNSSGETFIX: <*fix_id1*>, <*timestamp*>, <*ttf*>, <*confidence*>, <*lat*>, <*long*>, <*elev*>, <*north_speed*>, <*east_speed*>, <*down_speed*>, <*raw_meas*>[,(<*sat1_num*>, <*sat1_cn0*>), (<*sat_2_num*>,<*sat2_cn0*>), … , (<*satN_num*>,<*satN_cn0*>)] +LPGNSSGETFIX: <*fix_id2*>, <*timestamp*>, <*ttf*>, <*confidence*>, <*lat*>, <*long*>, <*elev*>, <*north_speed*>, <*east_speed*>, <*down_speed*>, <*raw_meas*>[,(<*sat1_num*>, <*sat1_cn0*>), (<*sat_2_num*>,<*sat2_cn0*>), … , (<*satN_num*>,<*satN_cn0*>)] … +LPGNSSGETFIX: <*fix_idN*>, <*timestamp*>, <*ttf*>, <*confidence*>, <*lat*>, <*long*>, <*elev*>, <*north_speed*>, <*east_speed*>, <*down_speed*>, <*raw_meas*>[,(<*sat1_num*>, <*sat1_cn0*>), (<*sat_2_num*>,<*sat2_cn0*>), … , (<*satN_num*>,<*satN_cn0*>)] OK If error: ERROR Or +CME ERROR: <*err*>
	+LPGNSSFIXREADY: <*fix_id*>,[<*timestamp*>, <*ttf*>, <*confidence*>, <*lat*>, <*long*>, <*elev*>, <*north_speed*>, <*east_speed*>, <*down_speed*>, <*raw_meas*>[,(<*sat1_num*>, <*sat1_cn0*>), (<*sat_2_num*>,<*sat2_cn0*>), … , (<*satN_num*>,<*satN_cn0*>)]]

Command	Possible Response(s)
AT+LPGNSGETFIX?	+LPGNSSGETFIX: <*fix_id0*>, <*fix_id1*>, <*fix_id2*>, …, <*fix_idN*> OK
AT+LPGNSSCFG=?	+LPGNSSGETFIX: possible values of <*fix_id*> OK

Description

This AT command reads one or more fixes:

- If the write command is followed by a fix number <*fix_id*>, the results for this fix are sent. The fix is then erased from the GNSS memory.
- The write command alone dumps all the fixes in memory. The memory is cleared.
- The read command returns the list of the <*fix_id*> currently stored in memory.

CN0 figures for GNSS satellites are only reported if <*metrics*> has been enabled by a previous AT+LPGNSSCFG *(on page 231)* command. Some other parameters are only reported based on the <loc_mode> configuration set by the AT+LPGNSSCFG *(on page 231)* command.

Defined Values

fix_id

Integer: 0..10. Fix identifier. The memory can store ten fixes. If no free slot remains, the oldest fix is overwritten.

timestamp

String: UTC time, in ISO 8601 format, of the GNSS fix. When <*loc_mode*> is set to "on-device location" mode by the AT+LPGNSSCFG *(on page 231)* command, the time stamp is computed using GNSS.

ttf

Integer. Duration (in milliseconds) of the fix. When <*loc_mode*> is set to "on-device location" mode by the AT+LPGNSSCFG *(on page 231)* command, the duration runs from the start of the capture to the completion of the computation.

confidence

Integer. Estimated error of the fix in metres. When <*loc_mode*> is set to "on-device location" mode by the AT+LPGNSSCFG *(on page 231)* command, the confidence is estimated at 1 σ (68 %).

lat

String. Latitude in degrees from -90 to 90. Only available when <*loc_mode*> is set to "on-device location" mode by the AT+LPGNSSCFG *(on page 231)* command.

long

String. Longitude in degrees from -180 to 180. Only available when <*loc_mode*> is set to "on-device location" mode by the AT+LPGNSSCFG *(on page 231)* command.

elev

Integer. Elevation in metres. Only available when <*loc_mode*> is set to "on-device location" mode by the AT+LPGNSSCFG *(on page 231)* command. Since this figure is computed using the GRS 80 ellipsoid as reference, it is likely to depart drastically from the true (geodesic) value in some areas.

north_speed

Integer. Northing speed in m/s. Only available when <*loc_mode*> is set to `"on-device location"` mode by the AT+LPGNSSCFG *(on page 231)* command.

east_speed

Integer. Easting speed in m/s. Only available when <*loc_mode*> is set to `"on-device location"` mode by the AT+LPGNSSCFG *(on page 231)* command.

down_speed

Integer. Down speed in m/s. Only available when <*loc_mode*> is set to `"on-device location"` mode by the AT+LPGNSSCFG *(on page 231)* command.

raw_meas

String. Base64 encoding of the GNSS raw data to be used with AT+LPGNSSSENDRAW *(on page)*. Maximum 256 chars.

satN_num

String. Satellite number (2 chars).

satN_cn0

Integer. CN0 figure for the <*satN_num*>th satellite, in dB/Hz.

+GNSSFIXREADY URC

This notification is received when a GNSS fix is available. The notification information depends on <*urc_settings*> and <*metrics*> configuration set by the AT+LPGNSSCFG *(on page 231)* command.

GNSS Frequency Drift Compensation Mode: AT+LPGNSSFREQOFFSET

Syntax

Command	Possible Response(s)
AT+LPGNSSFREQOFFSET="<*mode*>"	If success: OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSFREQOFFSET?	+LPGNSSFREQOFFSET: "<*mode*>", "<*offset*>" OK
AT+LPGNSSFREQOFFSET=?	+LPGNSSFREQOFFSET: possible values of <*mode*> OK

Description

This AT command defines the frequency drift compensation mode. The read command provides the currently measured offset. The setting is preserved at reboot.

Defined Values

mode

String: "auto" or "fixed". "auto" derives the offset from LTE measurements and updates it before each fix (default); "fixed" derives the offset from the value given to the AT+LPGNSSXTALCFG *(on page 241)* command.

offset

Current frequency drift (in ppm). Either derived from real-time LTE measurements ("auto" mode) or given to the AT+LPGNSSXTALCFG *(on page 241)* command ("fixed" mode).

GNSS Time Hint: AT+LPGNSSUTCTIME

Syntax

Command	Possible Response(s)
AT+LPGNSSUTCTIME="<*UTC_time*>"	If success: OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSUTCTIME?	+LPGNSSUTCTIME: "<*UTC_time*>" +LPGNSSUTCTIME: "NO_CLOCK_DEFINED" OK
AT+LPGNSSUTCTIME=?	+LPGNSSUTCTIME: format of <*UTC_time*> OK

Description

This AT command sets the UTC date to be used at the next fix. If the <*UTC_time*> parameter is not in ISO 8601 format, the command returns an error with <*err*> equal to "UTC_TIME_NOT_IN_ISO8601_FORMAT".

The NO_CLOCK_DEFINED error is returned if one attempts to read the clock when it has not been previously set.

Defined Values

UTC_time

String. Date in ISO 8601 format (e.g.: 1998-07-12T21:27:00).

GNSS Timeout Value: AT+LPGNSSTIMEOUT

Syntax

Command	Possible Response(s)
AT+LPGNSSTIMEOUT=<*timeout*>	If success: OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSTIMEOUT?	+LPGNSSTIMEOUT: <*timeout*> OK
AT+LPGNSSTIMEOUT=?	+LPGNSSTIMEOUT: possible values of <*timeout*> OK

Description

This AT command sets a time-out for GNSS processing. If the time-out is reached, a +LPGNSSFIXSTOP URC is sent with "TIMEOUT" as the <*reason*> parameter.

Defined Values

timeout

Integer: 0..999. Time-out in seconds. 0 means no limit (default).

GNSS Xtal Clock Frequency Compensation: AT+LPGNSSXTALCFG

Syntax

Command	Possible Response(s)
AT+LPGNSSXTALCFG=”<*freq_error*>"[, "<*uncertainty*>"]	If success: OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSXTALCFG?	+LPGNSSXTALCFG=”<*freq_error*>", "<*uncertainty*>" OK
AT+LPGNSSXTALCFG=?	+LPGNSSXTALCFG: possible values of <*freq_error*>, possible val OK

Description

This AT command defines the local crystal oscillator compensation. This setting is preserved at reboot, but erased during a full image software update.

Defined Values

freq_error

String. Frequency error of the local crystal oscillator in ppm. Range is -10..10.

uncertainty

String. Uncertainty of the frequency error in ppm. Range is 0.32..3.2 with 0.6 as default.

Store GNSS Assistance Response: AT+LPGNSSSTOREASSISTANCE

Syntax

Command	Possible Response(s)
AT+LPGNSSSTOREASSISTANCE=<*type*>,[”<*UTC_time*>”] > <*assistance_data*> CTRL-Z	If success: OK If error: ERROR Or +CME ERROR: <*err*>
AT+LPGNSSTOREASSISTANCE?	+LPGNSSSTOREASSISTANCE: (0-2)[,"YYYY-MM-DDThh:mm:ss"]

Note: The test command does not mention the assistance data input phase.

Description

This AT command it used when assistance data is fetched by the host, rather than the modem. It stores the assistance data downloaded from the GNSS cloud as a response to a former POST request.

The AT command sends a '> ' (greater than, space) prompt, then waits for the chunk of base64 encoded downloaded assistance data. The input must end with a CTRL-Z character.

In case of error, the command returns a +LPGNSSSTOREASSISTANCE: <*err*> notification, where <*err*> is a string and has the possible following values:

- “UTC_TIME_NOT_IN_ISO8601_FORMAT”: if <*UTC_time*> is not in ISO 8601 format.

Defined Values

type

Integer: 0, 1 or 2. Type of assistance: 0 = almanac (almanac assistance is not needed for assisted on-device GNSS operation); 1 = real-time ephemeris; 2 = predicted ephemeris.

UTC_time

String. Optional. UTC time in ISO 8601 format. Used to select and fetch a time-specific assistance file from the GNSS cloud. If not specified, the current time is used and the latest assistance file is fetched.

assistance_data

String. Base64. Chunk of characters representing the assistance data downloaded in response to the POST request to the GNSS cloud.

Informal Network Scanning: AT+SQNINS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=0 or 4
Time-out	Depends on Network
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNINS=*<action>*	+SQNINS:*<action>*,*<rb>*,*<ratINS>*,*<cell_Id>*,*<tac>*,*<plmn>*,*<earfcn>*,*<pci>*,*<bandwidthDownload>*,*<rsrp>*,*<rsrq>* [+SQNINS:...] +CME ERROR:*<err>* OK
AT+SQNINS=?	+SQNINS:*<action range>* OK
AT+SQNINS?	+CME ERROR:*<err>*

Description

The write form triggers an informal network scanning (INS).

This command scans all bands supported by the modem for surrounding cells, then collects information about them.

This command can be used only when the module is not attached (AT+CFUN=0 or AT+CFUN=4).

Refer to the *AT Commands Use Cases* manual for further information.

Defined Values

action

Integer: 0 or 1. Type of scan.

Table 124. *action*

Value	Description
0	Full network scanning. Full report of information extracted from the MIB (Master Information Block) and SIB1 (System Information Block 1).
1	Deprecated. Do not use.

rb

Integer. Radio band (band_id).

ratINS

Integer: 7. Radio Access Technology.

Table 125. *ratINS*

Value	Description
7	E-UTRAN
9	E-UTRAN (NB-S1 mode) (see below)

Note: 3GPP TS 36.331 [86] specifies the System Information blocks which give the information about whether the serving cell supports NB-IoT, which corresponds to E-UTRAN (NB-S1 mode).

cell_Id

Integer. Cell ID.

tac

Integer. Tracking Area Code.

plmn

Integer. Numeric PLMN, including the MCC (Mobile Country Code)+MNC (Mobile Network Code).

earfcn

Integer. Downlink E-UTRAN Absolute Radio Frequency Channel Number.

pci

Integer. Physical Cell ID.

bandwidthDownload

String. Downlink bandwidth in MHz. Please refer to the software release notes for the list of supported bandwidths.

Note: Cat-M devices are able to decode 4G MIBs, but unable to decode SIB1 for non Cat-M cells. In this case the *cell_Id*, *plmn* and *tac* information is not provided

Table 126. *bandwidthDownload*

Value	Description
1.4	1400 kHz
3	3000 kHz
5	5000 kHz
10	10000 kHz
15	15000 kHz
20	20000 kHz

rsrp

Float. Reference Signal Received Power in dBm.

rsrq

Float. Reference Signal Received Quality in dB.

Usage Examples

- Full scanning

```
AT+SQNINS=0
+SQNINS: 0,4,7,"1A2D006","0001","00101",2350,6,10,-107.80,-5.80
+SQNINS: 0,13,7,"1A2E005","0001","00101",5230,5,10,-94.90,-5.20
+SQNINS: 0,4,7,"0","0000","000000",2050,2,20,-107.50,-6.10
OK
```

- Test command

```
AT+SQNINS=?
(0-1)
OK
```

Chapter 11. Manufacturing Commands

Bind Serial Port: AT+BIND

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Important: Use of this command is restricted to upgrading with TSFU, please refer to the *Software Upgrade Procedure* application note.

Syntax

Command	Possible Response(s)
AT+BIND=*[<application>][[,<serial>][,<store>]]*	OK
AT+BIND[=]	+BIND=*<serial>*,"at"
AT+BIND?	+BIND:*<serial1>*,*<application>* +BIND:*<serial2>*,*<application>* +BIND:*<serial3>*,*<application>* … +BIND:*<serialN>*,*<application>*
AT+BIND=?	+BIND=("CONSOLE","AT","DCP","PPP","NONE")[,(*list of serial devices*)[,"store"]]

Description

This command binds a serial input/output data stream to a given application. Redirecting a serial data stream to an 'AT command' application can be done from any serial port operating in AT mode or preferably using the application switch command provided if available.

The executable form (AT+BIND) or write command without parameters (AT+BIND=) returns the identification string and the current binding of the serial port on which the AT command was emitted.

The write command with one parameter returns OK.

The write command with full parameters triggers the requested serial port reconfiguration if the binding differs from the current one. If the *<serial>* parameter is omitted, the affected UART is that the AT command was emitted on.

To create a bridge, the two linked serial ports must be identified in the write command using the *<serial>* and *<brserial>* parameters.

The query form AT+BIND? returns the list of available serial interfaces as well as their currently bound function.

```
AT+BIND?
+BIND: "uart0","pipe"
```

```
+BIND: "uart1","dcp"
+BIND: "uart2","console"
```

Defined Values

serial

String: Serial interface ID.

- "uart*N*": the physical serial interface #N.
- "spi*N*": SPI virtual interface running on SPI #N.
- "mux*N*": Multiplexed virtual serial interface #N.

application

String: Type of application the serial port is bound to.

- "none": no binding.
- "AT": AT command channel.
- "console": system console and standard output (stdout).
- "DCP": device control protocol channel. Use for debugging purposes (DM and DV tools).
- "PPP": Point-to-Point channel.
- "pipe": CMUX channel as defined in 3GPP TS 07.10.
- "bridge": bridge (raw data copy) between two serial ports.

store

String: "" or "store".

- "": The configuration is volatile and is lost at reboot.
- "store": The configuration is written in persistent memory and is restored after every reboot/power on.

brserial

String: ID of the serial interface bridged

This parameter specifies which peer the serial interface specified in <*serial*> is bound to. Only relevant when <*application*> is "bridge", ignored otherwise.

Burn Public Key: AT+SMNPK

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=5, OTP unlocked and pubkey not already set.
Time-out	300 ms
Persistency	Reboot persistent

Syntax

Command	Possible response(s)
AT+SMNPK=<*size*>,<*type*>	+SMT ERROR:<*err*>
AT+SMNPK?	+SMNPK:<*size*>,<*type*><CR> *PEMpubkey*
AT+SMNPK=?	

Description

This command allows to set the public key used to check the integrity of the upgrade packages.

Once this command is sent, the device expects the input of a <*size*>-byte PEM encoded public key.

The current public key can be obtained by using AT+SMNPK?.

Defined Values

The following values are defined:

size

Integer.

Size in bytes of PEM encoded public key.

type

String.

Public key type:

- "ECDSA 256": ECDSA public key, 256 bits.
- "RSA 2048": RSA public key, 2048 bits.

Downlink Continuous Wave Receiver: AT+SMCWRX

Warning

This is a manufacturing mode command. You need to enter manufacturing mode with `AT+CFUN=5` before using it. Please refer to the introductory text at the top of this section.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	–
Persistency	N/A

Syntax

Command	Possible response(s)
AT+SMCWRX=<*earfcn*>	+SMCWRX: <rssi0> +SMT ERROR: <*err*>
AT+SMCWRX?	ERROR
AT+SMCWRX=?	OK

Description

This command starts a continuous wave Rx RSSI measurement. The input signal should be generated with a sine wave generator at the exact frequency and band.

Important: Because of the DC rejection, it is not possible to perform Rx measurements at the centre frequency. Use the AT command (`AT+SMCWRX`=mid channel) and set the signal generator at a ±100 kHz offset. For example, on band 19, use `AT+SMCWRX=6075` (corresponding to a centre channel frequency of 882.5 MHz) and set the signal generator at 882.6 MHz.

Linear dynamic range is about -40 to -6 dBm. However signals stronger than about -25 dBm could damage the RF amplifier. Signals under -45 dBm are not detected.

Defined Values

The following values are defined:

earfcn

Integer. An E-UTRA Absolute Radio Frequency Channel Number.

rssi0

Integer. RSSI in hundredths of dBm at the main antenna.

Enter Advanced Manufacturing Mode: AT+SME

Syntax

Command	Possible response(s)
AT+SME=*pwd*[,<*fmt*>, <*mode*>]	+SME ERROR: *err*
AT+SME?	+SME: *status*
AT+SME=?	

Description

This command is used to enter/leave the advanced manufacturing mode.

Non pristine devices (for example, non-blank IMEI and MAC) require a password. It is not possible to enter advanced mode after running a protocol stack-specific AT command. The device must be reset.

Defined Values

The following values are defined:

pwd

String. Password, enclosed in double quotes (").

fmt

Integer: 0 or 1. Format of the password:

- 0: Plain text of at most 16 bytes (default).
- 1: A base64-encoded value of at most 128 bits.

mode

Integer: 0 or 1. Enter or leave advanced mode.

- 0: Leave advanced mode.
- 1: Enter advanced mode.

status

String.

- ACTIVE: Advanced mode is activated.
- CMAC: Advanced mode activation is pending an AES-CMAC derived password.
- BLOCKED: Advanced mode cannot be enabled.

err

String. An error code, either listed below or in the related section.

- BAD CODE: The password entered is invalid.
- BLOCKED: Advanced mode cannot be enabled.

GPIO Input Tests: AT+SMGI

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	300 ms
Persistency	Not reboot persistent (see text).

Syntax

Command	Possible response(s)
AT+SMGI=*mHi, mMed, mLo, pHi, pMed, pLo*	OK ERROR
AT+SMGI?	+SMGI:*vHi, vMed, vLo*
AT+SMGI=?	OK

Description

This command configures the general purpose I/O pins (GPIO) in input mode with arbitrary polarity. If mask only selected, pin from the mask will be configured as input (no change to others).

If the query syntax is used (+SMGI?), the returned value is the bitmask of GPIOs in input mode and active state (high or low depending on the polarity).

Defined Values

The following values are defined:

mHi, mMed, mLo

Most and least significant 32 bits respectively of a mask denoting affected GPIOs with bit 0 corresponding to GPIO 0 and so on.

pHi, pMed, pLo

Most and least significant 32 bits respectively of the polarities of the GPIO pins selected by above mask. If bit *x* is set to 1 then GPIO polarity pin *x* will be set as inverted; otherwise normal.

vHi, vMed, vLo

Most and least significant 32 bits respectively of the values of GPIO pins. If bit *x* is set to 1 then GPIO pin *x* is enabled, configured as input and has an active input value; disabled GPIOs or GPIOs configured as output appears as a 0 in this bitmask.

GPIO Tests: AT+SMGT

Mode	CatM – NBIoT
Type	Synchronous
Requirements	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	300 ms
Settings	Not reboot persistent (see text).

Syntax

Command	Possible response(s)
AT+SMGT=*mHi*,*mMed*,*mLo*,*vHi*,*vMed*,*vLo*,*pHi*,*pMed*,*pLo*	
AT+SMGT=?	

Description

This command allows general purpose I/O (GPIO) pins to be driven to arbitrary values and/or arbitrary polarity. If the mask parameter is the sole parameter, pin from the mask will be selected in open drain mode. There is no change for the other modes.

Defined Values

The following values are defined:

mHi, mMed, mLo

Most, medium and least significant 32 bits, respectively, of a mask denoting the affected GPIOs, with bit 0 corresponding to GPIO 0, and so on. GPIOs selected in this way are enabled and set to output mode.

vHi, vMed, vLo

Most, medium and least significant 32 bits, respectively, of the values to drive on GPIO pins selected by the mask. When bit *x* is set to 1, the corresponding GPIO pin *x* is driven high; otherwise low.

pHi, pMed, pLo

Most and least significant 32 bits respectively of the polarities to drive on GPIO pins selected by above mask. If bit *x* is set to 1 then GPIO polarity pin *x* will be set as inverted; otherwise normal.

Hardware Function Configuration: AT+SQNHWCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	300 ms
Persistency	Reboot persistent

Syntax

Command	Possible Response(s)
AT+SQNHWCFG=<*function*> [,<*enable*>, [<*polarity*>]]	OK
AT+SQNHWCFG="<adcId>"[,<*enable*>]	OK
AT+SQNHWCFG="antennaTuning"[,<*enable*> [,<*defaultValue*>[,"<*minFreq*>, <*maxFreq*>, <*value*> [,<*minFreq*>, <*maxFreq*>, <*value*> [,…]]…"]]]	OK
AT+SQNHWCFG="dcd"[,<*enable*>]	OK
AT+SQNHWCFG="dsr"[,<*enable*>]	OK
AT+SQNHWCFG="dtr"[,<*enable*>]	OK
AT+SQNHWCFG="fff_ffh"[,<*enable*>,[<*polarity*>]]	OK
AT+SQNHWCFG="gpioId"[,<*enable*>[,<*polarity*>,<*direction*> [,<*value*>]]]	OK
AT+SQNHWCFG="i2c"[,<*enable*>]	OK
AT+SQNHWCFG="jtag"[,<*enable*>]	OK
AT+SQNHWCFG="lpm"	OK
AT+SQNHWCFG="po_trigger"[,<*enable*>]	OK
AT+SQNHWCFG="ps_status"[,<*enable*>]	OK
AT+SQNHWCFG="pwmId"[,<*enable*>]	OK
AT+SQNHWCFG="ringId"[,<*enable*>,[<*polarity*>]]	OK
AT+SQNHWCFG="simItf"[,<*enable*>[,<*polling*>]]	OK
AT+SQNHWCFG="spi"[,<*enable*>]	OK
AT+SQNHWCFG="status_led"[,<*enable*>,[<*polarity*>]]	OK
AT+SQNHWCFG="txIndicator"[,<*enable*>][,<*threshold*>]	OK
AT+SQNHWCFG="uartId"[,<*enable*> [,<*rtscts*>[,<*rate*> [,<*format*>[,<*parity*>[,<*stopbits*>[,<*application*>]]]]]]]	OK

Command	Possible Response(s)
AT+SQNHWCFG="wakeId"[,<enable>,[<polarity>]]	OK
AT+SQNHWCFG?	For each <function>: +SQNHWCFG:<function>, list of <values> OK
AT+SQNHWCFG=?	For each <function>: +SQNHWCFG:<function>, range of <values> OK

Important: Other <function> values are undocumented and reserved for Sequans's internal use.

Important: This command is a manufacturing command and should only be used during the manufacturing phase. This command should not be used by the MCU during normal operation. This command may be used for debugging/investigation purpose.

Description

The write command configure the primary/alternate module pin functions described in the module's data sheet.

The write command used with the sole <function> parameter is equivalent to the read command output restricted to the selected <function>.

The read command returns the list of supported pin functions state (1 function per line). For each function, it includes the state and detailed configuration, whenever applicable. The displayed information corresponds to the configuration applied at the next reboot. The current configuration is overridden at reboot by the changes, if any.

Notes:

1. Any configuration change is delayed until the next reboot.
2. The configuration is non-volatile, survives device reboots and software upgrades.
3. If given an unsupported function or an invalid configuration, the AT command returns ERROR and the +CME ERROR: <err> notification is sent.
4. Multipurpose pins need their current function be disabled before a new function can be configured. Trying to enable a function on a pin already assigned to another function returns ERROR and the +CME ERROR: <err> notification is sent.
5. Pins with unassigned functions are disabled, and at reset are configured as described in the data sheet. Please refer to the data sheet for details.

The following functions can currently be activated on *Monarch 2* module pins. More functions will be added with future software releases.

- 32 kHz clock out (32khz_clk_out). The corresponding pad is either connected to the internal 32 kHz frequency source, or disabled. This clock signal may be shut off, depending on the power status of the module.

  Write command:
  AT+SQNHWCFG="32khz_clk_out"[,<enable>]

Read command output:
`+SQNHWCFG:"32khz_clk_out"[,<enable>]`

- *<enable>*: either `"enable"` or `"disable"`

- Analogue to digital converter (`adcId`) control:

  Write command:
  `AT+SQNHWCFG="<adcId>"[,<enable>]`
  Read command output:
  `+SQNHWCFG:"<adcId>"[,<enable>]`

  - *<adcId>*: name of ADC channel(s) in the product's data sheet
  - *<enable>*: either `"enable"` or `"disable"`

- Antenna tuning (`antennaTuning`) function control. Antenna tuning consists in associating the output value of the two signals (`ANT_TUNE0`, `ANT_TUNE1`) to a frequency range. The output value, which can be represented by numbers from 0 to 3, is then used by the board circuitry to select a specific matching circuit.

  Write command:
  `AT+SQNHWCFG="antennaTuning"[,<enable>`
  `[,<defaultValue>[,"<minFreq, maxFreq, value>[,<minFreq, maxFreq, value>[,…]]…"]]]`
  Read command output:
  `+SQNHWCFG:"antennaTuning"[,<enable>`
  `[,<defaultValue>[,"<minFreq, maxFreq, value>[,<minFreq, maxFreq, value>[,…]]…"]]]`

  - *<enable>*: `"enable"` or `"disable"` to activate/deactivate the function.
  - *<defaultValue>*: String. Default `ANT_TUNE` pattern (in hexadecimal), for all frequencies outside the defined ranges. See below.

The third optional parameter is composed of comma-separated triplets `<minFreq>, <maxFreq>, <value>`. Each triplet defines a frequency range and an `ANT_TUNE` pattern: *<minFreq>* and *<maxFreq>* (in MHz) set the frequency range, and *<value>* (in hexadecimal) is the pattern, where bit 0 corresponds to `ANT_TUNE0`, bit 1 to `ANT_TUNE1` – for instance, `0x2` corresponds to `ANT_TUNE1` set to 1, and `ANT_TUNE0` to 0. Up to eight such triplets can be defined.

Table 127. Possible *<value>*

Value	ANT_TUNE0	ANT_TUNE1
0x00	0	0
0x01	1	0
0x10	0	1
0x11	1	1

Note: For all frequencies outside the defined ranges, *<defaultValue>* is used.

CAUTION: Frequencies ranges as defined in the third parameter must not overlap. `ANT_TUNE` signals values are undefined in the overlapping parts.

Example: The following command sets `ANT_TUNE0` to 1 and `ANT_TUNE1` to 0 in the range (800, 900) MHz, and the opposite in the range (1000, 1500) MHz. Both `ANT_TUNE` signals are set to 0 elsewhere:

```
AT+SQNHWCFG="antennaTuning", "enable", "0x00", "800, 900, 0x1, 1000, 1500, 0x2"
```

- Modem UART I/O configuration:

  Write commands:
  `AT+SQNHWCFG="dcd"[,<enable>]`
  `AT+SQNHWCFG="dsr"[,<enable>]`
  `AT+SQNHWCFG="dtr"[,<enable>]`
  Read commands outputs:
  `+SQNHWCFG:"dcd"[,<enable>]`
  `+SQNHWCFG:"dsr"[,<enable>]`
  `+SQNHWCFG:"dtr"[,<enable>]`

  - *<enable>*: `"enable"` or `"disable"` to enable or disable the I/O function.

- Emergency shutdown:

  Write command:
  `AT+SQNHWCFG="emergencyShutdown"[,<enable>[,<pulseDuration>]]`

  - *<enable>*: `"enable"` or `"disable"` to enable or disable the emergency shutdown feature. Default value is disabled
  - *<pulseDuration>*: acknowledge pulse duration in 10 μs units, from `100` (1 ms) to `100000` (1 s). Default value is `1000` (10 ms).

- Boot source function control (Boot From Flash or Boot From Host):

  Write command:
  `AT+SQNHWCFG="fff_ffh"[,<enable>[,<polarity>]]`
  Read command output:
  `+SQNHWCFG:"fff_ffh"[,<enable>[,<polarity>]]`

  - *<enable>*: `"enable"` or `"disable"` to activate/deactivate the function activation
  - *<polarity>*: `"normal"` or `"inversed"`. Default polarity is `"normal"`.

- GPIO function control:

  Write command:
  `AT+SQNHWCFG="gpioId"[,<enable>[,<polarity>,<direction>[,<value>]]]`
  Read command output:
  `+SQNHWCFG:"gpioId"[,<enable>[,<polarity>,<direction>[,<value>]]]`

  - *gpioId*: defines the GPIO function, for example `"gpio4"`.
  - *<enable>*: `"enable"` or `"disable"` to activate/deactivate the function.
  - *<polarity>*: `"normal"` or `"inversed"`. Default polarity is `"normal"`.
  - *<direction>*: `"input"` or `"output"`. Default direction is `"input"`.
  - *<value>*: `"high"` or `"low"`. Default value is `"low"`.

- I²C interface function control:

  Write command:
  `AT+SQNHWCFG="i2c"[,<enable>]`
  Read command output:
  `+SQNHWCFG:"i2c"[,<enable>]`

  - *<enable>*: `"enable"` or `"disable"` to enable or disable the I²C interface.

- JTAG function control:

  Write command:
  `AT+SQNHWCFG="jtag"[,<enable>]`
  Read command output:
  `+SQNHWCFG:"jtag"[,<enable>]`

  - *<enable>*: `"enable"` or `"permanentDisable"` to activate/deactivate the interface. Once turned off, the JTAG cannot be turned on again.

- Low Power Mode control:
  `AT+SQNHWCFG="lpm",<enable>`

  - *<enable>*: `"enable"` or `"disable"` to enable or disable the low power mode. If disabled, the module doesn't enter sleep or deep sleep modes.

- PO Trigger:

  This function is reserved for Sequans's internal use.

- PS_STATUS function control:

  Write command:
  `AT+SQNHWCFG="ps_status"[,<enable>]`
  Read command output:
  `+SQNHWCFG:"ps_status"[,<enable>]`

  - *<enable>*: `"enable"` or `"disable"` to enable or disable the I/O function activation.

- PWM (Pulse Width Modulation) function control:

  Write command:
  `AT+SQNHWCFG="pwmId"[,<enable>]`
  Read command output:
  `+SQNHWCFG:"pwmId"[,<enable>]`

  - *pwmId*: `"pwm0"` or `"pwm1"` to select PWM interface number 0 or 1.
  - *<enable>*: `"enable"` or `"disable"` to enable or disable the associated PWM.

- RING function control:

  Write command:
  `AT+SQNHWCFG="ringId"[,<enable>[,<polarity>]]`
  Read command output:
  `+SQNHWCFG:"ringId"[,<enable>[,<polarity>]]`

- *ringId*: `"ring0"`
- *<enable>*: `"enable"` or `"disable"` to activate/deactivate the function.
- *<polarity>*: `"normal"` or `"inversed"`.

- UICC interface (*"simItf"*: `sim0`, `sim1, sim2`) function control:

  Write command:
  `AT+SQNHWCFG="simItf"[,<enable>[,<polling>]]`
  Read command output:
  `+SQNHWCFG:"simItf"[,<enable>[,<polling>]]`

  - `sim0`: card slot 0
  - `sim1`: card slot 1
  - `sim2`: card slot 2
  - *<enable>*: `"enable"` or `"disable"` to activate/deactivate the interface.
  - *<polling>*: enables software SIM card detection method. If not specified, polling is disabled and the detection makes use of the SIM card detect pin.

Note: The number of available card slots as well as their mapping is hardware and software dependent.

- SPI interface function control:

  Write command:
  `AT+SQNHWCFG="spi"[,<enable>]`
  Read command output:
  `+SQNHWCFG:"spi"[,<enable>]`

  - *<enable>*: `"enable"` or `"disable"` to enable or disable the I/O function activation.

- STATUS_LED function control:

  Write command:
  `AT+SQNHWCFG="status_led"[,<enable>[,<polarity>]]`
  Read command output:
  `+SQNHWCFG:"status_led"[,<enable>[,<polarity>]]`

  - *<enable>*: `"enable"` or `"disable"` to activate/deactivate the interface
  - *<polarity>*: `"normal"` or `“inversed”`

- TX Indicator function control:

  Write command:
  `AT+SQNHWCFG="txIndicator"[,<enable>][,<threshold>]`
  Read command output:
  `+SQNHWCFG:"txIndicator"[,<enable>][,<threshold>]`

- *<enable>*: String: `"enable"` or `"disable"`. Activate/deactivate the RF Psi Tx Indicator. This command enables the "tx_ind" hardware pin.
- *<threshold>*: Integer. A threshold value in hundredths of dBm. If the power output is under this threshold, the pin does not toggle from Rx to Tx. Default value is 3000, or +30 dBm.

Important: Parameters beyond the first two are undocumented and reserved for Sequans's internal use.

- Change UART configuration (uartId: `uart0`, `uart1`, `uart2`) function control:

  Write command:
  `AT+SQNHWCFG="uartId"[,<enable>[,<rtscts>[,<rate>[,<format>[,<parity>[,<stopbits>[,<application>]]]]]]]`
  Read command output:
  `+SQNHWCFG:"uartId"[,<enable>[,<rtscts>[,<rate>[,<format>[,<parity>[,<stopbits>[,<application>]]]]]]]`

  - *uart0*: UART0 interface
  - *uart1*: UART1 interface
  - *uart2*: UART2 interface
  - *<enable>*: `"enable"` or `"disable"` to activate/deactivate the interface.
  - *<rtscts>* represents the 'flow control'. Default is "none", use "rtscts" to enable hardware flow control.
  - *<rate>* represents the baudrate. Default is 115200.
  - *<format>* represents the 'wordlength'. Default is 8, the value must be 5, 6, 7 or 8.
  - *<parity>* represents the parity policy. Possible values are "none", "even", "odd", "mark", "space". Default is "none".
  - *<stopBits>* represents the number of stop bits. Possible values are "1", "1.5", "2". Default is "2".
  - *<application>*. This parameter can be "AT", "CONSOLE", "DCP" or "none".

- Wake signal detection (wakeId = `"wake0"`, `"wake1"`, `"wake2"`, `"wake3"`, `"wake4"`, `"wakeRTS0"`, `"wakeRTS1"`, `"wakeSim0"`, `"wakeSim1"`) function control:

  Write command:
  `AT+SQNHWCFG="wakeId"[,<enable>[,<polarity>]]`
  Read command output:
  `+SQNHWCFG:"wakeId"[,<enable>[,<polarity>]]`

  - *wake0*: WAKE0 interface
  - *wake1*: WAKE1 interface
  - *wake2*: WAKE2 interface
  - *wake3*: WAKE3 interface
  - *wake4*: WAKE4 interface
  - *wakeRTS0*: WAKE on RTS0 interface
  - *wakeRTS1*: WAKE on RTS1 interface
  - *wakeSim0, wakeSim1*: WAKE on SIM interface

- <*enable*>: `"enable"` or `"disable"` to activate/deactivate the interface
- <*polarity*> : `"normal"` or `"inversed"` if possible.

> **Note:** Polarity setting is not available for `wakeRTS0`, `wakeRTS1`, `wakeSim0`.

AT command usage and syntax depends on the function to activate/deactivate.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

function

String. Function name. Please see above for details about each function.

Table 128. *function*

Value	
32khz_clk_out	
adc1	
antennaTuning	
dcd	
dsr	
dtr	
fff_ffh	
gpioId	
i2c	
jtag	
ps_status	
pwm0, pwm1	
ring0, ring1	
sim0, sim1 (, sim2)	
spi	
status_led	
txIndicator	
uart0, uart1, uart2	
wake0, wake1, wake2, wake3, wake4, wakeRTS0, wakeRTS1, wakeSim0, wakeSim1	

enable

Integer: 0 or 1. Function enable/disable.

Table 129. *enable*

Value	Description
0	Function is disabled.
1	Function is enabled.

polarity

String: "normal" or "inversed".

Table 130. *enable*

Value	Description
normal	Signal is active high.
inversed	Signal is active low.

Important: The string to enter is "inversed" with a 's', not "inverted" with a 't'!

defaultValue

String: Default AGC in hexadecimal (see above).

polling

Integer: 0 or 1. Activate SW polling or use SIM_DETECT pin activity.

Table 131. *polling*

Value	Description
0	SIM_DETECT pin activity
1	SW polling

rtscts

String. Flow control type.

Table 132. *rtscts*

Value	Description
none	No flow control
rtscts	RTS/CTS flow control

rate

Integer. Standard baudrate amongst (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200). Default value is 115200.

format

Integer. Word length amongst (5, 6, 7, 8). Default value is 8.

parity

String. Parity possible values amongst (none, even, odd, mark, space). Default is “none”.

stopBits

Integer. Number of stop bits amongst (1, 1.5, 2). Default value is 2.

application

String. Usage of the UART port amongst (none, AT, CONSOLE, DCP).

Table 133. *application*

Value	Description
none	
AT	
CONSOLE	
DCP	

Lock NVRAM: AT+SMNL

Syntax

Command	Possible response(s)
AT+SMNL=<*code*>	OK
AT+SMNL	+SMT ERROR:<*err*>
AT+SMNL?	+SMNL:<*state*>[,<*code*>]

Description

This command locks (write protects) the NVRAM. The command must first be called as AT+SMNL? to get a locking code <*code*>, which is then used in a subsequent AT+SMNL=<*code*> call to lock the NVRAM.

Important: Once locked, the NVRAM cannot be unlocked any more.

Defined Values

state

String. Current lock state:

- ACTIVE: The NVRAM is write-protected.
- INACTIVE: The NVRAM is not write-protected, a random <*code*> is given to allow write-protecting with AT+SMNL=<*code*>.

err

String. An error code.

MIO Test: AT+SMGD

Warning

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	–
Persistency	Not reboot persistent (see text).

Syntax

Command	Possible response(s)
AT+SMGD=<*mask*>,<*value*>	
AT+SMGD=?	

Description

This command set the MIO (multipurpose I/O) pads (RFDATA) to arbitrary values.

If mask only selected, pin from the mask will be selected in open drain (no change to others).

Note: When MIO tests are finished, the command must be called a last time without any parameters to restore MIOs to their initial state. A backup of that initial state is automatically performed at the first command call.

Defined Values

The following values are defined:

mask

32-bit bitmask. If bit *x* is set to 1 then MIO pin *x* is selected. All selected MIOs are enabled and set to GPIOs in output mode.

value

32-bit bistmask. If bit *x* is set to 1 then MIO pin *x* is driven high; otherwise low.

Module Hardware ID Configuration: AT+SMMHID

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode, OTP unlocked
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SMMHID?	+SMMHID:<mhid> OK +SMT ERROR: *<err>*
AT+SMMHID=?	OK

Description

This module manufacturing command reads the Module Hardware ID, if it exists. If not, it returns ERROR with the code 'NA'.

Defined Values

mhid

String. Module Hardware ID string. Printable character only. Max length: 16 chars.

err

String. Error code.

Table 134. *err*

Value	Description
NA	Module Hardware ID not available

RF Path Losses Configuration: AT+SMPL

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	300 ms
Persistency	Reboot persistent (see text).

Syntax

Command	Possible response(s)
AT+SMPL=<*band*>,[<*txPathLoss*>]	OK ERROR
AT+SMPL=?	+SMPL:(1-255),(-100-100) OK
AT+SMPL?	+SMPL=<*band1*>,<*txPathLoss_band1*> … +SMPL=<*bandN*>,<*txPathLoss_bandN*> OK

Description

This command sets the RF Transmission path loss per band.

Path losses are given in hundredths of dB.

An empty path loss parameter means no change to it. Erasing a path loss is done by setting the corresponding `pathloss` to 0 (no loss).

An error is generated if a RF band parameter is not supported by the hardware.

No more than 7 bands can have a non-null path loss defined. Any attempt to define path losses for more than 7 bands is rejected.

The read command displays the transmission path losses for each supported RF band.

Defined Values

The following values are defined:

band

Integer: 1..255. LTE frequency band as specified in 3GPP TS36.101.

txPathLoss

Integer: -100..100. Transmission path loss in hundredths of dB. Selecting a negative value causes the transmit power to decrease.

Save Module Configuration: AT+SQNFACTORYSAVE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	10 s
Persistency	Reboot persistent

Syntax

Command	Possible Response(s)
AT+SQNFACTORYSAVE=<*label*>	OK ERROR
AT+SQNFACTORYSAVE?	+SQNFACTORYSAVE:<*label*> OK ERROR
AT+SQNFACTORYSAVE=?	OK

Description

This AT command allows an OEM's to save a module configuration during the manufacturing process. It creates a restoration point, that the module can be reverted to using the Device Reset to Factory State: AT+SQNSFACTORYRESET *(on page 484)*.

The restoration point includes:

- The hardware configuration of the module, set with Hardware Function Configuration: AT+SQNHWCFG *(on page 253)*;
- The persistent settings of the following AT commands: Conformance Test Mode: AT+SQNCTM *(on page 40)*, 4G LTE Band Selection: AT+SQNBANDSEL *(on page 311)*, Device Management Configuration: AT+SQNDMCFG *(on page 43)*

A tag can be specified by the OEM to identify the restoration point.

The read command reads the tag, thereby confirming that the restoration point has been created successfully. If no restoration point with the given tag is found, the command responds ERROR.

Important: Only a single restoration point exists at any given time. Creating a new restoration point always overwrites the previous one, even if the new one has a different <*label*> tag.

Defined Values

label

String (max. 128 bytes). Tag used to identify the restoration point. The same tag can be used multiple times.

Set Advanced Manufacturing Mode Password: AT+SMA

Syntax

Command	Possible response(s)
AT+SMA=<*pwd*>[,<*fmt*>]	+SMT ERROR: *err*
AT+SMA?	+SMA: *status*
AT+SMA=?	

Description

This command starts the protocol stack and defines the passcode required to enter advanced manufacturing tools. The MAC address, IMEI and serial numbers must be set prior to activating the device; the `mTools` passcode can only be written once.

Defined Values

The following values are defined:

pwd

String. The password required to enter advanced manufacturing mode.

b64

Integer: 0 or 1. Format of the password:

- `0`: Plain text string of at most 16 bytes. This is the default, though its usage in production is discouraged.
- `1`: A base64 encoded value of at most 128 bits.

status

String. The device's current activation state:

- `UNPROV`: The device cannot be activated because of missing MAC and IMEI.
- `READY`: Activation in progress.
- `ACTIVE`: The device is activated and can run the protocol stack.

err

String. An error code:

- `BAD CODE`: The specified password has an invalid format.

Show Version: AT+SVER

Mode	CatM – NBIoT
Type	Synchronous
Requirements	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	300 ms
Settings	–

Syntax

Command	Possible response(s)
`AT+SVER`	`+SVER:`*<component>*,*<version>* `OK`
`AT+SVER=?`	`OK`

Description

This command displays the versions of various components of the stack.

Defined Values

The following values are defined:

component

The component about which information is requested:

- `CORE`: Core software component, including mTools application.
- `BSP`: Board Support Package.

version

The version of the component, displayed as a free-form string.

SIM Network PLMN Configuration: AT+SMNP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	300 ms
Persistency	Reboot persistent.

Syntax

Command	Possible response(s)
AT+SMNP=*nck*[,*plmn0*[, … [,*plmn6*]…]	OK
AT+SMNP?	*<nck>[,<plmn0>,[<plmn1>,...[,<plmn6>]]]*
AT+SMNP=?	OK

Description

This configuration allows up to 7 PLMNs. The chosen PLMN number survives resets and upgrades.

Defined Values

nck

String. 64 bits NCK value, in either decimal or hexa.

plmn0…6

String. 32 bits PLMN value. For MCC=123 MNC=45, PLMN value is the network like encoding with filler: "21f354"

SIM Test: AT+SMST

Mode	CatM – NBIoT
Type	Synchronous
Requirements	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	1 s
Settings	–

Syntax

Command	Possible response(s)
AT+SMST[=<*interface*>]	+SMST=<*status*> +SMT ERROR:<*err*>
AT+SMST=?	

Description

This command tests that the SIM card responds to basic solicitations. The UICC must be compatible with the tested device and have been inserted before powering up the device.

Defined Values

The following values are defined:

interface

Integer: 0 or 1. Optional parameter to select the SIM interface:

- 0: selects the external SIM (default interface)
- 1: selects the internal SIM

- 0: selects the SCI0 interface (default interface)
- 1: selects the SCI1 interface

status

String. Test result:

- OK: The test passed
- NO SIM: No SIM card was detected
- NOK: The test detected a problem

err

String. Error code. The only possible error code is ITF UNKNOWN in case <*interface*> is out of range.

Uplink Continuous Wave Transmitter: AT+SMCWTX

Warning

This is a manufacturing mode command. You need to enter manufacturing mode with `AT+CFUN=5` before using it. Please refer to the introductory text at the top of this section.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	–
Persistency	N/A

Syntax

Command	Possible response(s)
AT+SMCWTX=*<enable>,<earfcn>,<level>*	+SMT ERROR: *err*
AT+SMCWTX?	+SMCWTX:*<enable>,<earfcn>,<level>*
AT+SMCWTX=?	

Description

This command start an uplink continuous wave service. When in Continuous Wave generation mode, the module does not perform any LTE activity. Starting a new Continuous Wave terminates the previous one.

Defined Values

The following values are defined:

enable

Integer: 0 or 1. 1 to start the CW transmission, 0 to stop it.

earfcn

Integer. An E-UTRA Absolute Radio Frequency Channel Number. This command should not be used to output a tone whose frequency is less than 300 kHz away from any band edge.

level

Integer. RF output power level of the continuous wave signal, in hundredths of dBm.

Example

```
AT+SMCWTX=1,21790,2300
OK
```

1: Start RF Tone
21790: UL EARFCN
2300: Tx Power set to +23 dBm (max)

Uplink CW Generator: AT+SMCWTXFREQ

Warning

This is a manufacturing mode command. You need to enter manufacturing mode with `AT+CFUN=5` before using it. Please refer to the introductory text at the top of this section.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	–
Persistency	N/A

Syntax

Command	Possible response(s)
`AT +SMCWTXFREQ=`*<enable>[,<band>,<freq>[,<offset>[,<bw>[,<mode>[,<power>]]]]]*	`+SMT ERROR:` *err*
`AT+SMCWTXFREQ?`	`+SMCWTXFREQ:`*<enable>[,<band>,<freq>[,<offset>[,<bw>[,<mode>[,<power>]]]]]*
`AT+SMCWTXFREQ=?`	

Description

This command starts an uplink continuous wave service. When in Continuous Wave generation mode, the module does not perform any LTE activity. Starting a new Continuous Wave terminates the previous one.

Defined Values

The following values are defined:

enable

Integer: 0 or 1. 1 to start the CW transmission, 0 to stop it.

band

Integer. The band number.

freq

Integer. Centre frequency of the CW tone in kHz.

Wake Input Test: AT+SMWAKE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=5 to enter Manufacturing mode
Time-out	–
Persistency	N/A

Syntax

Command	Possible response(s)
AT+SMWAKE	OK
AT+SMWAKE?	+SMWAKE:<*wakeIds*>
AT+SMWAKE=?	OK

Description

This command reports the wake pins currently active (at HIGH level).

Defined Values

The following values are defined:

wakeIds

String. List of current active wake inputs: wake0, wake1, wake2, wake3, wake4, wakeRTS0, wakeRTS1, wakeSim0

Chapter 12. Mobile Equipment Control and Status Commands

Automatic Time Zone Update: AT+CTZU

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CTZU=*<onoff>*	OK +CME ERROR:*<err>*
AT+CTZU?	+CTZU:*<onoff>* +CME ERROR:*<err>*
AT+CTZU=?	+CTZU:*(list of supported <onoff>s* +CME ERROR:*<err>*

Description

This command enables and disables the automatic time zone update via NITZ/SIB16. If the setting fails, `+CME ERROR: <err>` is returned.

The new time zone information is applied immediately and survives resets, reboots and upgrades.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

The Read command returns the current settings in the MT.

The test command returns supported on- and off- values.

Defined Values

onoff

Integer: 0 or 1. Boolean switch.

Table 135. *onoff*

Value	Description
0	Disable automatic time zone update via NITZ.

Table 135. *onoff* (continued)

Value	Description
1	Enable automatic time zone update via NITZ.

Extended Error Report: AT+CEER

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CEER	+CEER:<*report*>
AT+CEER=?	OK

Description

This command causes the TA to return one or more lines of information text <report>, determined by the MT manufacturer, which should offer the user of the TA an extended report of the reason for:

- The failure in the last unsuccessful call setup (originating or answering) or in call modification;
- The last call release;
- The last unsuccessful LTE attach or unsuccessful PDP context activation;
- The last LTE detach or PDP context deactivation.

Typically, the text consists of a single line containing the cause information given by GSM/UMTS network in textual format.

Defined Values

report

String. The total number of characters, including line terminators, of the information text shall not exceed 2041 characters. Text must not contain the sequence 0<S3> or OK<S3>. <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3 *(on page 3)*

Extended Signal Quality: AT+CESQ

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN = 1
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CESQ	+CESQ:<*rxlev*>,<*ber*>,<*rscp*>,<*ecno*>,<*rsrq*>,<*rsrp*> +CME ERROR:<*err*>
AT+CESQ=?	+CESQ: *(list of supported <rxlev>s), (list of supported <ber>s), (list of supported <rscp>s),(list of supported <ecno>s), (list of supported <rsrq>s), (list of supported <rsrp>s)*

Description

This command returns the received signal quality parameters.

The only meaningful parameters are <*rsrq*> and <*rsrp*>. All other parameters are kept for compatibility reasons and either set to 99 (<*rxlev*>, <*ber*>) or 255 (<*rscp*>, <*ecno*>).

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Test command returns values supported as compound values.

Defined Values

rxlev

Integer. Received signal strength level (see 3GPP TS 45.008 [20] sub-clause 8.1.4). Always set to 99 ('unknown').

ber

Integer. Channel bit error rate (in percent). Always set to 99 ('unknown').

rscp

Integer. Received signal code power (see 3GPP TS 25.133 [95] sub-clause 9.1.1.3 and 3GPP TS 25.123 [96] sub-clause 9.1.1.1.3). Always set to 255 ('unknown').

ecno

Integer. Ratio of the received energy per PN chip to the total received power spectral density (see 3GPP TS 25.133 [95] sub-clause). Always set to 255 ('unknown').

rsrq

Integer. Reference signal received quality (see 3GPP TS 36.133 [96] sub-clause 9.1.7).

Table 136. *rsrq*

Value	Description
0	rsrq < -19.5 dB
1	-19.5 dB ≤ rsrq < -19 dB
2	-19 dB ≤ rsrq < -18.5 dB
...	...
32	-4 dB ≤ rsrq < -3.5 dB
33	-3.5 dB ≤ rsrq < 3 dB
34	-3 dB ≤ rsrq
255	Not known or not detectable

rsrp

Integer. Reference signal received power (see 3GPP TS 36.133 [96] sub-clause 9.1.4).

Table 137. *rsrp*

Value	Description
0	rsrp < -140 dBm
1	-140 dBm ≤ rsrp < -139 dBm
2	-139 dBm ≤ rsrp < -138 dBm
...	...
95	-46 dBm ≤ rsrp < -45 dBm
96	-45 dBm ≤ rsrp < -44 dBm
97	-44 dBm ≤ rsrp
255	Not known or not detectable

Indicator Control: AT+CIND

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CIND=	OK
AT+CIND=[<ind>[,<ind>[,...]]]	+CME ERROR:<err>
AT+CIND?	+CIND:<ind>[,<ind>[,...]] +CME ERROR:<err>
AT+CIND=?	+CIND: ("battchg",(0)),("signal",(0)), ("service",(0,1)),("sounder",(0)),("message",(0)), ("call",(0)),("vox",(0)),("roam",(0,1)), ("smsfull",(0)),("inputstatus",(0)), ("simsmsfull",(0-2))

Description

The set command has no effect and trying to set any value returns ERROR

The read command returns the status of MT indicators. If the MT is not currently reachable, +CME ERROR: <err> is returned.

The test command returns pairs, where string value <*descr*> (maximum 16 characters) is the description of the indicator and the compound value are the allowed values for the indicator. If the MT is not currently reachable, +CME ERROR: <err> is returned.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Note: MT manufacturer should offer the description of supported indicators not listed here and their value ranges and default values.

Defined Values

ind

Integer. Must be in the range of the corresponding <*descr*>.

descr

String. Values reserved by the present document and their <*ind*> ranges.

Note: "battchg", "sounder", "call", "vox", "inputstatus" are currently not supported.

Table 138. *descr*

Value	Description
"battchg"	Battery charge level (0..5)
"signal"	Signal quality (0..5)
"service"	Service availability (0,1)
"sounder"	Sounder activity (0, 1)
"message"	Message received (0, 1)
"call"	Call in progress (0, 1)
"vox"	Transmit activated by voice activity (0..1)
"roam"	Roaming indicator (0, 1)
"smsfull"	The short message memory storage in the MT is full and a short message has been rejected (2), is full (1), or not full (0)
"inputstatus"	keypad/touch screen status (0, 1)

Mobile Termination Error Result Code: +CME ERROR

Note: This command is described in *3GPP TS 27.007*. The error codes reported here are from *3GPP TS 27.007* and *3GPP TS 27.005*. See Section *References*.

Syntax

	Possible Response(s)
	`+CME ERROR:` *<err>*

Description

`+CME ERROR: <err>` final result code is similar to the regular `ERROR` result code if `+CME ERROR: <err>` is the result code of any of the commands in a command line and none of the following commands in the same command line is executed (neither `ERROR` nor `OK` result code shall be returned as a result of a completed command line execution). The format of `<err>` can be either numeric or verbose. This is set with the command `AT+CMEE`, see Section Report Mobile Termination Error: AT+CMEE *(on page 297)*.

CME/CMS Error Defined Values

err

Integer. Error code.

Table 139. General "CME ERROR" Codes (3GPP TS 27.007)

Code	Description
0	Equipment Failure
1	No Connection
2	Phone Adaptor Link Reserved
3	Operation Not Allowed
4	Operation Not Supported
5	PH-SIM PIN Required
6	PH-FSIM PIN Required
7	PH-FSIM PUK Required
10	SIM Not Inserted (see Note 1)
11	SIM PIN Required
12	SIM PUK Required
13	SIM Failure (See Note 1)
14	SIM Busy (See Note 1)
15	SIM Wrong (See Note 1)
16	Incorrect Password
17	SIM PIN2 Required
18	SIM PUK2 Required

Table 139. General "CME ERROR" Codes (3GPP TS 27.007) (continued)

Code	Description
20	Memory Full
21	Invalid Index
22	Not Found
23	Memory Failure
24	Text String Too Long
25	Invalid Characters in Text String
26	Dial String Too Long
27	Invalid Characters in Dial String
30	No Network Service
31	Network Timeout
32	Network Not Allowed - Emergency Calls Only
40	Network Personalisation PIN Required
41	Network Personalisation PUK Required
42	Network Subset Personalisation PIN Required
43	Network Subset Personalisation PUK Required
44	Service Provider Personalisation PIN Required
45	Service Provider Personalisation PUK Required
46	Corporate personalisation PIN Required
47	Corporate Personalization PUK Required
48	Hidden Key Required (See Note 2)
49	EAP Method Not Supported
50	Incorrect Parameters
60	System Failure
100	Unknown Error
528	Upgrade Failed: General Error
529	Upgrade Failed: Corrupted Image.
530	Upgrade Failed: Invalid Signature
531	Upgrade Failed: Network Error
532	Upgrade Failed: Upgrade Already in Progress
533	Upgrade Cancel Failed: No Upgrade in Progress
540	HW Configuration Failed: General Error
541	HW Configuration Failed: Invalid Function
542	HW Configuration Failed: Invalid Function Parameter
543	HW Configuration Failed: Pin(s) Already Assigned to Another Function

Note 1: This error code is also applicable to UICC.

Note 2: This key is required when accessing hidden phonebook entries.

Table 140. EPS Related "CME ERROR" Codes (3GPP TS 27.007) - Perform an Attach

Code	Description
103	Illegal MS (#3)
106	Illegal ME (#6)
107	GPRS Services Not Allowed (#7)
108	GPRS Services and Non-GPRS Services Not Allowed (#8)
111	PLMN Not Allowed (#11)
112	Location Area Not Allowed (#12)
113	Roaming Not Allowed in This Location Area (#13)
114	GPRS Services Not Allowed in This PLMN (#14)
115	No Suitable Cells in Location Area (#15)
122	Congestion (#22)
125	Not Authorized for This CSG (#25)
172	Semantically Incorrect Message (#95)
173	Mandatory Information Element Error (#96)
174	Information Element Non-Existent or Not Implemented (#97)
175	Conditional IE Error (#99)
176	Protocol Error, Unspecified (#111)

Note: Values in parentheses are 3GPP TS 24.008 [8] cause codes.

Table 141. EPS Related "+CME ERROR" Codes (3GPP TS 27.007) - Activate a Context

Code	Description
126	Operation Temporarily Not Allowed
127	Missing or Unknown APN (#27)
128	Unknown PDP Address or PDP Type (#28)
129	User Authentication Failed (#29)
130	Activation Rejected by GGSN, Serving GW or PDN GW (#30)
131	Activation Rejected, Unspecified (#31)
132	Service Option Not Supported (#32)
133	Requested Service Option Not Subscribed (#33)
134	Service Option Temporarily Out of Order (#34)
140	Feature Not Supported (#40)
141	Semantic Error in the TFT Operation (#41)

Table 141. EPS Related "+CME ERROR" Codes (3GPP TS 27.007) - Activate a Context (continued)

Code	Description
142	Syntax Error in the TFT Operation (#42)
143	Unknown PDP Context (#43)
144	Semantic Errors in Packet Filter(s) (#44)
145	Syntax Errors in Packet Filter(s) (#45)
146	PDP Context Without TFT Already Activated (#46)
149	PDP Authentication Failure
177	Operator Determined Barring (#8)
178	Maximum Number of PDP Contexts Reached (#65)
179	Requested APN Not Supported in Current RAT and PLMN Combination (#66)
180	Request Rejected, Bearer Control Mode Violation (#48)
181	Unsupported QCI Value (#83)

Note 1: Values in parentheses are 3GPP TS 24.008 [8] cause codes.

Note 2: Values in parentheses for error code 181 are 3GPP TS 24.301 [83] cause codes.

Table 142. EPS Related "+CME ERROR" Codes (3GPP TS 27.007) - Disconnect a PDN

Code	Description
171	Last PDN Disconnection Not Allowed (#49)

Note 1: This error is returned when the MT detects an attempt to disconnect the last PDN or the network returns a response message with cause value #49.

Note 2: Values in parentheses are 3GPP TS 24.301 [83] cause codes.

Note 3: The numeric error code for 'Last PDN disconnection not allowed (#49)' changed to 171 since 3GPP Rel 11.

Table 143. Other Proprietary Error Codes

Code	Description
550	Cell Info Reporting Failure, Incorrect/Inconsistent Parameters
551	Cell Info Reporting Failure, MT Not Registered and Not Searching
552	Cell Info Reporting Failure, MT Searching for Network
553	Cell Info Reporting Failure, MT out of Coverage
554	Cell Info Reporting Failure, Cell Measurements Temporary Unavailable
555	Cell Info Reporting Failure, Unknown Error
570	Coverage Enhancement Mode Information Not Available
580	HTTP Failure, Incorrect Connection HTTP Profile Parameters
581	HTTP Failure, Incorrect Connection Security Profile Parameters

Table 143. Other Proprietary Error Codes (continued)

Code	Description
582	HTTP Failure, MT not Registered and not Searching
583	HTTP Failure, MT Searching for Network
584	HTTP Failure, MT out of Coverage
585	HTTP Failure, Unknown Network Error
586	HTTP Failure, Connection Error (See the `+SQNHTTPSH` Notification for Failure Cause)
587	HTTP Failure, Internal Data Buffer Full
588	HTTP Failure, No Pending Data
589	Dual mode not configured
591	Device is in active state
650	No Existing Restoration Point. FS Flushed. Hardware Configuration Unchanged
651	Unable to Restore Module Configuration (Data Corrupted)

Mobile Termination Event Reporting: AT+CMER

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

See the current implementation limitation in the parameters description.

Syntax

Command	Possible Response(s)
AT+CMER=*[<mode>[,<keyp>[,<disp>[,<ind>[,<bfr>[,<tscrn>][,<orientation>]]]]]]*	OK +CME ERROR:*<err>*
AT+CMER?	+CMER:*<mode>*, *<keyp>*, *<disp>*, *<ind>*,*<bfr>*,*<tscrn>*, *<orientation>*
AT+CMER=?	+CMER: *(list of supported <mode>s), (list of supported <keyp>s), (list of supported <disp>s), (list of supported <ind>s), (list of supported <bfr>s), (list of supported <tscrn>s), (list of supported <orientation>s)*

Description

This command enables or disables sending of unsolicited result codes from TA to TE in the case of keystrokes, display changes, and indicator state changes. *<mode>* controls the processing of unsolicited result codes specified within this command. *<bfr>* controls the effect on buffered codes when *<mode>* 1, 2 or 3 is entered. If setting is not supported by the MT, +CME ERROR: <err> is returned.

The test command returns the modes supported as compound values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

Defined Values

CAUTION: Restriction: only the following parameters are supported:

- **<mode>: '3'**
- **<keyp>: '0'**
- **<disp>: '0'**
- **<ind>: '0' or '1' or '2'**

  When <*ind*> is set to '1' or '2', the URC `+CIEV` is used (when supported). Only the notifications 'SERVICE', 'SMS FULL' and 'ROAMING' are supported. 'SMS FULL' is a proprietary notification.

- **<bfr>: '0'**
- **<tscrn>: '0'**

The parameter <*orientation*> is not supported.

mode

Integer: 0, 1, 2 or 3.

Table 144. *mode*

Value	Description
0	Buffer unsolicited result codes in the TA; if the TA result code buffer is full, codes can be buffered somewhere else or the oldest ones can be discarded
1	Discard unsolicited result codes when TA-TE link is reserved (e.g. in online data mode); otherwise forward them directly to the TE
2	Buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g. in online data mode) and flush them to the TE after reservation; otherwise forward them directly to the TE
3	Forward unsolicited result codes directly to the TE; TA-TE link specific in-band technique used to embed result codes and data when TA is in online data mode

keyp

Integer: 0, 1 or 2.

Table 145. *keyp*

Value	Description
0	No keypad event reporting
1	Keypad event reporting using unsolicited result code `+CKEV`: <*key*>,<*press*>. <*key*> indicates the key (refer to IRA values defined in table 67 in sub-clause 'Keypad control `AT+CKPD`') and <*press*> the action (1 = key pressed and 0 = key released). Only the keystrokes not caused by `AT+CKPD` are indicated by the TA to the TE. Note 1: When this mode is enabled, all keys currently pressed are reported to the TA regardless of the <*bfr*> value.

Table 145. *keyp* (continued)

Value	Description
2	Keypad event reporting using they unsolicited result code +CKEV: <*key*>,<*press*>. All key pressings are directed from TA to TE. Note 2: When this mode is enabled, all keys currently pressed are reported to the TA regardless of the <*bfr*> value.

disp

Integer: 0, 1 or 2.

Table 146. *disp*

Value	Description
0	No display event reporting
1	Display event reporting using the unsolicited result code +CDEV: <*elem*>,<*text*>. <*elem*> indicates the element order number (as specified for AT+CDIS) and <*text*> is the new value of the text element. Only the display events not caused by AT+CDIS are indicated by the TA to the TE. The character set used in <*text*> is specified by the command Select TE Character Set AT+CSCS
2	Display event reporting using the unsolicited result code +CDEV: <*elem*>,<*text*>. All display events are directed from TA to TE. The character set used in <*text*> is specified by the command Select TE Character Set AT+CSCS

ind

Integer: 0, 1 or 2. Event indicator.

Table 147. *ind*

Value	Description
0	No indicator event reporting
1	Indicator event reporting using the unsolicited result code +CIEV: <*ind*>,<*value*>. <*ind*> indicates the indicator order number (as specified for +CIND) and <*value*> is the new value of indicator. Only those indicator events, which are not caused by +CIND, are indicated by the TA to the TE
2	Indicator event reporting using the unsolicited result code +CIEV: <*ind*>,<*value*> (when supported). All indicator events shall be directed from TA to TE.

bfr

Integer: 0 or 1.

Table 148. *bfr*

Value	Description
0	The TA buffer of unsolicited result codes defined with this command is cleared when <*mode*> 1, 2 or 3 is entered.
1	The TA buffer of unsolicited result codes defined within this command is flushed to the TE when <*mode*> 1, 2 or 3 is entered (OK response is given before flushing the codes)

tscrn

Integer: 0..6. Touch screen event.

Table 149. *tscrn*

Value	Description
0	No touch screen event reporting
1	Touch screen event reporting using the unsolicited result code `+CTEV: <action>,<x>,<y>.` The <*x*>,<*y*> parameters indicate the x, y coordinates on the touch screen device (as specified for `AT+CTSA`), and <*action*> indicates the action performed on the screen (0 for screen released, 1 for screen depressed, 2 for single tap, and 3 for double tap). Only the touch screen events not caused by `AT+CTSA` are indicated by the TA to the TE. Note 3: When this mode is enabled, the corresponding result codes of all touch screen actions are flushed to the TA regardless of the <*bfr*> setting.
2	Touch screen event reporting using the unsolicited result code `+CTEV: <action>,<x>,<y>`. All touch screen events shall be directed from the TA to the TE. When this mode is enabled, the corresponding result codes of all touch screen actions are flushed to the TA regardless of the `<bfr>` setting.
3	Verbose mode. Touch screen event reporting using the unsolicited result code `+CTEV: <action>,<x>,<y>`. This is a special mode where intermediate depressed result codes (`+CTEV: 1,<x>,<y>`) are generated for each new <*x*>,<*y*> coordinate detected while a user is dragging a touch to a new location. All other touch screen actions shall be directed from the TA to the TE normally. Only the touch screen events not caused by `AT+CTSA` are indicated by the TA to the TE. Note 5: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of the <*bfr*> setting.
4	Enhanced touch screen event reporting using the unsolicited result code `+CTEV: <action>,<x>,<y>,<id>[,<duration>]`. The <*x*>,<*y*> parameters indicate the x, y coordinates on the touch screen device (as specified for `+CTSA`), the <*duration*> parameter indicates the duration of the touch (as specified for `AT+CTSA`) and, the <*id*> identifies any simultaneous touch (as specified for `AT+CTSA`). Only the touch screen events not caused by AT+CTSA are indicated by the TA to the TE. The <*action*> parameter indicates the action performed on the screen, if the <*duration*> parameter is: • 0, it is valid for the <*action*> parameter to indicate 0 for screen released, 1 for screen depressed, 2 for single tap, and 3 for double tap; • A positive, non-zero integer, it is valid for the <*action*> parameter to indicate 0 for screen released. Note 6: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <*bfr*> setting.
5	Enhanced touch screen event reporting using the unsolicited result code `+CTEV: <action>,<x>,<y>,<id>[,<duration>]`. See description of <*tscrn*> set to 4 for the valid for the <*action*> parameter. All touch screen events shall be directed from the TA to the TE. Note 7: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <*bfr*> setting.

Table 149. *tscrn* (continued)

Value	Description
6	Verbose mode. Enhanced touch screen event reporting using the unsolicited result code `+CTEV: <action>,<x>,<y>,<id>[,<duration>]`. This is a special mode where intermediate depressed result codes (`+CTEV: 1,<x>,<y>,<id>[,<duration>]`) are generated for each new <*x*>,<*y*> coordinate detected while a user is dragging a touch to a new location. All other touch screen actions are directed from the TA to the TE normally. See description of <*tscrn*> set to 4 for the <*action*> parameter. Only the touch screen events not caused by `AT+CTSA` are indicated by the TA to the TE. Note 8: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <*bfr*> setting.

Modem statistics: AT+SQNRXTXSTATS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNRXTXSTATS=<*enable*>, <*reset*>	OK ERROR
AT+SQNRXTXSTATS?	ERROR AT+SQNRXTXSTATS=<enable>, <rx_time>, <tx_time>, <tx_time23>, <tx_time22>, <tx_time21>, <tx_time20>, <tx_time19>, <tx_time18>, <tx_ <tx_time12>, <tx_time9>, <tx_time6>, <tx_time3>, <tx_time0> OK
AT+SQNRXTXSTATS=?	+SQNRXTXSTATS:(0-1),(0-1)

Description

This AT command displays statistics about the modem time spent in the various active modes.

The command enables or disables the feature and optionally indicates if the collected statistics are reset after every read. These settings survive reboots.

Note: The command configuration and statistics are lost after HW resets and FATALs.

The read command returns ERROR if the facility is disabled. Otherwise, it provides the number of milliseconds the modem has spent in Rx and Tx, as well as the average Tx output power. The statistics are computed from the feature's enable time or from the last call. The command resets the statistics if <*reset*> is set to 1 (AT +SQNRXTXSTATS=1,1). The respective times are tallied using 32-bit unsigned integers with no roll-over (the counters block at 0xFFFFFFFF). This ceiling can be reached if statistics are not reset for about ~49 days of continuous operation.

The statistics can be read at any time if <*enable*> is 1, otherwise the command returns ERROR.

If the modem has never attached to the network, all values are set to 0.

The statistics are kept when modem goes into deep sleep or SW reboots.

Defined Values

enable

Integer: 0 or 1. 1 to enable to collection of statistics, 0 to disable it (default).

reset

Integer: 0 or 1. Whether to reset (1) or not (0, default) the statistics each time their values are read

rx_time

Integer. Number of milliseconds (subframes) the modem has spent in reception

tx_time

Integer. Number of milliseconds (subframes) the modem has spent in transmission

tx_time23

Integer. Number of milliseconds (subframes) the modem has spent in transmission with power > 22 dBm

tx_time22

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 22 dBm ≥ power > 21 dBm

tx_time21

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 21 dBm ≥ power > 20 dBm

tx_time20

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 20 dBm ≥ power > 19 dBm

tx_time19

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 19 dBm ≥ power > 18 dBm

tx_time18

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 18 dBm ≥ power > 17 dBm

tx_time17

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 17 dBm ≥ power > 16 dBm

tx_time16

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 16 dBm ≥ power > 15 dBm

tx_time15

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 15 dBm ≥ power > 12 dBm

tx_time12

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 12 dBm ≥ power > 9 dBm

tx_time9

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 9 dBm ≥ power > 6 dBm

tx_time6

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 6 dBm ≥ power > 3 dBm

tx_time3

Integer. Number of milliseconds (subframes) the modem has spent in transmission with 3 dBm ≥ power > 0 dBm

tx_time0

Integer. Number of milliseconds (subframes) the modem has spent in transmission with power ≤ 0 dBm

Phone Activity Status: AT+CPAS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CPAS	+CPAS:<*pas*> +CME ERROR:<*err*>
AT+CPAS=?	+CPAS:*list of supported* <*pas*>*s* +CME ERROR:<*err*>

Description

This command returns the activity status <*pas*> of the MT. It can be used to ask the MT before requesting action from the phone.

The test command returns values supported by the MT as a compound value.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Although this command was originally designed for voice calls, it also works for data connections.

Defined Values

pas

Integer: 0..128.

CAUTION: Only the 0, 4 and 5 values are currently implemented. All other values are reserved.

Table 150. *pas*

Value	Description
0	Ready (MT allows commands from TA/TE)
1	Unavailable (MT does not allow commands from TA/TE)
2	Unknown (MT is not guaranteed to respond to instructions)
3	Ringing (MT is ready for commands from TA/TE, but the ringer is active)

Table 150. *pas* (continued)

Value	Description
4	Call in progress (MT is ready for commands from TA/TE, but a call is in progress) / Data connection active
5	Asleep (MT is unable to process commands from TA/TE because it is in a low functionality state)
6..128	Reserved

Report Mobile Termination Error: AT+CMEE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CMEE=<*n*>	+CME ERROR:<*err*>
AT+CMEE?	+CMEE:<*n*>
AT+CMEE=?	+CMEE:(*list of supported* <*n*>*s*)

Description

This command disables or enables the use of final result code +CME ERROR: <err> as an error report related to the functionality of the MT. When enabled, MT related errors cause a +CME ERROR: <err> result code to be sent instead of the regular ERROR code. ERROR is still returned if the error is related to syntax, invalid parameters, or TA functionality.

The test command returns values supported as a compound value.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

n

Integer: 0, 1 or 2. Defines the form of the final result code.

Table 151. *n*

Value	Description
0	Disable +CME ERROR: <err> use and send ERROR instead.
1	Enable +CME ERROR: <err> and use numeric <*err*> values
2	Enable +CME ERROR: <err> result code and use verbose <*err*> values

Retrieve Current GUTI: AT+SQNGUTI

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNGUTI	SQNGUTI:<*plmn*>,<*mmeGrpId*>,<*mmeCode*>,<*mTmsi*> OK

Description

This command reads the Globally Unique Temporary ID (GUTI) assigned to the UE by the network.

This identifier is composed of the:

- PLMN (3 bytes), Public Land Mobile Network: <*plmn*>
- MME Group ID (2 bytes), MME Group Identifier: <*mmeGrpId*>
- MME Code (1 byte), MME Code: <*mmeCode*>
- M-TMSI (4 bytes), MME temporary Mobile Subscriber Identity: <*mTmsi*>

Defined Values

plmn

Numeric. Public Land Mobile Network in hexadecimal format. Empty if unknown.

mmeGrpId

Numeric. MME Group Identifier in hexadecimal format. Empty if unknown.

mmeCode

Numeric. MME Code in hexadecimal format. Empty if unknown.

mTmsi

Numeric. 4 bytes MME temporary Mobile Subscriber Identity in hexadecimal format. Empty if unknown.

Set Phone Functionality: AT+CFUN

Mode	LTE-M – NBIoT
Type	Synchronous / Asynchronous
Prerequisite	–
Time-out	Network dependent
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

See the current implementation limitation in <*fun*> parameter description.

Syntax

Command	Possible Response(s)
AT+CFUN=*[<fun>[,<rst>]]*	+CME ERROR:<*err*>
AT+CFUN?	+CFUN:<*fun*> or +CME ERROR:<*err*>
AT+CFUN=?	+CFUN:*(list of supported <fun>s), (list of supported <rst>s)*

Description

This command selects the level of functionality <*fun*> in the MT. The level 'full functionality' corresponds to the highest power consumption. Conversely, 'Minimum functionality' corresponds to the lowest power consumption. The level of functionality between these can also be specified by manufacturers. When supported by manufacturers, MT resetting with <*rst*> parameter may be utilized.

Note: It is manufacturer specific if this command affects network registration. Command Operator Selection +COPS is used to force registration/deregistration.

The test command returns the values supported by the MT as a compound value.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

CAUTION: Restriction: only levels 0, 1, 4 and 5 can be set.

- AT+CFUN=0 **is used to configure the minimum functionality level;**
- AT+CFUN=1 **is used to configure the full functionality level;**
- AT+CFUN=4 **disables the RF interface. In this mode, access to the SIM card is still possible;**
- AT+CFUN=5 **is used to enable the Manufacturing Mode.**

fun

Integer: 0, 1, 4 or 5. Functionality code (A/S = Asynchronous/Synchronous):

Table 152. *fun*

Value	A/S	Description
0	S	Minimum functionality
1	A	Full functionality
2, 3		Reserved
4	S	Disable RF
5	S	Disable RF and enable manufacturing mode. Mandatory to use manufacturing AT commands (see Section Manufacturing Commands).
…12		Reserved

Important: Since `AT+CFUN=1` is asynchronous, the `OK` response does not mean that the UE is attached to the network. The successful attachment is signalled with the subsequent `CEREG` URC.

Important: The `AT+CFUN=0` command is synchronous. The `OK` response is sent once the modem has successfully detached from the network. The `CEREG:0` URC (if enabled) follows immediately after the `OK` response

rst

Integer: 0 or 1. Reset required indication.

Table 153. *rst*

Value	Description
0	Do not reset the MT before setting it to <*fun*> functional level. Note: This shall be always default when <*rst*> is not given.
1	Reset the MT prior to setting it to <*fun*> functional level

Signal Quality: AT+CSQ

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
`AT+CSQ`	`+CSQ:`*<rssi>,<ber>* `+CME ERROR:`*<err>*
`AT+CSQ=?`	`+CSQ:`*(list of supported <rssi>s), (list of supported <ber>s)*

Note: The test command reports unused *<ber>* values. See below.

Description

This command returns received signal strength indication *<rssi>*. The parameter *<ber>* is kept for compatibility reasons but is always set to 99.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

The test command returns values supported as compound values.

Defined Values

rssi

Integer. Received signal strength indicator.

Table 154. *rssi*

Value	Description
0	-113 dBm or less
1	-111 dBm
2 .. 30	-109 to -53 dBm
31	-51 dBm or greater
99	Not known or not detectable

ber

Integer. Channel bit error rate (in percent). Always 99 (‘unknown’).

Support of Cell Monitoring: AT+SQNMONI

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	1 s
Persistency	N/A

Syntax

Command	Possible Response(s)

AT+SQNMONI=<*n*>	• When extracting data for the serving cell and the network name is known:
	`+SQNMONI: <netmame> RSRP:<rsrp> RSRQ:<rsrq> TAC:<tac> Id:<pci> EARFCN:<earfcn> PWR:<dBm> PAGING:<drx> CID:<cid> BAND:<band> BW:<bw> CE:<celevel>`
	• When the network name is unknown:
	`+SQNMONI: Cc:<cc> Nc:<nc> RSRP:<rsrp> RSRQ:<rsrq> TAC:<tac> Id:<pci> EARFCN:<earfcn> PWR:<dBm> PAGING:<drx> CID:<cid> BAND:<band> BW:<bw> CE:<celevel>`
	• When extracting data from neighbour cells:
	`+SQNMONI: RSRP:<rsrp> RSRQ:<rsrq> Id:<pci> EARFCN:<earfcn> PWR:<dBm>`
	• If report type #9 is selected, "`RSRP:<rsrp>`" is replaced by "`RSRP:<rsrp> CINR:<cinr>`"
	• `+CME ERROR: <err>`

AT+SQNMONI?	`+SQNMONI:`<*n*> `OK`
AT+SQNMONI=?	`+SQNMONI:(0,1,2,7,9)` *(list of possible <n>s)* `OK`

Description

This command returns information on the serving and neighbouring cells. It returns an error if the <*n*> parameter is not supported.

Note: The command can also return an error if the modem is not connected to any cell, typically when the `CEREG` status is 0, 2, 4, or 80, or when the UE is in PSM state. An error can also be infrequently generated when the `CEREG` status code is 1 or 5 in the RRC CONNECTED or the RRC IDLE states (not in PSM): this is a temporary failure due to physical measurements retrieval delay. In such case, please retry the command after a few seconds.

The test command returns values supported as a compound value.

See Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for specific <*err*> values.

Defined Values

n

Integer: 0, 1, 2, 7 or 9. Scope of the information request.

Table 155. *n*

Value	Description
0	Report information for the serving cell only.
1	Report information for the intra-frequency cells only.
2	Report information for the inter-frequency cells only.
7	Report information for all cells.
9	Report information for the serving cell only with RSRP/CINR on main antenna.

netname

String. Name of network operator.

cc

String (3 digits). Country code.

nc

String (3 digits, 2 digits in Japan). Network operator code.

n

String. Progressive number of adjacent cell.

pci

Integer: 0..503. Physical Cell ID determined by PSS (Primary Sync Signal) and SSS (Secondary Sync Signal) signal decoding.

pwr

Float. Received signal strength (RSSI) in dBm.

rsrp

Float (format -xyz.vd. Max. 7 characters, "-" and "." included). Reference Signal Received Power.

cinr

Float. Carrier to Interference-plus-Noise Ratio. This is equivalent to 3GPP `RS-SINR`.

rsrq

Float (format -xy.vd. Max. 6 characters, "-" and "." included). Reference Signal Received Quality.

tac

String (representing a value from 1 to 65534). Tracking Area Code.

earfcn

Integer: 0..70545. E-UTRA Assigned Radio Channel.

cid

Integer in hexadecimal. 28-bit E-UTRAN Cell Identity as advertised in SIB1 (System Information Block Type 1).

band

Integer. Band number as defined by 3GPP standard TS 36.101.

bw

Integer. Downlink bandwidth in kHz.

paging

Integer. DRX cycle in number of radio frames (1 frame = 10 ms).

celevel

Integer: 0..3.

Table 156. celevel

Value	Description
0	CE level 0 (applicable to LTE-M and NB-IoT).
1	CE level 1 (applicable to LTE-M and NB-IoT).
2	CE level 2 (applicable to NB-IoT only in this software release).
3	Reserved.

Time synchronisation with NTP: AT+SQNNTP

Syntax

Command	Possible Response(s)
OK ERROR +CME ERROR: <*err*>	
AT+SQNNTP=<*cmd*>[,<*serverList*> ,[<*autosetTime*>][,[<*tz*>][,[<*cid*>][,[<*cnx_to*>]]]]]	OK ERROR +CME ERROR: <*err*>
AT+SQNNTP?	+SQNNTP:<*state*>, <*serverList*>, <*autosetTime*>, <*tz*>, <*cid*>, <*cnx_to*>
AT+SQNNTP=?	+SQNNTP: (0-2),"serverList"[,[(0-1)][,[(-48-56)][,[(1-8)][,[(0-180)]]]]]

Description

The AT+SQNNTP command synchronises the local clock with a reference time server using NTP (Network Time Protocol). An application can request NTP synchronisation at any time using the AT+SQNNTP=2,… command. This command is asynchronous: after NTP synchronization is complete, the module sends the "+SQNNTP: <status>[,<time>]" URC.

Before launching an NTP synchronization, the application must activate the modem (AT+CFUN=1 *(on page 299)*), wait for the registration to complete and IP connectivity to be up, otherwise the request returns ERROR. The application must provide one to three time servers: if none is given the command returns ERROR . Examples of such servers are: time.esa.int, time.nist.gov, time.google.com, time.apple.com, ntp.obspm.fr or pool.ntp.org. if no port number is provided, 123 is used. The NTP client sequentially requests UTC from each server (in configuration order), stopping as soon as a valid time stamp is received.

The NTP client compensates for the NTP request/response transmission latency, but does not apply any complex time stamp selection, combining or filtering algorithm. Expected accuracy is in the order of a second.

Important: Neither time zone nor daylight saving time information is delivered by NTP servers. The application can provide this information using the Clock: AT+CCLK *(on page 39)*, or as the optional <*tz*> parameter of an AT+SQNNTP command.

Important: This automatic mode is not yet implemented. Setting <*cmd*> to 1 currently returns ERROR.

Local time can be obtained using the Clock: AT+CCLK *(on page 39)*command.

NTP configuration is persistent (survives device reboots and all power states), and changes are applied immediately.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The read command returns the current reporting settings in the MT.

The test command returns the supported <*reporting*>-values.

Note: Time Zone reporting is not affected by the Automatic Time Zone setting command, Automatic Time Zone Update: AT+CTZU *(on page 275)*.

Defined Values

cmd

Integer: 0, 1 or 2. NTP service control command.

Table 157. *cmd*

Value	Description
0	On-demand mode. Synchronous execution.
1	**NOT IMPLEMENTED** Enable automatic time update. The NTP client automatically queries for UTC time whenever required. The command is asynchronous, sending a `+SQNNTP` notification at each time update completion (success or failure).
2	On-demand mode. Command is asynchronous, returning `+SQNNTP` notification after completion (success or failure).

state

Integer: 0 or 1. NTP automatic time update service activation state.

Table 158. *state*

Value	Description
0	Automatic time update is disabled
1	Reserved for future use

autosetTime

Integer: 0 or 1. Update policy.

Table 159. *autosetTime*

Value	Description
0	Local time is unchanged after the NTP query.
1	Local time is automatically set to the NTP query response.

serverList

String. Comma separated value of NTP servers to query. An empty string triggers `ERROR`. If the port number is not provided, 123 is used. See description above for examples of well-known NTP servers. Default value: pool.ntp.org

tz

Integer: -48..56. Represents the local time zone offset w/r to UTC measured in quarters of an hour, plus the additional daylight saving time offset. If this parameter is omitted, the current system time zone is used (see `AT+CCLK`).

cid

Integer: 1..8. PDP Context identifier. The default value points to the Internet PDN. It is not recommended to set this parameter, except in advanced usage.

cnx_to

Integer: 0..180. Query timeout. This includes any required DNS resolution. Defaults to 30 seconds.

status

Integer: 0..6. NTP query response code

Table 160. *status*

Value	Description
0	OK
1	Connection timed out
4	DNS error
5	NTP error
6	Unknown network error

time

String. Computed local time in"yy/mm/dd,hh:mm:ss±zz" format, indicating year (two last digits), month, day, hour, minutes, seconds and time zone (offset, expressed in quarters of an hour, between the local time and GMT; range -48..+56). E.g. May 6th, 2021, 22:10:00 GMT+2 is written as '21/05/06,22:10:00+08'.

Specific +CME ERROR error codes

This command can return specific extended error codes.

Table 161. +CME ERROR specific error codes

Code	Meaning
570	NTP failure, MT not registered and not searching (CEREG = 0)
571	NTP failure, MT searching for network (CEREG = 2)
572	NTP failure, MT out of coverage (CEREG = 4 or 80)
573	NTP failure, unknown cause

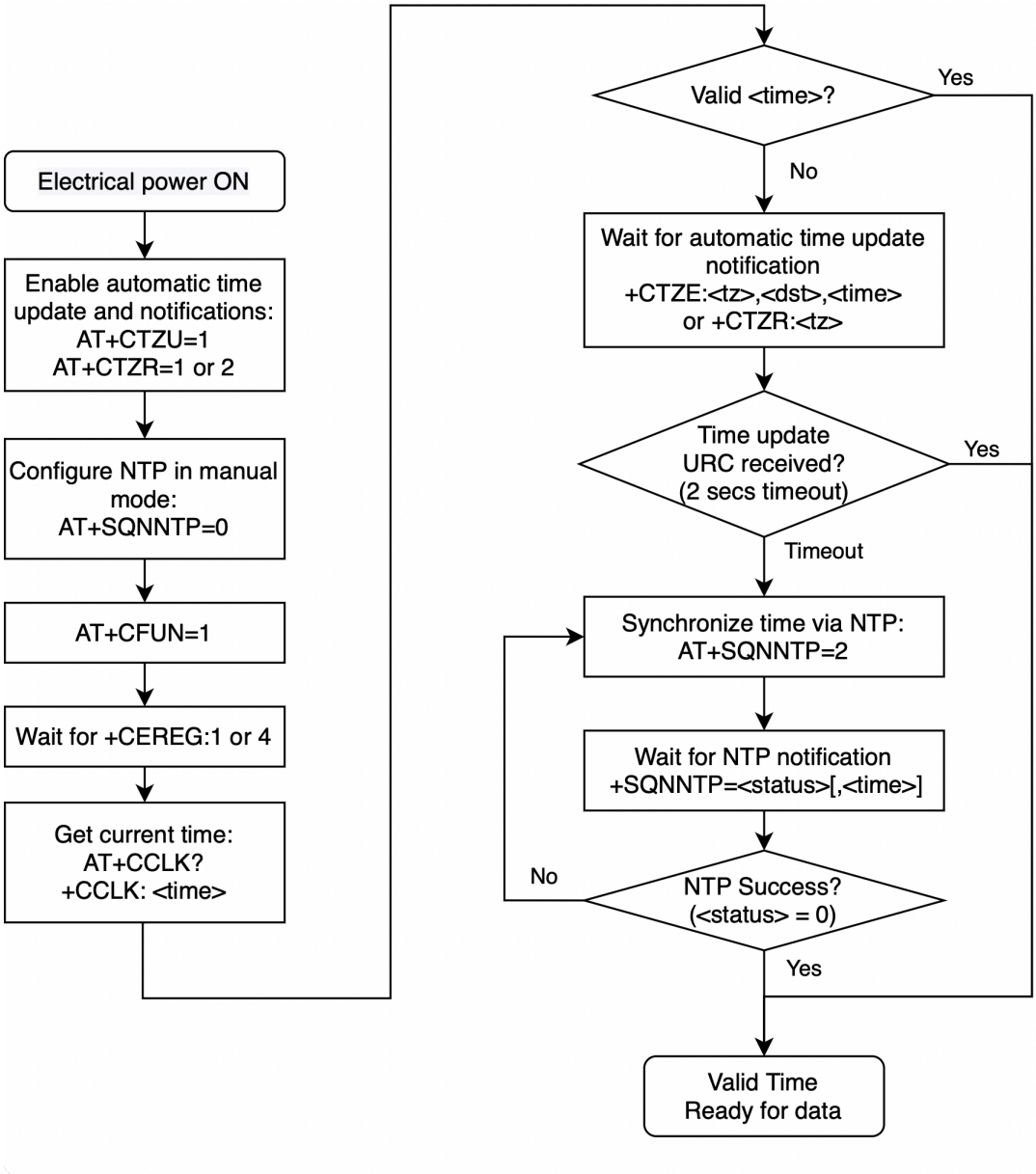
Recommended Time Synchronisation Process

Sequans's recommendation is to rely on cellular native solutions (SIB16, NITZ) to acquire local time, since these methods do not require any user action and can be done at no cost. Only if the network does not support these protocols shall NTP be used to acquire UTC time.

The user can trigger a NTP request, performed as soon as the registration is complete, to acquire the current UTC value if the RTC is blatantly adrift (for example if the year returned is 2020 or before). Compared to an automated process, the on-demand mode speeds up the setting, at the risk of triggering a useless NTP session if the time from SIB16 and/or NITZ becomes available before the NTP query concludes. Unfortunately, once initiated, an NTP query (including DNS and NTP transactions) cannot be aborted.

As a last option, the user can simply use the `AT+CCLK` command to set the modem's clock to a local time obtained from another source (external RTC, GNSS, etc.).

Figure 1. Recommended time synchronisation process



Note: This section will be updated when the automatic NTP adjustment option is implemented.

Time Zone Reporting: AT+CTZR

Mode	LTE-M – NBIoT
Type	Synchronous / Asynchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CTZR=<*reporting*>	+CME ERROR: <*err*>
AT+CTZR?	+CTZR:<*reporting*> +CME ERROR:<*err*>
AT+CTZR=?	+CTZR:(*list of supported* <*reporting*>*s* +CME ERROR: <*err*>

Description

This set command controls the time zone change event reporting. If the reporting is enabled, the MT returns the unsolicited result code +CTZV: <tz>, or +CTZE: <tz>,<dst>,[<time>] whenever the time zone is changed. The MT also provides the time zone upon network registration if provided by the network. If setting fails in an MT error, +CME ERROR: <err> is returned.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The read command returns the current reporting settings in the MT.

The test command returns the supported <*reporting*>-values.

Note: Time Zone reporting is not affected by the Automatic Time Zone setting command, Automatic Time Zone Update: AT+CTZU *(on page 275)*.

Defined Values

reporting

Integer: 0, 1 or 2.

Table 162. *reporting*

Value	Description
0	Disable time zone change event reporting.
1	Enable time zone change event reporting using the URC +CTZV: <tz>.

Table 162. *reporting* (continued)

Value	Description
2	Enable extended time zone and time adjustment reporting using the URC `+CTZE: <tz>,<dst>,[<time>]`.

tz

String. Sum of the local time zone (difference between the local time and GMT expressed in quarters of an hour) plus daylight saving time. The format is "±zz", expressed as a fixed width, two digit integer in the range -48 to +56. To maintain a fixed width, numbers in the range -9 to +9 are sent with a leading zero, e.g. "-09", "+00" and "+09".

dst

Integer: 0, 1 or 2. Value indicating whether <*tz*> includes daylight saving time (DST) adjustment.

Table 163. *dst*

Value	Description
0	<*tz*> includes no adjustment for Daylight Saving Time
1	Includes +1 hour (equals 4 quarters in <*tz*>) adjustment for DST
2	`<tz>` includes +2 hours (equals 8 quarters in <*tz*>) adjustment for DST

time

String. Local time. The format is "YYYY/MM/DD,hh:mm:ss", expressed as integers representing the year (YYYY), month (MM), date (DD), hour (hh), minute (mm) and second (ss). This parameter can be provided by the network when delivering time zone information and will be present in the extended time zone reporting unsolicited result code (if provided by the network).

Unsolicited Result Codes: +CTZE, +CTZV

URC	Description
`+CTZE:`<*tz*>,<*dst*>,[<*time*>]	If reporting is enabled and according to the value of <*reporting*> (1 or 2), the MT returns the unsolicited result code `+CTZV: <tz>` or `+CTZE:<tz>,<dst>,[<time>]` whenever the time zone is changed or, for <*reporting*>=2, when a time adjustment results in a leap grater than 10 seconds. The MT also provides the time zone upon network registration, if provided by the network.
`+CTZV:`<*tz*>	

Chapter 13. Network Service Commands

4G LTE Band Selection: AT+SQNBANDSEL

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNBANDSEL=<*rat*>,<*operator*>,<*bandList*>	OK
AT+SQNBANDSEL?	+SQNBANDSEL:<*rat1*>,<*operator1*>,<*bandList*> +SQNBANDSEL:<*rat1*>,<*operator2*>,<*bandList*> … +SQNBANDSEL:<*rat2*>,<*operator1*>,<*bandList*> +SQNBANDSEL:<*rat2*>,<*operator2*>,<*bandList*> … OK
AT+SQNBANDSEL=?	+SQNBANDSEL:*(list of supported <rat>s),* *(list of supported <operator>s),(list of hardware supported bands)* OK

Description

This command enables the user to specify a list of 4G LTE bands the modem is allowed to use for different Radio Access Technologies (RATs) during all cell search operations (initial scanning, cell drop scanning, cell reselection, handover, etc.) for identified <*rat*> and <*operator*>. New configuration is saved in non-volatile memory and applied at next device registration to network.

For a given pair of <*rat*> and <*operator*>, the list of enabled bands is given by the <*bandList*> parameter containing comma-separated list of LTE band numbers as defined by 3GPP standard TS 36.101 (4G). Any LTE band not part of <*bandList*> is considered as deactivated.

Default authorized band per `<rat>` and `<operator>` mode is defined as:

- `standard`: equal to device's supported bands as declared in the device's bootrom
- `MNO/MVNO`: list of bands enabled by carrier

Trying to configure a <*bandList*> containing band(s) not supported in the product variant causes the AT command to reject the configuration request and respond with an `ERROR` message.

The test command reports the list of supported <*rat*> and <*operator*> as well as the list of 4G LTE bands supported by the device (Hardware capabilities).

The read command reports the list of authorized band configuration per <*rat*> and <*operator*>.

Caveats:

- This AT command should be used only to limit the bands to be scanned compared to default configuration.
- The number of bands that can enabled is limited to the maximum number of bands that can be read by `AT+SQNBANDSEL=?`. Additional bands above this number will be ignored.
- Changing the list of bands for a RAT different from what the module currently operates in returns `ERROR`. To change the RAT, see AT+SQNMODEACTIVE *(on page)*.

Defined Values

rat

Integer: 0 or 1. Radio Access Technology.

Table 164. *rat*

Value	Description
0	LTE-M
1	NB-IoT

operator

String. Operator mode.

Table 165. *operator*

Value	Description
"3GPP"	Default mode if the operator is unknown (no SIM card, etc)
"operator name"	"Operator name" mode

bandlist

String. List of authorized LTE bands, comma separated.

For instance: `"5,3,8"`.

Allow Partial Enabling/Disabling of +CEREG: AT +SQNCEREGSELECT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNCEREGSELECT=<*n*>,<*stat*>	OK ERROR
AT+SQNCEREGSELECT?	+SQNCEREGSELECT: list of enabled <*stat*>

Description

While the AT+CEREG *(on page)* command allows global activation and deactivation of the +CEREG URC, it is not possible to cherry-pick specific <*stat*> values. AT+SQNCEREGSELECT offers a fine-grained activation/deactivation of +CEREG at the <*stat*> level.

If +CEREG notifications are disabled by AT+CEREG=0 *(on page)*, no +CEREG URC is emitted, irrespective of any AT+SQNCEREGSELECT setting. If, on the contrary, +CEREG notifications have been allowed by a prior call to AT +CEREG=n *(on page)* with n ≠ 0, then only those notifications enabled with AT+SQNCEREGSELECT are raised.

AT+SQNCEREGSELECT settings persist at reboot and over upgrades.

Defined Values

n

Integer: 0 or 1. Enable (1) or disable (0) the +CEREG URC for the given <*stat*>.

stat

Integer: 0..10 or 80. Indicates the EPS registration status.

Attention: Only 80 is currently supported.

Value	Description
0	Not registered, MT is not currently searching an operator to register to
1	Registered, home network
2	Not registered, but MT is currently trying to attach or searching an operator to register to
3	Registration denied
4	Unknown (e.g. out of E-UTRAN coverage)

Value	Description
5	Registered, roaming
6	Registered for 'SMS only', home network (NB-IoT only)
7	Registered for 'SMS only', roaming (NB-IoT only)
8	Attached for emergency bearer services only (see note below)
9	Registered for 'CSFB not preferred', home network (not applicable)
10	Registered for 'CSFB not preferred', roaming (not applicable)
80	This code is a Sequans's proprietary notification. Registered, temporary connection lost. A PLMN loss indication is received from RRC.

Note: 3GPP TS 24.008 [8] and 3GPP TS 24.301 [83] specify the condition when the MS is considered as attached for emergency bearer services.

By default, all notification are activated:

```
AT+SQNCEREGSELECT?
+SQNCEREGSELECT:0,1,2,3,4,5,6,7,8,9,10,80
```

EPS Network Registration Status: AT+CEREG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CEREG=<*n*>	+CME ERROR:<*err*>
AT+CEREG?	When <*n*>=0, 1, 2 or 3 and command successful: +CEREG:<*n*>,<*stat*>[[,<*tac*>][,<*ci*>][,<*AcT*>[,<*cause_type*>,<*reject_cause*>]] When <*n*>=4 or 5 and command successful: +CEREG:<*n*>,<*stat*>[[,<*lac*>][,<*ci*>][,<*AcT*>][,<*rac*>][[,<*cause_type*>][,<*reject_cause*>] [[,<*Active-Time*>][,<*Periodic-TAU*>]]]]
AT+CEREG=?	+CEREG:*(list of supported <n>s))*

Description

This command controls the presentation of the unsolicited result code +CEREG: <stat> when <*n*>=*1* and there is a change in the MT's EPS network registration status in E-UTRAN, or the unsolicited result code +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]] when <*n*>=*2* and there is a change of the network cell in E-UTRAN. The parameters <*AcT*>, <*tac*> and <*ci*> are sent only if available.

The value <*n*>=*3* further extends the unsolicited result code with *[,<cause_type>,<reject_cause>]*, when available, when the value of <*stat*> changes.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values. The read command returns the status of the result code presentation and an integer <*stat*> which tells whether the network has currently indicated the registration of the MT. Location information elements <*tac*>, <*ci*> and <*AcT*>, if available, are returned only when <*n*>=*2* and the MT is registered on the network.

The parameters *[,<cause_type>,<reject_cause>]*, if available, are returned when <*n*>=*3*.

The test command returns values supported as a compound value.

Defined Values

n

Integer: 0..5.

Table 166. *n*

Value	Description
0	Disable network registration unsolicited result code
1	Enable network registration unsolicited result code `+CEREG: <stat>`
2	Enable network registration and location information unsolicited result code `+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]]`
3	Enable network registration, location information and EMM cause value information unsolicited result code `+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]]`
4	For a UE that wants to apply PSM, enable network registration and location information unsolicited result code `+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,,[,[<Active-Time>],[<Periodic-TAU>]]]]`
5	For a UE that wants to apply PSM, enable network registration, location information and EMM cause value information unsolicited result code `+CEREG:<stat>[,[<tac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<Active-Time>],[<Periodic-TAU>]]]]`

stat

Integer: 0..10 or 80. Indicates the EPS registration status.

Table 167. *stat*

Value	Description
0	Not registered, MT is not currently searching an operator to register to
1	Registered, home network
2	Not registered, but MT is currently trying to attach or searching an operator to register to
3	Registration denied
4	Unknown (e.g. out of E-UTRAN coverage)
5	Registered, roaming
6	Registered for 'SMS only', home network (NB-IoT mode only)
7	Registered for 'SMS only', roaming (NB-IoT mode only)
8	Attached for emergency bearer services only (See note below)
9	Registered for 'CSFB not preferred', home network (not applicable)
10	Registered for 'CSFB not preferred', roaming (not applicable)
80	This code is a Sequans's proprietary notification. Registered, temporary connection lost. A PLMN loss indication is received from RRC.

Note: 3GPP TS 24.008 [8] and 3GPP TS 24.301 [83] specify the condition when the MS is considered as attached for emergency bearer services.

tac

String. Two byte tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal).

ci

String. Four byte E-UTRAN cell ID in hexadecimal format

AcT

Integer: 0..9. The parameter sets/shows the access technology of the serving cell.

Table 168. *AcT*

Value	Description
0	GSM (not applicable)
1	GSM Compact (not applicable)
2	UTRAN (not applicable)
3	GSM w/EGPRS (see NOTE 3) (not applicable)
4	UTRAN w/HSDPA (see NOTE 4) (not applicable)
5	UTRAN w/HSUPA (see NOTE 4) (not applicable)
6	UTRAN w/HSDPA and HSUPA (see NOTE 4) (not applicable)
7	E-UTRAN
9	E-UTRAN (NB-S1 mode)

NOTE 3: 3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.

NOTE 4: 3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

cause_type

Integer: 0 or 1. Indicates the type of <*reject_cause*>.

Table 169. *cause_type*

Value	Description
0	Indicates that <*reject_cause*> contains an EMM cause value, see 3GPP TS 24.301 [83] Annex A.
1	Indicates that <*reject_cause*> contains a manufacturer-specific cause.

reject_cause

Integer. contains the cause of the failed registration. The value is of type as defined by <*cause_type*>.

Active-Time

String. Single byte in an 8 bit format. Indicates the Active Time value (T3324) allocated to the UE in E-UTRAN. The Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. `"00100100"` equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 [8] Table 10.5.163/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82].

Periodic-TAU

String. Single byte in an 8 bit format. Indicates the extended periodic TAU value (T3412) allocated to the UE in E-UTRAN. The extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. `"01000111"` equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82].

Forward Network Reject/Error Codes : AT$ARMEE, $ARME ERROR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	ATT Operator Mode
Time-out	–
Persistency	Not Reboot Persistent

Syntax

Note: This command is implemented according to the requirements written in AT&T's Device Requirements Rev. 21.1 dated February 26th, 2021.

Command	Possible Response(s)
AT$ARMEE=*[<n>]*	
AT$ARMEE?	$ARMEE:*<n>*
AT$ARMEE=?	$ARMEE:*(list of supported <n>s)*
	$ARME ERROR:*<type>, <err>*

Description

This command disables or enables the use of the URC $ARME ERROR:*<type>, <err>* as an indication of an error relating to the functionality of the UE. When enabled, the URC $ARME ERROR:*<type>, <err>* is returned when the network sends a reject code or ignores a request from Terminal Adaptor. This command is not related to the AT +CMEE *(on page 297)* command.

The Test command returns the values supported as a compound value.

Defined Values

n

Integer: 0 or 1. Enable/disable the $ARME ERROR:*<type>, <err>* URC.

Table 170. *n*

Value	Description
0	Disable the $ARME ERROR:*<type>, <err>* URC
1	Enable the $ARME ERROR: *<type>, <err>* URC and use numeric *<type>, <err>* values

The $ARME ERROR URC

When enabled (AT$ARMEE=1), this URC is sent if the network sends a reject code or ignores a request from the Terminal Adaptor.

Table 171. <type>, <err> values

<type>	<err>
'01' - MM Reject code is received during an MM procedure	See 3GPP TS 24.008, 10.5.3.6 Reject Cause
'02' - CM Reject code is received during a CM procedure	See 3GPP TS 24.008, 10.5.3.6 Reject Cause
'03' - GMM Reject code is received during a non-combined GMM procedure for GPRS services	See 3GPP TS 24.008, 10.5.5.14 GMM Cause
'04' - SM Reject is received	See 3GPP TS 24.008, 10.5.6.6
'05' - GMM reject code is received during a combined GMM procedure for non-GPRS services	See 3GPP TS 24.008, 10.5.5.14 GMM Cause
'06' - GMM reject code is received during a combined GMM procedure for GPRS and non- GPRS services	See 3GPP TS 24.008, 10.5.5.14 GMM Cause
'07' - EMM reject code is received for a non-combined EMM procedure for EPS services	See 3GPP TS 24.301, EMM Cause
'08' - EMM reject code is received during a combined procedure for non-EPS services	See 3GPP TS 24.301, EMM Cause
'09' - EMM reject code is received during a combined procedure for EPS and non-EPS services	See 3GPP TS 24.301, EMM Cause
'0A' - ESM reject code is received during an ESM procedure	
'0B'-'FF' - (RFU) Reserved for Future Use	See 3GPP TS 24.301, 9.9.4.4

Note: The <*err*> parameter is set to '00' when the request was ignored by the network. <*type*> specifies the error type.

Handover configuration: AT+SQNHOCFG

Mode	LTE-M
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNHOCFG=<*rat*>, <*operator*>, <*enable*>	+CME ERROR:<*err*> OK
AT+SQNHOCFG?	+SQNHOCFG:<rat1>,<operator1>,<enable> +SQNHOCFG:<rat1>,<operator2>,<enable> […] +SQNHOCFG:<rat2>,<operator1>,<enable> +SQNHOCFG:<rat2>,<operator2>,<enable> […]
AT+SQNHOCFG=?	+SQNHOCFG: *(list of supported <rat>s), (list of supported <operator>s), (0-1)* OK

Description

This command is used to read and configure handover (intra- and inter- frequency) behaviour. It is possible to configure Radio Access Technologies (<*rat*>s) and identified <*operator*> (Note: Available <*operator*> names correspond to names as defined in AT+SQNCTM).

The read command reports handover <*enable*> state per <*rat*> and <*operator*>, one {<*rat*>; <*operator*>} combination per line, sorted by <*rat*>, then <*operator*>. By default, handover feature activation state is defined in pre-provisioned <*operator*> profiles, driven by operator specific requirements.

The commands modifies the handover configuration for a given <*rat*> and <*operator*>. Typically, handover deactivation may be desirable to optimize the modem connection efficiency in case of repeated short connectivity periods needed for small data reporting. In such scenario, the modem can be considered as a static device, and handover are counterproductive for short data sessions, requiring extra activity, thus worsening the power consumption in return for no perceptible gain.

Trying to modify an invalid <*rat*> and/or <*operator*> results in the AT command denying the configuration request and returning ERROR.

Important: In the current implementation, the command only works with the "standard" operator. Any attempts to change the configuration of another operator is rejected.

This configuration is stored in non-volatile memory, it survives device reboots and software upgrades. Changes are effective at the next reconnection to the network (AT+CFUN=1).

CAUTION: *This is an advanced command. Any configuration change is made under the device owner's responsibility and shall be approved by the operator.*

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

rat

Integer: 0 or 1.

Table 172. RAT

Value	RAT
0	Cat. M1
1	Cat. NB1

operator

String: Operational mode.

Table 173. Operator

Value	Mode
"standard"	Standard 3GPP mode
"3gpp-conformance"	Standard 3GPP mode tailored to conformance tests
"operator-name"	Operation mode as defined by the specific supported operator "operator-name"

enable

Integer: 0 or 1. Handover enable.

Table 174. Enable

Value	Handover mode
0	No handover
1	Handover enabled

Highest priority EARFCN selection: AT+SQNEARFCNSEL

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=1 to activate
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNEARFCNSEL=<*rat*>, <*operator*>, <*earfcnList*>	ERROR OK
AT+SQNEARFCNSEL?	+SQNEARFCNSEL:<rat1>,<operator1>,<earfcnList> +SQNEARFCNSEL:<rat1>,<operator2>,<earfcnList> […] +SQNEARFCNSEL:<rat2>,<operator1>,<earfcnList> +SQNEARFCNSEL:<rat2>,<operator2>,<earfcnList> […]
AT+SQNEARFCNSEL=?	+SQNEARFCNSEL: *(list of supported <rat>s), (list of supported <operator>s)* OK

Description

This command reads and configures the list of the highest priority EARFCN which is considered first during initial scanning and cell drop scanning operations. This highest priority list of EARFCN enable the modem to speed up cell acquisition, while keeping the modem compliant with 3GPP PLMN and cell search procedure.

Attention: Usage of this command outside *"standard"* (see below) mode is strongly discouraged.

DANGER: The current software only accepts changes on the current *operator* mode or *operator* mode previously enabled on the device. It is strongly recommended to use this command only in "standard" mode.

The command specifies or updates the list of the highest priority EARFCN for a given Radio Access Technologies (<*rat*>) and <*operator*>. An empty <*earfcnList*> argument (i.e. "") resets the list of the highest priority EARFCN to its factory default.

The read command returns the list of the highest priority EARFCN per <*rat*> and <*operator*>, one {<*rat*>; <*operator*>} combination per line, sorted by <*rat*>, then <*operator*>.

The test command reports the list of supported <*rat*> and <*operator*>.

Note: Available <*operator*> names correspond to the names defined in Conformance Test Mode: AT+SQNCTM *(on page 40)*.

Note: The `"3gpp-conformance"` profile cannot be modified: any attempt to do so is rejected and returns `ERROR`.

Note: Attempting to modify an invalid <*rat*> and/or <*operator*> is rejected and returns `ERROR`.

Note: Only 24 EARFCN can be configured. Any additional EARFCN is silently ignored.

Note: Attempting to configure an <*earfcnList*> containing EARFCN(s) outside the bands supported by the product fails and returns `ERROR`.

Note: Any EARFCN outside the configured band list for the specified pair (<*rat*>, <*operator*>) (see 4G LTE Band Selection: AT+SQNBANDSEL *(on page 311)*) is silently ignored during scanning operations.

Note: To add a new EARFCN(s), read the current list, append the new EARFCN(s) and write the updated list back.

Note: The configuration is stored in non-volatile memory and survives device reboots and software upgrades. New configurations are activated at the next reboot.

Note: Refer to operator recommendations to create the list of the highest priority EARFCN.

Note: Removal of one or more EARFCN(s) from the default list can result in a much longer initial registration.

Defined Values

rat

Integer: 0 or 1.

Table 175. RAT

Value	RAT
0	Cat. M1
1	Cat. NB1

operator

String: Operational mode.

Table 176. Operator

Value	Mode
"standard"	Standard 3GPP mode
"3gpp-conformance"	Standard 3GPP mode tailored to conformance tests
"operator-name"	Operation mode as defined by the specific supported operator "operator-name"

earfcnList

String. Comma separated list of the highest priority EARFCN.

PLMN Selection: AT+COPS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Prior call to AT+CFUN=1
Time-out	Network Dependent
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+COPS=*[<mode>[,<format>[,<oper>[,<AcT>]]]]*	OK +CME ERROR:*<err>*
AT+COPS?	+COPS:*<mode>[,<format>,<oper>[,<AcT>]]* +CME ERROR: *<err>*
AT+COPS=?	+COPS:*[list of supported <stat>,long alphanumeric <oper>, short alphanumeric <oper>, numeric <oper> [, <AcT>])s][, (list of supported <mode>s),(list of supported <format>s)]* +CME ERROR: *<err>*

Description

This command attempts to select and register the MT on the operator network using the SIM / USIM card installed in the currently selected card slot.*<mode>* indicates whether the selection is done automatically by the MT or is forced to operator *<oper>* (whose id is given in format *<format>*) using a certain access technology, indicated in *<AcT>*. If the selected operator is not available, no other operator is selected (except if *<mode>*=4). If the selected access technology is not available, then the same operator is selected using an other access technology. The selected operator name format applies to further read commands (AT+COPS?) also. *<mode>*=2 forces an attempt to unregister from the network. The selected mode affects to all further network registration (e.g. after *<mode>*=2, MT is unregistered until *<mode>*=0 or 1 is selected). This command should be abortable when registration / de-registration attempt is made. CEREG *(on page 315)* URCs will be received as the module registers / deregisters from the network.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

The read command returns the current mode, the currently selected operator and the current Access Technology. If no operator is selected, *<format>*, *<oper>* and *<AcT>* are omitted.

The test command returns a set of five parameters, each representing an operator present in the network. A set consists of an integer indicating the availability of the operator *<stat>*, long and short alphanumeric format of the name of the operator, numeric format representation of the operator and access technology. If any of the formats are unavailable, the field is empty. The list of operators is in order: home network, networks referenced in SIM or active application in the UICC in the following order: HPLMN selector, User controlled PLMN selector, Operator controlled PLMN selector and PLMN selector (in the SIM or GSM application), and other networks.

It is recommended (although optional) that after the operator list TA returns lists of supported <*mode*>s and <*format*>s. These lists shall be delimited from the operator list by two commas.

The access technology selected parameters, <*AcT*>, should only be used in terminals capable to register to more than one access technology. Selection of <*AcT*> does not limit the capability to cell reselections, even though an attempt is made to select an access technology, the phone may still re-select a cell in another access technology.

Note: This command is only available in operational mode `(CFUN=1)`.

Defined Values

mode

Integer: 0, 1, 2, 3 or 4.

Table 177. *mode*

Value	Description
0	Automatic (<*oper*> field is ignored)
1	Manual (<*oper*> field shall be present, and <*AcT*> optionally)
2	Unregister from network
3	Set only <*format*> (for read command `+COPS?`), do not attempt registration/deregistration (<*oper*> and <*AcT*> fields are ignored); this value is not applicable in read command response
4	Manual/automatic (<*oper*> field shall be present); if manual selection fails, automatic mode (<*mode*>=0) is entered

format

Integer: 0, 1 or 2.

Table 178. *format*

Value	Description
0	Long format alphanumeric <*oper*>
1	Short format alphanumeric <*oper*>
2	Numeric <*oper*>

oper

String. <*format*> indicates if the format is alphanumeric or numeric; long alphanumeric format can be upto 16 characters long and short format up to 8 characters (refer GSM MoU SE.13 [9]); numeric format is the Location Area Identification number (refer 3GPP TS 24.008 [8] sub-clause 10.5.1.3) which consists of a three BCD digit country code coded as in ITU T Recommendation E.212 [10] Annex A, plus a two BCD digit network code, which is administration specific; returned <*oper*> shall not be in BCD format, but in IRA characters converted from BCD; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network code digit 3)(network code digit 2)(network code digit 1).

stat

Integer: 0, 1, 2 or 3.

Table 179. *stat*

Value	Description
0	Unknown
1	Available
2	Current
3	Forbidden

AcT

Integer: 0..9. The parameter sets/shows the access technology selected.

Table 180. *AcT*

Value	Description
0	GSM
1	GSM Compact
2	UTRAN
3	GSM w/EGPRS (see NOTE 1)
4	UTRAN w/HSDPA (see NOTE 2)
5	UTRAN w/HSUPA (see NOTE 2)
6	UTRAN w/HSDPA and HSUPA (see NOTE 2)
7	E-UTRAN
8	EC-GSM-IoT (A/Gb mode) (see NOTE 3)
9	E-UTRAN (NB-S1 mode) (see NOTE 4)

Note:

1. 3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
2. 3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.
3. 3GPP TS 44.018 [156] specifies the EC-SCH INFORMATION message which, if present, indicates that the serving cell supports EC-GSM-IoT.
4. 3GPP TS 36.331 [86] specifies the System Information blocks which give the information about whether the serving cell supports NB-IoT, which corresponds to E-UTRAN (NB-S1 mode).

Preferred PLMN List: AT+CPOL

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	Depends on SIM
Persistency	Reboot Persistent (SIM write)

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CPOL=*[[<index>][, <format> [, <oper> [, <GSM_AcT>, <GSM_Compact_AcT>, <UTRAN_AcT>, <E-UTRAN_AcT>]]]]*	OK +CME ERROR: *<err>*
AT+CPOL?	+CPOL:*[<index1>, <format>, <oper1>[,<GSM_AcT1>, <GSM_Compact_AcT1>, <UTRAN_AcT1>, <E-UTRAN_AcT1>]* [<S3><S4>+CPOL:*<index2>, <format>, <oper2>[, <GSM_AcT2>, <GSM_Compact_AcT2>, <UTRAN_AcT2>, <E-UTRAN_AcT2>] [...]*] +CME ERROR:*<err>*
AT+CPOL=?	+CPOL:*(list of supported <index>s), (list of supported <format>s)* +CME ERROR: *<err>*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command is used to edit the PLMN selector with Access Technology lists in the SIM card or active application in the UICC (GSM or USIM).

The command writes an entry in the USIM list of preferred PLMNs, previously selected by the command AT+CPLS *(on page 336)*. If no list has been previously selected, the User controlled PLMN selector with Access Technology *EFPLMNwAcT* is the one accessed by default. If *<index>* is given but *<oper>* is omitted, entry is deleted. If *<oper>* is given but *<index>* is omitted, *<oper>* is put in the next free location. If only *<format>* is given, the format of the *<oper>* in the read command is changed. The Access Technology selection parameters, *<GSM_AcT>*, *<GSM_Compact_AcT>* and *<UTRAN_AcT>* and *<E-UTRAN_AcT>* are required when writing User controlled PLMN selector with Access Technology, EFPLMNwAcT, Operator controlled PLMN selector with Access Technology *EFOPLMNwAcT* and HPLMN selector with Access Technology *EFHPLMNwAcT*, see 3GPP TS 31.102 [59].

Note:

1. MT can also update the User controlled PLMN selector with Access Technology `EFPLMNwAcT`, automatically when new networks are selected.
2. The Operator controlled PLMN selector with Access Technology `EFOPLMNwAcT`, can only be written if the write access condition in the USIM has been previously verified.

Read command returns all used entries from the USIM list of preferred PLMNs, previously selected by the command AT+CPLS *(on page 336)*, with the Access Technologies for each PLMN in the list.

Test command returns the whole index range supported by the SIM.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for `<err>` values.

Defined Values

index*n*

Integer. The order number of operator in the USIM preferred operator list

format

Integer: 0, 1 or 2.

Table 181. *format*

Value	Description
0	Long format alphanumeric <*oper*>
1	Short format alphanumeric <*oper*>
2	Numeric <*oper*>

oper*n*

String. <*format*> indicates if the format is alphanumeric or numeric (see PLMN Selection: AT+COPS *(on page 325)*)

GSM_AcT*n*

Integer: 0 or 1. GSM access technology

Table 182. *GSM_AcTn*

Value	Description
0	Access technology not selected
1	Access technology selected

GSM_Compact_AcT*n*

Integer: 0 or 1. GSM compact access technology

Table 183. *GSM_Compact_AcTn*

Value	Description
0	Access technology not selected
1	Access technology selected

UTRAN_AcT*n*

Integer: 0 or 1. UTRAN access technology

Table 184. *UTRAN_AcTn*

Value	Description
0	Access technology not selected
1	Access technology selected

E-UTRAN_AcT*n*

Integer: 0 or 1. E-UTRAN access technology

Table 185. *E-UTRAN_AcTn*

Value	Description
0	Access technology not selected
1	Access technology selected

Read Operator Names: AT+COPN

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+COPN	+COPN:<*numeric1*>,<*alpha1*> [<S3><S4>+COPN:<*numeric2*>,<*alpha2*> [...]] +CME ERROR: <*err*>
AT+COPN=?	OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns the list of operator names from the MT. Each operator code <*numericn*> that has an alphanumeric equivalent <*alphan*> in the MT memory is returned.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

numeric*n*

String. Operator id in numeric format (see PLMN Selection: AT+COPS *(on page 325)*).

alpha*n*

String. Operator id in long alphanumeric format (see PLMN Selection: AT+COPS *(on page 325)*).

Read the Home PLMN: AT+SQNHPLMN

Syntax

Command	Possible Response(s)
AT+SQNHPLMN?	+SQNHPLMN:<*num_oper*>, <*short_oper*>, <*long_oper*> OK

Description

This command reads the HPLMN.

Defined Values

num_oper

Numeric format. The GSM Location Area Identification number (refer to 3GPP TS 24.008 [8] sub-clause 10.5.1.3). Country code with three BCD digits coded as in ITU-T Recommendation E.212 [10] Annex A, plus a two BCD digit network code, which is administration specific.

The returned <*num_oper*> value is not in BCD format, but in IRA characters converted from BCD, so the number has the following format:

```
(country digit3)(country digit2)(country digit1)(network digit3)(network digit2)(network digit1)
```

short_oper

String. Short alphanumeric format of the operator name: up to 8 characters (refer to GSM MoU SE.13 [9]).

long_oper

String. Long alphanumeric format of the operator name, up to 16 characters.

Example

```
AT+SQNHPLMN?
+SQNHPLMN: "00101","TEST","Aeroflex"
OK
```

Scanning Loop Counter: AT+SQNSEARCHSTEP

Syntax

Command	Possible Response(s)
AT+SQNSEARCHSTEP=<*enable*>	OK
AT+SQNSEARCHSTEP?	+SQNSEARCHSTEP: <*enable*> OK
AT+SQNSERACHSTEP=?	+SQNSEARCHSTEP: (0-1) OK

URC
+SQNSEARCHSTEP: <*loop_iteration*>

Description

When this command is used with <*enable*> = 1, the device sends a URC each time it completes a scanning loop over the configured bands, until it enters the infinite scanning step.

Defined values

enable

Integer: 0 or 1. Activate or deactivate the URC:

Table 186. n

enab	URC
0	Disable the URCs.
1	Enable the URC. URC generation stops when the device enters the infinite scanning loop.

loop_iteration

Integer: 1..255. Current number of loops already performed.

Select Wireless Network: AT+WS46

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+WS46=<*n*>	OK ERROR
AT+WS46?	<*n*>
AT+WS46=?	*[list of supported <n>s]*

Description

Set command selects the WDS side stack <*n*> to be used by the TA. Read command shows current setting and test command displays side stacks implemented in the TA.

Defined Values

n (read mode)

Integer (see below). The values in <*n*> for the read command are mutually exclusive. A single value is always returned.

Table 187. *n (read mode)*

Value	Description
12	GSM Digital Cellular Systems (GERAN only)
22	UTRAN only
25	3GPP Systems (GERAN, UTRAN and E-UTRAN)
28	E-UTRAN only
29	GERAN and UTRAN
30	GERAN and E-UTRAN
31	UTRAN and E-UTRAN

n (set mode)

Integer: 12 (see below). Refer PCCA STD 101 [17] for other values.

Table 188. *n (set mode)*

Value	Description
12	3GPP System
22	Not used. These value are treated as if 12 had been sent. An ERROR may be returned.
25	
28	
29	
30	
31	

Selection of Preferred PLMN List: AT+CPLS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CPLS=<*list*>	OK +CME ERROR:<*err*>
AT+CPLS?	+CPLS:<*list*> +CME ERROR: <*err*>
AT+CPLS=?	+CPLS:(*list of supported* <list>*s*) +CME ERROR: <*err*>

Description

This command selects one PLMN selector with Access Technology list in the SIM card or active application in the UICC (GSM or USIM), that is used by Preferred PLMN List: AT+CPOL *(on page 328)* command.

The read command returns the selected PLMN selector list from the SIM/USIM.

The test command returns the whole index range supported lists by the SIM/USIM.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

list

Integer: 0, 1 or 2.

Table 189. *list*

Value	Description
0	User controlled PLMN selector with Access Technology $EF_{PLMNwAcT}$, if not found in the SIM/UICC then PLMN preferred list $EF_{PLMNsel}$ (this file is only available in SIM card or GSM application selected in UICC)
1	Operator controlled PLMN selector with Access Technology $EF_{OPLMNwAcT}$
2	HPLMN selector with Access Technology $EF_{HPLMNwAcT}$

Subscriber Number: AT+CNUM

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CNUM	+CNUM:[<alpha1>,<number1>,<type1>[,<speed>,<service>[,<itc>]]][<S3><S4>] +CNUM:[<alpha2>,<number2>,<type2>[,<speed>,<service>[,<itc>]]] [...] +CME ERROR:<err>
AT+CNUM=?	OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

Action command returns the MSISDNs related to the subscriber (this information can be stored in the SIM/UICC or in the MT). When storing information in the SIM/UICC, if the currently selected card slot contains a SIM card or a UICC with an active GSM application, the information is stored in the EFMSISDN under DFTelecom. If the currently selected card slot contains a UICC with an active USIM application, the information is stored in the EFMSISDN under ADFUSIM). If subscriber has different MSISDN for different services, each MSISDN is returned in a separate line.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

alphax

String. Associated with <*numberx*>; the character set should be the one selected with command Select TE Character Set: AT+CSCS *(on page 12)*.

numberx

String. Phone number in the format specified by <*typex*>.

typex

Integer. Type of address octet (see 3GPP TS 24.008 [8] sub-clause 10.5.4.7)

speed

As defined in sub-clause 6.7

service

Integer: 0..5. Service related to the phone number.

Table 190. *service*

Value	Description
0	Asynchronous modem
1	Synchronous modem
2	PAD Access (asynchronous)
3	Packet Access (synchronous)
4	Voice
5	Fax
All other values below 128 are reserved	

itc

Integer: 0 or 1. Information transfer capability.

Table 191. *itc*

Value	Description
0	3.1 kHz
1	UDI

Chapter 14. Packet Domain Related Commands

Define EPS Quality Of Service: AT+CGEQOS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	1 s
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGEQOS=*[<cid>[,<QCI>[,<DL_GBR>,<UL_GBR>[,<DL_MBR>,<UL_MBR>]]]]*	+CME ERROR: *<err>*
AT+CGEQOS?	[+CGEQOS:*<cid>, <QCI>,[<DL_GBR>, <UL_GBR>][,<DL_MBR>,<UL_MBR>]*] [<S3><S4> +CGEQOS:*<cid>,<QCI>,[<DL_GBR>,<UL_GBR>][,<DL_MBR>,<UL_MBR>] […]]*
AT+CGEQOS=?	+CGEQOS: *(range of supported <cid>s), (list of supported <QCI>s), (list of supported <DL_GBR>s), (list of supported <UL_GBR>s), (list of supported <DL_MBR>s), (list of supported <UL_MBR>s)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command allows the TE to specify the EPS Quality of Service parameters *<cid>*, *<QCI>*, *<DL_GBR>* and *<UL_GBR>* and *<DL_MBR>* and *<UL_MBR>* for a PDP context or Traffic Flows (see 3GPP TS 24.301 [83] and 3GPP TS 23.203 [85]). When in UMTS/GPRS the MT applies a mapping function to UTMS/GPRS Quality of Service.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

A special form of the set command, AT+CGEQOS= <cid> causes the values for context number *<cid>* to become undefined.

The read command returns the current settings for each defined QoS.

The test command returns the ranges of the supported parameters.

Defined Values

cid

Integer. Specifies a particular EPS Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS (see the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

QCI

Integer: 0..254. Specifies a class of EPS QoS (see 3GPP TS 24.301 [83]).

Table 192. *QCI*

Value	Description
0	QCI is selected by network
1 to 4	Value range for guaranteed bit rate Traffic Flows
5 to 9	Value range for non-guaranteed bit rate Traffic Flows
128 to 254	Value range for Operator-specific QCIs

DL_GBR

Integer. Indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_GBR

Integer. Indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

DL_MBR

Integer. Indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_MBR

Integer. Indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

Define PDP Context Authentication Parameters: AT+CGAUTH

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	N/A
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGAUTH=*<cid>*[,*<auth_prot>*[,*<userid>*[,*<password>*]]]	OK +CME ERROR:*<err>*
AT+CGAUTH?	[+CGAUTH:*<cid>*,*<auth_prot>*,*<userid>*,*<password>*] [<S3><S4> +CGAUTH:*<cid>*,*<auth_prot>*,*<userid>*,*<password>* *[...]*]
AT+CGAUTH=?	+CGAUTH:*(range of supported <cid>s), (list of supported <auth_prot>s), (range of supported <userid>s), (range of supported <password>s)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command allows the TE to specify authentication parameters for a PDP context identified by the (local) context identification parameter *<cid>* used during the PDP context activation and the PDP context modification procedures. Since the *<cid>* is the same parameter that is used in the AT+CGDCONT *(on page 343)* and AT +CGDSCONT *(on page 350)* commands, Define PDP Context Authentication Parameters: AT+CGAUTH *(on page 341)* can be thought of as an extension to these commands.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value.

Defined Values

cid

Integer. Specifies a particular PDP context definition (see the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

auth_prot

Integer: 0, 1 or 2. Authentication protocol used for this PDP context.

Table 193. *auth_prot*

Value	Description
0	None. Used to indicate that no authentication protocol is used for this PDP context. User name and password are removed if previously specified.
1	PAP
2	CHAP

userid

String. User name for access to the IP network.

password

String. Password for access to the IP network.

Define PDP Context: AT+CGDCONT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Module must not be attached (+CEREG ≠ 1 or 5)
Time-out	N/A
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGDCONT=*[<cid>* *[,<PDP_type>* *[,<APN>* *[,<PDP_addr>* *[,<d_comp>* *[,<h_comp>* *[,<IPv4AddrAlloc>* *[,<request_type>* *[,<P-CSCF_discovery>* *[,<IM_CN_Signalling_Flag_Ind>* *[,<NSLPI>* *[,<securePCO>* *[,<IPv4_MTU_discovery>]* *[,<Local_Addr_Ind>]* *[,<Non-IP_MTU_discovery>]* *[,<Reliable_Data_Service>]* *]]]]]]]]]]]]*	OK ERROR +CME ERROR:*<err>*
AT+CGDCONT?	[+CGDCONT:*<cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>* *[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>* *[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<securePCO>* *[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non-IP_MTU_discovery>* *[,<Reliable_Data_Service>]]]]]]]]]]* [<S3><S4> +CGDCONT:*<cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>* *[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>* *[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<securePCO>* *[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non-IP_MTU_discovery>* *[,<Reliable_Data_Service>]]]]]]]]]]* [...]]

Command	Possible Response(s)
AT+CGDCONT=?	+CGDCONT: *(range of supported <cid>s), <PDP_type>,,,* *(list of supported <d_comp>s),* *(list of supported <h_comp>s),* *(list of supported <IPv4AddrAlloc>s),* *(list of supported <request_type>s),* *(list of supported <P-CSCF_discovery>s),* *(list of supported <IM_CN_Signalling_Flag_Ind>s),* *(list of supported <NSLPI>s),* *(list of supported <securePCO>s),* *(list of supported <IPv4_MTU_discovery>s),* *(list of supported <Local_Addr_Ind>s),* *(list of supported <Non-IP_MTU_discovery>s),* *(list of supported <Reliable_Data_Service>s)* [<S3><S4>+CGDCONT: *(range of supported <cid>s), <PDP_type>,,,* *(list of supported <d_comp>s),* *(list of supported <h_comp>s),* *(list of supported <IPv4AddrAlloc>s),* *(list of supported <request_type>s),* *(list of supported <P-CSCF_discovery>s),* *(list of supported <IM_CN_Signalling_Flag_Ind>s),* *(list of supported <NSLPI>s),* *(list of supported <securePCO>s),* *(list of supported <IPv4_MTU_discovery>s),* *(list of supported <Local_Addr_Ind>s),* *(list of supported <Non-IP_MTU_discovery>s),* *(list of supported <Reliable_Data_Service>s)* [...]]

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, <*cid*> and also allows the TE to specify whether the security protected transmission of ESM information is requested, because the PCO can include information that requires ciphering. There can be other reasons for the UE to use security protected transmission of ESM information, e.g. if the UE needs to transfer an APN. The number of PDP contexts that may be in a defined state at the same time is given by the range returned by the test command.

For EPS the PDN connection and its associated EPS default bearer is identified herewith.

A special form of this command, AT+CGDCONT=<cid> causes the values for context number <*cid*> to become undefined.

If the initial PDP context is supported, the context with <*cid*>=0 is automatically defined at startup, see sub-clause 10.1.0. As all other contexts, the parameters for <*cid*>=0 can be modified with AT+CGDCONT. If the initial PDP context is supported, AT+CGDCONT=0 resets context number 0 to its particular default settings.

Important: The PDP cannot be changed if the module is attached to the network (EPS Network Registration Status: AT+CEREG *(on page 315)* or EPS Network Registration Status: AT+CEREG *(on page 315)*)

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, <*PDP_type*>, the parameter value ranges for each <*PDP_type*> are returned on a separate line.

Defined Values

cid

Integer. Specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value = 1 or if the initial PDP context is supported (see sub-clause 10.1.0), minimum value = 0) is returned by the test form of the command.

Note: The <*cid*>s for network-initiated PDP contexts will have values outside the ranges indicated for the <*cid*> in the test form of the commands `AT+CGDCONT` and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)*.

PDP_type

String. Specifies the type of packet data protocol.

Table 194. *PDP_type*

Value	Description
X.25	ITU-T/CCITT X.25 layer 3 (Obsolete)
IP	Internet Protocol (IETF STD 5 [103])
IPV6	Internet Protocol, version 6 (see RFC 2460 [106])
IPV4V6	Virtual <*PDP_type*> introduced to handle dual IP stack UE capability. (See 3GPP TS 24.301 [83])
OSPIH	Internet Hosted Octet Stream Protocol (Obsolete)
PPP	Point to Point Protocol (IETF STD 51 [104])
Non-IP	Transfer of Non-IP data to external packet data network (see 3GPP TS 23.401 [82])

Note: Only IP, IPV6 and IPV4V6 values are supported for EPS services.

APN

String. A logical name that is used to select the GGSN or the external packet data network.

If the value is *null* or omitted, then the subscription value is requested.

Note: The maximum usable value for <*APN*> is 99 bytes. Any longer string is silently truncated to its first 99 bytes.

PDP_addr

String. Identifies the MT in the address space applicable to the PDP.

If the parameter value is *null* or omitted, then a value may be provided by the TE during the PDP start-up procedure or, failing that, a dynamic address will be requested.

The read form of the command will continue to return the null string even if an address has been allocated during the PDP start-up procedure. The allocated address(es) may be read using the Show PDP Address(es): AT+CGPADDR *(on page 379)* command.

When AT+CGPIAF *(on page 372)* is supported, its settings can influence the format returned by the read form of `AT+CGDCONT`.

Note: For EPS, this field or the parameter value of the field is omitted.

d_comp

Integer: 0, 1, 2 or 3. Controls PDP data compression (applicable for SNDCP only) (refer 3GPP TS 44.065 [61]).

Table 195. *d_comp*

Value	Description
0	Off
1	On (manufacturer preferred compression)
2	V.42bis
3	V.44

h_comp

Integer: 0..4. Controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62]).

Table 196. *h_comp*

Value	Description
0	Off
1	On (manufacturer preferred compression)
2	RFC 1144 [105] (applicable for SNDCP only)
3	RFC 2507 [107]
4	RFC 3095 [108] (applicable for PDCP only)

IPv4AddrAlloc

Integer: 0 or 1. Controls how the MT/TA requests to get the IPv4 address information.

Table 197. *IPv4AddrAlloc*

Value	Description
0	IPv4 Address Allocation through NAS Signalling
1	IPv4 Address Allocated through DHCP

request_type

Integer: 0..4. Indicates the type of PDP context activation request for the PDP context, see 3GPP TS 24.301 [83] (sub-clause 6.5.1.2) and 3GPP TS 24.008 [8] (sub-clause 10.5.6.17). If the initial PDP context is supported (see sub-clause 10.1.0) it is not allowed to assign <*cid*>=*0* for emergency bearer services.

According to 3GPP TS 24.008 [8] (sub-clause 4.2.4.2.2 and sub-clause 4.2.5.1.4) and 3GPP TS 24.301 [83] (sub-clause 5.2.2.3.3 and sub-clause 5.2.3.2.2), a separate PDP context must be established for emergency bearer services.

NOTE 4: If the PDP context for emergency bearer services is the only activated context, only emergency calls are allowed, see 3GPP TS 23.401 [82] sub-clause 4.3.12.9.

NOTE 5: A PDP context established for handover of emergency bearer services from a non-3GPP access network has the same status as a PDP context for emergency bearer services.

Table 198. *request_type*

Value	Description
0	PDP context is for new PDP context establishment or for handover from a non-3GPP access network (how the MT decides whether the PDP context is for new PDP context establishment or for handover is implementation specific)
1	DP context is for emergency bearer services
2	PDP context is for new PDP context establishment
3	PDP context is for handover from a non-3GPP access network
4	PDP context is for handover of emergency bearer services from a non-3GPP access network

P-CSCF_discovery

Integer: 0 or 1. Influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [89] annex B and annex L.

Table 199. *P-CSCF_discovery*

Value	Description
0	Preference of P-CSCF address discovery not influenced by `+CGDCONT`
1	Preference of P-CSCF address discovery through NAS Signalling

IM_CN_Signalling_Flag_Ind

Integer: 0 or 1. Indicates to the network whether the PDP context is for IM CN subsystem-related signalling only or not.

Table 200. *IM_CN_Signalling_Flag_Ind*

Value	Description
0	UE indicates that the PDP context is not for IM CN subsystem-related signalling only
1	UE indicates that the PDP context is for IM CN subsystem-related signalling only

NSLPI

Integer: 0 or 1. Indicates the NAS signalling priority requested for this PDP context.

NOTE 6: The MT utilises the provide NSLPI information as specified in 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8].

Table 201. *NSLPI*

Value	Description
0	Indicates that this PDP context is to be activated with the value for the low priority indicator configured in the MT.
1	Indicates that this PDP context is to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority"

securePCO

Integer: 0 or 1. Specifies if security protected transmission of PCO is requested or not (applicable for EPS only, see 3GPP TS 23.401 [82] sub-clause 6.5.1.2).

Table 202. *securePCO*

Value	Description
0	Security protected transmission of PCO is not requested
1	Security protected transmission of PCO is requested

IPv4_MTU_discovery

Integer: 0 or 1. Influences how the MT/TA requests to get the IPv4 MTU size, see 3GPP TS 24.008 [8] sub-clause 10.5.6.3.

Table 203. *IPv4_MTU_discovery*

Value	Description
0	Preference of IPv4 MTU size discovery not influenced by `+CGDCONT`
1	Preference of IPv4 MTU size discovery through NAS signalling

Local_Addr_Ind

Integer: 0 or 1. indicates to the network whether or not the MS supports local IP address in TFTs (see 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8] sub-clause 10.5.6.3).

Table 204. *Local_Addr_Ind*

Value	Description
0	Indicates that the MS does not support local IP address in TFTs
1	Indicates that the MS supports local IP address in TFTs

Non-IP_MTU_discovery

Integer: 0 or 1. Influences how the MT/TA requests to get the Non-IP MTU size, see 3GPP TS 24.008 [8] sub-clause 10.5.6.3.

Table 205. *Non-IP_MTU_discovery*

Value	Description
0	Preference of Non-IP MTU size discovery not influenced by `+CGDCONT`
1	Preference of Non-IP MTU size discovery through NAS signalling

Reliable_Data_Service

Integer: 0 or 1. Indicates whether the UE is using Reliable Data Service for a PDN connection or not, see 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8] sub-clause 10.5.6.3.

Table 206. *Reliable_Data_Service*

Value	Description
0	Reliable Data Service is not being used for the PDN connection
1	Reliable Data Service is being used for the PDN connection

Define Secondary PDP Context: AT+CGDSCONT

Mode	LTE-M
Type	Synchronous
Prerequisite	–
Time-out	N/A
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
`AT+CGDSCONT=`*[<cid>, <p_cid> [,<d_comp>[,<h_comp> [,<IM_CN_Signalling_Flag_Ind>]]]]*	`OK` `ERROR`

`AT+CGDSCONT?`	`[+CGDSCONT:`*<cid>, <p_cid>, <d_comp>, <h_comp>, <IM_CN_Signalling_Flag_Ind>*`]`
	
	`[<S3><S4>+CGDSCONT:`*<cid>, <p_cid>, <d_comp>, <h_comp>, <IM_CN_Signalling_Flag_Ind>*
	
	`[...]]`

`AT+CGDSCONT=?`	`+CGDSCONT:`*(range of supported <cid>s), (list of <p_cid>s for active primary contexts), (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IM_CN_Signalling_Flag_Ind>s)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command specifies PDP context parameter values for a Secondary PDP context identified by the (local) context identification parameter, *<cid>*. The number of possible PDP contexts in a given state at the same time is returned by the test command.

In EPS, the command is used to define traffic flows.

A special form of the set command, `AT+CGDSCONT=<cid>` causes the values for context number *<cid>* to become undefined.

Note: If the initial PDP context is supported, the context with *<cid>*=0 is automatically defined at start-up, see sub-clause 10.1.0.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value.

Defined Values

cid

Integer: PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value = 1) is returned by the test command.

Note: The <*cid*>s for network-initiated PDP contexts have values outside the ranges indicated for the <*cid*> in the test form of the commands AT+CGDCONT *(on page 343)* and AT +CGDSCONT.

p_cid

Integer: Specifies a particular PDP context definition which has been specified by use of the AT +CGDCONT *(on page 343)* command. The parameter is local to the TE-MT interface. The list of permitted values is returned by the test form of the command.

d_comp

Integer: 0, 1, 2 or 3. Controls PDP data compression (applicable for SNDCP only) (refer 3GPP TS 44.065 [61])

Table 207. *d_comp*

Value	Description
0	Off
1	On (manufacturer preferred compression)
2	V.42bis
3	V.44

h_comp

Integer: 0..4. Controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

Table 208. *h_comp*

Value	Description
0	Off
1	On (manufacturer preferred compression)
2	RFC 1144 [105] (applicable for SNDCP only)
3	RFC 2507 [107]
4	RFC 3095 [108] (applicable for PDCP only)

IM_CN_Signalling_Flag_Ind

Integer: 0 or 1. Indicates to the network whether the PDP context is for IM CN subsystem-related signalling only or not.

Table 209. *IM_CN_Signalling_Flag_Ind*

Value	Description
0	UE indicates that the PDP context is not for IM CN subsystem-related signalling only
1	UE indicates that the PDP context is for IM CN subsystem-related signalling only

Enter Data State: AT+CGDATA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN = 1 or 4. SIM card present
Time-out	2 s
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGDATA*[=<L2P>[,<cid>[,<cid>[,...]]]]*	CONNECT ERROR +CME ERROR:<*err*>
AT+CGDATA=?	+CGDATA: *(list of supported <L2Ps>)*

Description

This command causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more Packet Domain PDP types. This may include performing a PS attach and one or more PDP context activations. If the <*L2P*> parameter value is unacceptable to the MT, the MT shall return an ERROR or +CME ERROR response. Otherwise, the MT issues the intermediate result code CONNECT and enters V.250 online data state.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Note: If the initial PDP context is supported, the context with <*cid*>=0 is automatically defined at start-up, see sub-clause 10.1.0.

Commands following AT+CGDATA command in the AT command line are not processed by the MT.

The detailed behaviour after the online data state has been entered is dependent on the PDP type. It is described briefly in 3GPP TS 25.060 [34] and in more detail in 3GPP TS 29.061 [39] and the specifications for the relevant PDPs. PS attachment and PDP context activation procedures may take place prior to or during the PDP start-up if they have not already been performed using the PS Attach or Detach: AT+CGATT *(on page 375)* and PDP Context Activate or Deactivate: AT+CGACT *(on page 365)* commands.

If context activation takes place during the PDP start-up, one or more <*cid*>s can be specified in order to provide the information needed for the context activation request(s).

During each PDP start-up procedure, the MT can access some or all of the following information:

- The MT may have *a priori* knowledge. For example, it may implement only one PDP type.
- The command may have provided an <*L2P*> parameter value.
- The TE may provide a PDP type and/or PDP address to the MT during in the PDP start-up procedure.

If any of this information is in conflict, the command fails.

Any PDP type and/or PDP address present in the above information shall be compared with the PDP type and/or PDP address in any context definitions specified in the command in the order in which their <*cid*>s appear. For a context definition to match:

- The PDP type must match exactly.
- The PDP addresses are considered to match if they are identical or if either or both addresses are unspecified. For example, a PPP NCP request specifying PDP type = IP and no PDP address would cause the MT to search through the specified context definitions for one with PDP type = IP and any PDP address.

The context is activated using the matched value for PDP type and a static PDP address, if available, together with other information found in the PDP context definition. If a static PDP address is not available, then a dynamic address is requested.

If no <*cid*> is given or if there is no matching context definition, the MT attempts to activate the context with whatever information is available to it. The other context parameters are set to their default values.

If the activation is successful, data transfer may proceed.

After the data transfer is complete, and the layer 2 protocol termination procedure has completed successfully, the V.250 command state is re-entered and the MT returns the final result code `OK`.

In the event of an abnormal termination or a failure to start up, the V.250 command state is re-entered and the MT returns the final result code `NO CARRIER` or, if enabled, `+CME ERROR`. Attach, activate and other errors may be reported.

Note: The module cannot enter deep sleep mode while the connection is active.

The test command is used for requesting information on the supported layer 2 protocols.

This command may be used in both normal and modem compatibility modes.

Defined Values

cid

Integer. This parameter specifies a particular PDP context definition (see Define PDP Context: AT +CGDCONT *(on page 343)* parameter <*cid*>).

Note: If this parameter is omitted, <*cid*>=3 (Internet PDN) is the default value for all implementations except CAT-M. For CAT-M implementation, <*cid*>=1 (Internet PDN) is the default value.

L2P

String: "PPP". Layer 2 Protocol (L2P) to be used between the TE and MT.

Table 210. *L2P*

Value	Description
"PPP"	Point-to-Point Protocol

Other values are obsolete or specific, and are not supported.

EPS Quality Of Service Read Dynamic Parameters: AT +CGEQOSRDP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN = 1 or 4. SIM card present
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGEQOSRDP	[+CGEQOSRDP:<*cid*>,<*QCI*> [,<*DL_GBR*>,<*UL_GBR*>] [,<*DL_MBR*>,<*UL_MBR*>] [,<*DL_AMBR*>,<*UL_AMBR*>]][<S3><S4>+CGEQOSRDP:<*cid*>,<*QCI*> [,<*DL_GBR*>,<*UL_GBR*>] [,<*DL_MBR*>,<*UL_MBR*>] [,<*DL_AMBR*>,<*UL_AMBR*>] [...]]
AT+CGEQOSRDP=?	+CGEQOSRDP:(*list of <cid>s associated with active contexts*)

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns the Quality of Service parameters <*QCI*>, [<*DL_GBR*> and <*UL_GBR*>] and [<*DL_MBR*> and <*UL_MBR*>] of the active secondary or non secondary PDP context associated to the provided context identifier <*cid*>.

If the parameter <*cid*> is omitted, the Quality of Service parameters for all secondary and non secondary active PDP contexts are returned.

The test command returns a list of <*cid*>s associated with secondary or non secondary active PDP contexts.

Parameters of both network and MT/TA initiated PDP contexts are returned.

Defined Values

cid

Integer. Specifies a particular Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS (see the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

QCI

Integer: 0..254. Specifies a class of EPS QoS (see 3GPP TS 24.301 [83]).

Table 211. *QCI*

Value	Description
0	QCI is selected by network
1 to 4	value range for guaranteed bit rate Traffic Flows
5 to 9	value range for non-guaranteed bit rate Traffic Flows
128 to 254	value range for Operator-specific QCIs

DL_GBR

Integer. Indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_GBR

Integer. Indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

DL_MBR

Integer. Indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_MBR

Integer. Indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

DL_AMBR

Integer. Indicates DL APN aggregate MBR (see 3GPP TS 24.301 [83]). The value is in kbit/s.

UL_AMBR

Integer. Indicates UL APN aggregate MBR (see 3GPP TS 24.301 [83]). The value is in kbit/s.

Note: If multiple lines in a response belong to the same PDN connection they contain the same <*DL_AMBR*> <*UL_AMBR*> values.

Initial PDP Context Activation: AT+CIPCA

Note:

This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CIPCA=*[<n>[,<AttachWithoutPDN>]]*	OK ERROR +CME ERROR:*<err>*
AT+CIPCA?	+CIPCA: *<n>[,<AttachWithoutPDN>]*
AT+CIPCA=?	+CIPCA: *(list of supported <n>s), (list of supported <AttachWithoutPDN>s)*

Description

This command controls whether an initial PDP context (see subclause 10.1.0) is automatically established after the attach procedure when the UE is attached to GERAN or UTRAN RATs, and whether the UE is attached to E-UTRAN with or without a PDN connection.

For *<n>*≠0, deactivating the last (active) PDP context can lead to a (re)establishment of the initial PDP context. Changing setting of *<n>* from 0 to 1 triggers an immediate attempt to (re)establish the initial PDP context if no PDP context is active. Changing *<n>* from 0 to 2, triggers an immediate attempt to (re)establish the initial PDP context if no other PDP context is active and the device is not in roaming mode. The value of *<n>*=3 applies to E-UTRAN RATs and does not change the setting of PDP context activation in GERAN or UTRAN RATs. Changing *<n>* never causes a PDP context deactivation.

For *<AttachWithoutPDN>*=1, the EPS attach is performed without a PDN connection.

Note: For this command, the term 'roaming' corresponds to being registered to a VPLMN which is not equivalent to HPLMN or EHPLMN.

The read command returns the current setting of the command.

Test command returns the modes supported as compound values.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <err> values.

Defined Values

n

Integer: 0, 1, 2 or 3. Activation of PDP context upon attach.

Table 212. *n*

Value	Description
0	Do not activate

Table 212. *n* (continued)

Value	Description
1	Always activate
2	Activate when not roaming
3	No change in current setting

Note: The values 1 and 2 do not apply to LTE modules.

AttachWithoutPDN

0 or 1. EPS Attach with or without PDN connection.

Table 213. *AttachWithoutPDN*

Value	Description
0	EPS Attach with PDN connection
1	EPS Attach without PDN connection

Packet Domain Event Reporting: AT+CGEREP

Mode	LTE-M – NBIoT
Type	Synchronous / Asynchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGEREP=[<*mode*>[,<*bfr*>]]	OK +CME ERROR: <*err*>
AT+CGEREP?	+CGEREP: <*mode*>,<*bfr*>
AT+CGEREP=?	+CGEREP: (*list of supported* <*mode*>*s*), (*list of supported*<*bfr*>*s*)

Description

This command enables or disables the unsolicited result codes, +CGEV: … from MT to TE in the case of certain events occurring in the Packet Domain MT or the network. <*mode*> controls the processing of unsolicited result codes specified within this command. <*bfr*> controls the effect on buffered codes when <*mode*> 1 or 2 is entered. If a setting is not supported by the MT, ERROR or +CME ERROR is returned.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Read command returns the current mode and buffer settings.

The test command returns the modes and buffer settings supported by the MT as compound values.

Defined Values

mode

Integer: 0, 1 or 2.

Table 214. *mode*

Value	Description
0	Buffer unsolicited result codes in the MT; if MT result code buffer is full, the oldest URC can be discarded. No codes are forwarded to the TE.
1	Discard unsolicited result codes when the MT TE link is reserved (e.g. in online data mode); otherwise forward them directly to the TE
2	Buffer unsolicited result codes in the MT when MT TE link is reserved (e.g. in online data mode) and flush them to the TE when MT TE link becomes available; otherwise forward them directly to the TE

bfr

Integer: 0 or 1.

Table 215. *bfr*

Value	Description
0	The MT buffer for unsolicited result codes defined in this command is cleared when <*mode*> 1 or 2 is entered
1	The MT buffer for unsolicited result codes defined within this command is flushed to the TE when <*mode*> 1 or 2 is entered (OK response is given before flushing the codes)

Event Notification URC: +CGEV

1. For network attachment, the following unsolicited result codes and the corresponding events are defined:
   - `+CGEV: NW DETACH`

     The network has forced a PS detach. This implies that all active contexts have been deactivated. These are not reported separately.
   - `+CGEV: ME DETACH`

     The mobile termination has forced a PS detach. This implies that all active contexts have been deactivated. These are not reported separately.
2. For MT class, the following unsolicited result codes and the corresponding events are defined:
   - `+CGEV: NW CLASS <class>`

     The network has forced a change of MT class. The highest available class is reported (see `+CGCLASS` in 3GPP 25.007 specification). The format of the parameter <*class*> is given below.
   - `+CGEV: ME CLASS <class>`

     The mobile termination has forced a change of MT class. The highest available class is reported (see `+CGCLASS` in 3GPP 25.007 specification). The format of the parameter <*class*> is given below.

class

- A: Class-A mode of operation (A/Gb mode), or CS/PS mode of operation (Iu mode) (highest mode of operation)
- B: Class-B mode of operation (A/Gb mode), or CS/PS mode of operation (Iu mode)
- CG: Class-C mode of operation in PS only mode (A/Gb mode), or PS mode of operation (Iu mode)
- CC: Class-C mode of operation in CS only mode (A/Gb mode), or CS (Iu mode) (lowest mode of operation)

Note:

A means that the MT would operate simultaneous PS and CS service;
B means that the MT would operate PS and CS services but not simultaneously in A/Gb mode;
CG means that the MT would only operate PS services;
CC means that the MT would only operate CS services.

If the MT is attached to the PS domain when the set command is issued with CC specified, a PS detach shall be performed by the MT.

3. For PDP context activation, the following unsolicited result codes and the corresponding events are defined:

   - `+CGEV: NW PDN ACT <cid>[,<WLAN_Offload>]`

     The network has activated a context. The context represents a Primary PDP context in GSM/UMTS. The *<cid>* for this context is provided to the TE. The format of the parameter *<cid>* is found in command Define PDP Context: AT+CGDCONT *(on page 343)*.

     <WLAN_Offload>: Integer: 0..3. Indicates whether traffic can be offloaded using the specified PDN connection via a WLAN or not. This refers to bit 1 (E-UTRAN offload acceptability value) and bit 2 (UTRAN offload acceptability value) in the WLAN offload acceptability IE as specified in 3GPP TS 24.008 [8] sub-clause 10.5.6.20.

Table 216. *WLAN_Offload*

Value	Description
0	Offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is not acceptable.
1	Offloading the traffic of the PDN connection via a WLAN when in S1 mode is acceptable, but not acceptable in Iu mode.
2	Offloading the traffic of the PDN connection via a WLAN when in Iu mode is acceptable, but not acceptable in S1 mode.
3	Offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is acceptable.

Note: This event is not applicable for EPS.

   - `+CGEV: ME PDN ACT <cid>[,<reason>[,<cid_other>]][,<WLAN_Offload>]`

     The mobile termination has activated a context. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS. The *<cid>* for this context is provided to the TE. This event is sent either in result of explicit context activation request (PDP Context Activate or Deactivate: AT+CGACT *(on page 365)*), or in result of implicit context activation request associated to attach request (PS Attach or Detach: AT+CGATT *(on page 375)*). The format of the parameters *<cid>* and *<cid_other>* are found in command Define PDP Context: AT+CGDCONT *(on page 343)*. The format of the parameter *<WLAN_Offload>* is defined above.

     <reason>: Integer: 0, 1, 2 or 3. Indicates the reason why the context activation request for PDP type IPv4v6 was not granted. This parameter is only included if the requested PDP type associated with *<cid>* is IPv4v6, and the PDP type assigned by the network for *<cid>* is either IPv4 or IPv6.

Table 217. *reason*

Value	Description
0	IPv4 only allowed.
1	IPv6 only allowed.
2	Single address bearers only allowed.
3	Single address bearers only allowed and MT initiated context activation for a second address type bearer was not successful.

<*cid_other*>: Integer. Indicates the context identifier allocated by MT for an MT initiated context of a second address type. MT shall only include this parameter if <*reason*> parameter indicates single address bearers only allowed, and MT supports MT initiated context activation of a second address type without additional commands from TE, and MT has activated the PDN connection or PDP context associated with <*cid_other*>.

Note: For legacy TEs supporting MT initiated context activation without TE requests, there is also a subsequent event `+CGEV: ME PDN ACT <cid_other>` returned to TE.

- `+CGEV: NW ACT <p_cid>, <cid>, <event_type>[,<WLAN_Offload>]`

The network has activated a context. The <*cid*> for this context is provided to the TE in addition to the associated primary <*p_cid*>. The format of the parameters <*p_cid*> and <*cid*> are found in command Define Secondary PDP Context: AT+CGDSCONT *(on page 350)*. The format of the parameter <*WLAN_Offload*> is defined above.

<*event_type*>:: Integer: 0 or 1. Indicates whether this is an informational event or whether the TE has to acknowledge it.

Table 218. *event_type*

Value	Description
0	Informational event
1	Information request: Acknowledgement required. The acknowledgement can be accept or reject, see `AT+CGANS`.

- `+CGEV: ME ACT <p_cid>, <cid>, <event_type>[,<WLAN_Offload>]`

The network has responded to an ME initiated context activation. The <*cid*> for this context is provided to the TE in addition to the associated primary <*p_cid*>. The format of the parameters <*p_cid*> and <*cid*> are found in command Define Secondary PDP Context: AT+CGDSCONT *(on page 350)*. The format of the parameters <*event_type*> and <*WLAN_Offload*> are defined above.

4. For PDP context deactivation, the following unsolicited result codes and the corresponding events are defined:

   - `+CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>]`

   The network has forced a context deactivation. The <*cid*> that was used to activate the context is provided if known to the MT. The format of the parameters <*PDP_type*>, <*PDP_addr*> and <*cid*> are found in command Define PDP Context: AT+CGDCONT *(on page 343)*.

   - `+CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>]`

The mobile termination has forced a context deactivation. The <*cid*> that was used to activate the context is provided if known to the MT. The format of the parameters <*PDP_type*>, <*PDP_addr*> and <*cid*> are found in command Define PDP Context: AT+CGDCONT *(on page 343)*.

- `+CGEV: NW PDN DEACT <cid>[,<WLAN_Offload>]`

  The network has deactivated a context. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS. The associated <*cid*> for this context is provided to the TE. The format of the parameter <*cid*> is found in command Define PDP Context: AT+CGDCONT *(on page 343)*. The format of the parameter <*WLAN_Offload*> is defined above.

  Note: Occurrence of this event replaces usage of the event `+CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>]`.

- `+CGEV: ME PDN DEACT <cid>`

  The mobile termination has deactivated a context. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS. The <*cid*> for this context is provided to the TE. The format of the parameter <*cid*> is found in command Define PDP Context: AT+CGDCONT *(on page 343)*.

  Note: Occurrence of this event replaces usage of the event `+CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>].`

- `+CGEV: NW DEACT <p_cid>, <cid>, <event_type>[,<WLAN_Offload>]`

  The network has deactivated a context. The <*cid*> for this context is provided to the TE in addition to the associated primary <*p_cid*>. The format of the parameters <*p_cid*> and <*cid*> are found in command Define Secondary PDP Context: AT+CGDSCONT *(on page 350)*. The format of the parameters <*event_type*> and <*WLAN_Offload*> are defined above.

  Note: Occurrence of this event replaces usage of the event `+CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>].`

- `+CGEV: ME DEACT <p_cid>, <cid>, <event_type>`

  The network has responded to an ME initiated context deactivation request. The associated <*cid*> is provided to the TE in addition to the associated primary <*p_cid*>. The format of the parameters <*p_cid*> and <*cid*> are found in command Define Secondary PDP Context: AT+CGDSCONT *(on page 350)*. The format of the parameter <*event_type*> is defined above.

  Note: Occurrence of this event replaces usage of the event `+CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>].`

5. For PDP context modification, the following unsolicited result codes and the corresponding events are defined:

   - `+CGEV: NW MODIFY <cid>, <change_reason>, <event_type>[,<WLAN_Offload>]`

     The network has modified a context. The associated <*cid*> is provided to the TE in addition to the <*change_reason*> and <*event_type*>. The format of the parameter <*cid*> is found in command Define PDP Context: AT+CGDCONT *(on page 343)* or Define Secondary PDP Context: AT+CGDSCONT *(on page 350)*. The format of the parameters <*change_reason*>, <*event_type*>, and <*WLAN_Offload*> are defined above.

<*change_reason*>: Integer. A bitmap that indicates what kind of change occurred. The <*change_reason*> value is determined by summing all the applicable bits. For example if both the values of QoS changed (Bit 2) and WLAN_Offload changed (Bit 3) have changed, then the <*change_reason*> value is 6.

Note: The WLAN offload value will change when bit 1 or bit 2 or both of the indicators in the WLAN offload acceptability IE change, see the parameter <*WLAN_Offload*> defined above.

Table 219. *change_reason*

Value	Description
Bit 1	TFT changed
Bit 2	Qos changed
Bit 3	WLAN Offload changed

- `+CGEV: ME MODIFY <cid>, <change_reason>, <event_type>[,<WLAN_Offload>]`

  The mobile termination has modified a context. The associated <*cid*> is provided to the TE in addition to the <*change_reason*> and <*event_type*>. The format of the parameter <*cid*> is found in command Define PDP Context: AT+CGDCONT *(on page 343)* or Define Secondary PDP Context: AT+CGDSCONT *(on page 350)*. The format of the parameters <*change_reason*>, <*event_type*> and <*WLAN_Offload*> are defined above.

6. For other PDP context handling, the following unsolicited result codes and the corresponding events are defined:

   - `+CGEV: REJECT <PDP_type>, <PDP_addr>`

     A network request for context activation occurred when the MT was unable to report it to the TE with a `+CRING` unsolicited result code and was automatically rejected. The format of the parameters <*PDP_type*> and <*PDP_addr*> are found in command Define PDP Context: AT+CGDCONT *(on page 343)*.

     Note: This event is not applicable for EPS.

   - `+CGEV: NW REACT <PDP_type>, <PDP_addr>, [<cid>]`

     The network has requested a context reactivation. The <*cid*> that was used to reactivate the context is provided if known to the MT. The format of the parameters <*PDP_type*>, <*PDP_addr*> and <*cid*> are found in command Define PDP Context: AT+CGDCONT *(on page 343)*.

     Note: This event is not applicable for EPS.

PDP Context Activate or Deactivate: AT+CGACT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	Network dependent
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGACT=*[<state>[,<cid>[,<cid>[,...]]]]*	OK +CME ERROR:*<err>*
AT+CGACT?	+CGACT:*[<cid>,<state>]* *[<S3><S4>* +CGACT:*<cid>,<state>* *[…]]*
AT+CGACT=?	+CGACT:*(list of supported <state>s)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command is used to activate or deactivate the specified PDP context(s). After the command has completed, the MT remains in V.250 command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If the requested state for any specified context cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the Report Mobile Termination Error: AT+CMEE *(on page 297)* command. If the MT is not PS attached when the activation form of the command is executed, the MT first performs a PS attach and then attempts to activate the specified contexts. If the attach fails then the MT responds with ERROR or, if extended error responses are enabled, with the appropriate failure-to-attach error message.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

For EPS, if an attempt is made to disconnect the last PDN connection, then the MT responds with ERROR or, if extended error responses are enabled, a +CME ERROR.

Note: If the initial PDP context is supported, the context with *<cid>*=0 is automatically defined at startup, see sub-clause 10.1.0.

For EPS, the activation request for an EPS bearer resource will be answered by the network by either an EPS dedicated bearer activation or EPS bearer modification request. The request must be accepted by the MT before the PDP context can be set in to established state.

If no <*cid*>s are specified the command activates or deactivates all defined contexts.

The read command returns the current activation states for all the defined PDP contexts.

The test command is used for requesting information on the supported PDP context activation states.

Note: This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

Defined Values

state

Integer: 0 or 1. Indicates the state of PDP context activation.

Table 220. *state*

Value	Description
0	De-activated
1	Activated

cid

Integer. Specifies a particular PDP context definition (see the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

PDP Context Modify: AT+CGCMOD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGCMOD*[=<cid>[,<cid>[,...]]]*	OK +CME ERROR:*<err>*
AT+CGCMOD=?	+CGCMOD:*(list of <cid>s with active contexts)*

Description

This command is used to modify the QoS and TFTs of the specified PDP context(s). After the command has completed, the MT returns to V.250 online data state. If the requested modification cannot be done, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the AT+CMEE *(on page 297)* command.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

The network answers a modification request for an EPS bearer resource using an EPS bearer modification request. The request must be accepted by the MT before the PDP context change occurs.

If no *<cid>s* are specified the command modifies all active contexts.

The test command returns a list of *<cid>s* associated with active contexts.

Defined Values

cid

Integer. Specifies a particular PDP context definition (see the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

PDP Context Read Dynamic Parameters: AT+CGCONTRDP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGCONTRDP*[=<cid>]*	[+CGCONTRDP:<cid>,<bearer_id>,<apn> [,<local_addr and subnet_mask> [,<gw_addr> [,<DNS_prim_addr> [,<DNS_sec_addr> [,<P-CSCF_prim_addr> [,<P-CSCF_sec_addr> [,<IM_CN_Signalling_Flag> [,<LIPA_indication> [,<IPv4_MTU> [,<WLAN_Offload> [,<Local_Addr_Ind> [,<NonIP_MTU> [,<Serving_PLMN_rate_control_value>]]]]]]]]]]]]] [<S3><S4> +CGCONTRDP:<cid>,<bearer_id>,<apn> [,<local_addr and subnet_mask> [,<gw_addr> [,<DNS_prim_addr> [,<DNS_sec_addr> [,<P-CSCF_prim_addr> [,<P-CSCF_sec_addr> [,<IM_CN_Signalling_Flag> [,<LIPA_indication> [,<IPv4_MTU> [,<WLAN_Offload> [,<Local_Addr_Ind> [,<NonIP_MTU> [,<Serving_PLMN_rate_control_value>]]]]]]]]]]]]] [...]
AT+CGCONTRDP=?	+CGCONTRDP:*(list of <cid>s associated with activecontexts)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns the relevant information (*<bearer_id>*, *<apn>*, *<local_addr and subnet_mask>*, *<gw_addr>*, *<DNS_prim_addr>*, *<DNS_sec_addr>*, *<P-CSCF_prim_addr>*, *<P-CSCF_sec_addr>*, *<IM_CN_Signalling_Flag>* and *<LIPA_indication>*) for an active, non-secondary PDP context with the context identifier *<cid>*.

If the MT indicates more than two IP addresses of P-CSCF servers or more than two IP addresses of DNS servers, multiple lines of information per *<cid>* are returned.

If the MT has dual stack capabilities, at least one pair of lines with information is returned per *<cid>*: a first line containing the IPv4 parameters, followed by another line with the IPv6 parameters. If the MT with dual stack capabilities has more than two IP addresses of P-CSCF servers or more than two IP addresses of DNS servers, multiple of such pairs of lines are returned.

Note: If the MT doesn't know all the requested IP addresses, e.g. if the UE received four IP addresses of DNS servers and only two IP addresses of P-CSCF servers, the value corresponding to an unknown IP address is set to an empty or absent string.

If the parameter *<cid>* is omitted, the relevant information for all active, non-secondary PDP contexts is returned.

The test command returns a list of *<cid>*s associated with active, non-secondary contexts.

Defined Values

cid

Integer. Specifies a non-secondary PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands (see the Define PDP Context: AT +CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

bearer_id

Integer. Identifies the bearer, i.e. the EPS bearer in EPS and the NSAPI in UMTS/GPRS.

apn

String. A logical name that was used to select the GGSN or the external packet data network.

local_addr, subnet_mask

String. IP address and subnet mask of the MT. The string is given as dot-separated numeric (0-255) parameters on the form: `"a1.a2.a3.a4.m1.m2.m3.m4"` for IPv4 or `"a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16"` for IPv6.

gw_addr

String. Gateway Address of the MT. The string is given as dot-separated numeric (0-255) parameters.

DNS_prim_addr

String. IP address of the primary DNS server.

DNS_sec_addr

String. IP address of the secondary DNS server.

P_CSCF_prim_addr

String. IP address of the primary P-CSCF server.

P_CSCF_sec_addr

String. IP address of the secondary P-CSCF server.

IM_CN_Signalling_Flag

Integer: 0 or 1. Tells whether the PDP context is for IM CN subsystem-related signalling only or not.

Table 221. *IM_CN_Signalling_Flag*

Value	Description
0	PDP context is not for IM CN subsystem-related signalling only
1	PDP context is for IM CN subsystem-related signalling only

LIPA_indication

Integer: 0 or 1. Indicates that the PDP context provides connectivity using a LIPA PDN connection. This parameter cannot be set by the TE.

Table 222. *LIPA_indication*

Value	Description
0	No indication that the PDP context provides connectivity using a LIPA PDN connection
1	The PDP context provides connectivity using a LIPA PDN connection

IPv4_MTU

Integer. IPv4 MTU size in bytes.

WLAN_offload

Integer: 0..3. Indicates whether traffic can be offloaded using the specified PDN connection via a WLAN or not. This refers to bits 1 and 2 of the WLAN offload acceptability IE as specified in 3GPP TS 24.008 clause 10.5.6.20.

Table 223. *WLAN_offload*

Value	Description
0	Offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is not acceptable.
1	Offloading the traffic of the PDN connection via a WLAN when in S1 mode is acceptable, but not acceptable in Iu mode.
2	Offloading the traffic of the PDN connection via a WLAN when in Iu mode is acceptable, but not acceptable in S1 mode.
3	Offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is acceptable.

Local_Addr_Ind

Integer: 0 or 1. Indicates whether (1) or not (0) the MS and the network support local IP address in TFTs (see 3GPP TS 24.301 and 3GPP TS 24.008 clause 10.5.6.3).

Non-IP_MTU

Integer. Non-IP MTU size in bytes.

Serving_PLMN_rate_control_value

Integer. Indicates the maximum number of uplink messages the UE is allowed to send in a 6 minute interval. This refers to byte 3 to 4 of the Serving PLMN rate control IE as specified in 3GPP TS 24.301 clause 9.9.4.28.

Printing IP Address Format: AT+CGPIAF

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGPIAF= [<IPv6_AddressFormat> [,<IPv6_SubnetNotation> [,<IPv6_LeadingZeros> [,<IPv6_CompressZeros>]]]]	OK ERROR
AT+CGPIAF?	+CGPIAF:<IPv6_AddressFormat>, <IPv6_SubnetNotation>, <IPv6_LeadingZeros>, <IPv6_CompressZeros>
AT+CGPIAF=?	+CGPIAF:(list of supported <IPv6_AddressFormat>s), (list of supported <IPv6_SubnetNotation>s), (list of supported <IPv6_LeadingZeros>s), (list of supported <IPv6_CompressZeros>s)

Description

Set command decides what format to print IPv6 address parameters of other AT commands. See RFC 4291 [88] for details of the IPv6 address format.

The AT+CGPIAF parameters *<IPv6_AddressFormat>*, *<IPv6_SubnetNotation>*, *<IPv6_LeadingZeros>* and *<IPv6_CompressedZeros>* affect the following commands and parameters:

1. In AT+CGTFT *(on page 383)* and AT+CGTFTRDP *(on page 381)*, the <remote address and subnet mask>;
2. In AT+CGDCONT *(on page 343)*, the <PDP_addr>;
3. In AT+CGPADDR *(on page 379)*, the <PDP_addr_1> and <PDP_addr_2>;
4. In PDP Context Read Dynamic Parameters: AT+CGCONTRDP *(on page 368)*, the <local address and subnet mask>, <DNS_prim_addr>, <DNS_sec_addr>, <P_CSCF_prim_addr> and <P_CSCF_sec_addr>; and

The read command returns the current command parameter settings.

The test command returns values supported as compound values.

Defined Values

IPv6_AddressFormat

Integer: 0 or 1. IPv6 address format. Relevant for all AT command parameters that can hold an IPv6 address.

Table 224. *IPv6_AddressFormat*

Value	Description

0	Use IPv4-like dot-notation. IP address, and network mask if applicable, are dot-separated. Example: For <remote address and subnet mask>:
	`"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0.`
	`255.255.255.255.255.255.255.240.0.0.0.0.0.0.0.0"`
	For other IP address parameters:
	`"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0"`

1	Use IPv6-like colon-notation. IP address, and network mask if applicable and when given explicitly, are separated by a space. Example:
	For `<remote address and subnet mask>:`
	`"2001:0DB8:0000:CD30:0000:0000:0000:0000`
	`FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000"`
	For other IP address parameters:
	`"2001:0DB8:0000:CD30:0000:0000:0000:0000"`

IPv6_SubnetNotation

Integer: 0 or 1. Subnet notation for `<remote address and subnet mask>`. Setting does not apply if `<IPv6_AddressFormat>` = 0.

Table 225. *IPv6_SubnetNotation*

Value	Description

0	Both IP Address and subnet mask are stated explicitly, separated by a space. Example:
	`"2001:0DB8:0000:CD30:0000:0000:0000:0000`
	`FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000"`

1	The format uses / (forward slash) Classless Inter-Domain Routing (CIDR) notation. Example:`"2001:0DB8:0000:CD30:0000:0000:0000:0000/60"`

IPv6_LeadingZeros

Integer: 0 or 1. Presence or omission of leading zeros. Setting does not apply if `<IPv6_AddressFormat>` = 0.

Table 226. *IPv6_LeadingZeros*

Value	Description
0	Leading zeros are omitted. Example: `"2001:DB8:0:CD30:0:0:0:0"`
1	Leading zeros are included. Example: `"2001:0DB8:0000:CD30:0000:0000:0000:0000"`

IPv6_CompressZeros

Integer: 0 or 1. Authorises the use of the double colon '::' standing for any number of consecutive zeros. This applies only once. Setting does not apply if `<IPv6_AddressFormat>` = 0.

Table 227. *IPv6_CompressZeros*

Value	Description
0	No ::. Example: `"2001:DB8:0:CD30:0:0:0:1"`
1	Use ::. Example: `"2001:DB8:0:CD30::1"`

PS Attach or Detach: AT+CGATT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	Network dependent
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGATT=<*state*>	OK +CME ERROR:<*err*>
AT+CGATT?	+CGATT: <*state*>
AT+CGATT=?	+CGATT: (*list of supported* <*state*>*s*)

Description

This command attaches the MT to, or detach the MT from, the Packet Domain service. After the command has completed, the MT remains in V.250 command state. If the MT is already in the requested state, the command is ignored and the OK response is returned. If the requested state cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the Report Mobile Termination Error: AT+CMEE *(on page 297)* command.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Note: If the initial PDP context is supported, the context with <*cid*>=*0* is automatically defined at start up, see sub-clause 10.1.0.

Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.

The read command returns the current Packet Domain service state.

The test command is used for requesting information on the supported Packet Domain service states.

Note: This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

Defined Values

state

Integer: 0 or 1. Indicates the state of PS attachment.

Note: `AT+CGATT=1` puts the UE in automatic attach mode only if Set Phone Functionality: AT+CFUN *(on page 299)* and until the next Set Phone Functionality: AT+CFUN *(on page 299)*.

Table 228. *state*

Value	Description
0	Detached
1	Attached

Secondary PDP Context Read Dynamic Parameters: AT +CGSCONTRDP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGSCONTRDP*[=<cid>]*	[+CGSCONTRDP:*<cid>, <p_cid>, <bearer_id>* *[,<IM_CN_Signalling_Flag>]]* [<S3><S4> +CGSCONTRDP:*<cid>,<p_cid>,<bearer_id>* *[,<IM_CN_Signalling_Flag>]* […]]
AT+CGSCONTRDP=?	+CGSCONTRDP: *(list of <cid>s associated with active contexts)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns *<p_cid>*, *<bearer_id>* and *<IM_CN_Signalling_Flag>* for an active secondary PDP context with the context identifier *<cid>*.

If the parameter *<cid>* is omitted, the *<cid>*, *<p_cid>*, *<bearer_id>* and *<IM_CN_Signalling_Flag>* are returned for all active secondary PDP contexts.

In EPS, the Traffic Flow parameters are returned.

Note: Parameters for UE initiated and network initiated PDP contexts are returned.

The test command returns a list of *<cid>*s associated with active secondary PDP contexts.

Defined Values

cid

Integer. Specifies a particular active secondary PDP context or Traffic Flows definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands (see the Define

PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

p_cid

Integer. Specifies a particular PDP context definition or default EPS context Identifier which has been specified by use of the Define PDP Context: AT+CGDCONT *(on page 343)* command. The parameter is local to the TE-MT interface (see the AT+CGDSCONT *(on page 350)* command).

bearer_id

Integer. Identifies the bearer, EPS Bearer in EPS and NSAPI in UMTS/GPRS.

IM_CN_Signalling_Flag

Integer: 0 or 1. Shows whether the PDP context is for IM CN subsystem-related signalling only or not.

Table 229. *IM_CN_Signalling_Flag*

Value	Description
0	PDP context is not for IM CN subsystem-related signalling only
1	PDP context is for IM CN subsystem-related signalling only

Show PDP Address(es): AT+CGPADDR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGPADDR*[=<cid>[,<cid>[,...]]]*	OK [+CGPADDR:<*cid*>[, <*PDP_addr_1*>[, <*PDP_addr_2*>]]] [<S3><S4> +CGPADDR: <*cid*>,[<*PDP_addr_1*>[, <*PDP_addr_2*>]] […]]
AT+CGPADDR=?	+CGPADDR: *(list of defined <cid>s)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns a list of PDP addresses for the specified context identifiers. If no <*cid*> is specified, the addresses for all defined contexts are returned.

The test command returns a list of defined <*cid*>s.

Defined Values

cid

Integer: Specifies a particular PDP context definition (see the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

PDP_addr_1, PDP_addr_2

Each is a string type that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic. For a static address, it will be the one set by the AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands when the context was defined. For a dynamic address it will be the one assigned during the last PDP context activation that used the context definition referred to by <*cid*>. Both <*PDP_addr_1*> and <*PDP_addr_2*> are omitted if none is available. Both <*PDP_addr_1*> and <*PDP_addr_2*> are included when both IPv4 and IPv6 addresses are assigned, with <*PDP_addr_1*> containing the IPv4 address and <*PDP_addr_2*> containing the IPv6 address.

The string is given as dot-separated numeric (0-255) parameter of the form:`a1.a2.a3.a4` for IPv4 and `a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16` for IPv6.

Note: In dual-stack terminals (<*PDP_type*> IPV4V6), the IPv6 address will be provided in <*PDP_addr_2*>. For terminals with a single IPv6 stack (<*PDP_type*> IPV6) or due to backwards compatibility, the IPv6 address can be provided in parameter <*PDP_addr_1*>.

Traffic Flow Template Read Dynamic Parameters: AT +CGTFTRDP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. Device attached
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGTFTRDP*[=<cid>]*	[+CGTFTRDP:*<cid>, <packet filter identifier>,* *<evaluation precedence index>, <remote address and subnet mask>,* *<protocol number (ipv4) / next header (ipv6)>,* *<local port range>, <remote port range>,* *<ipsec security parameter index (spi)>,* *<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>,* *<flow label (ipv6)>, <direction>,<NW packet filter Identifier>]* [<S3><S4> +CGTFTRDP:*<cid>, <packet filter identifier>,* *<evaluation precedence index>, <remote address and subnet mask>,* *<protocol number (ipv4) / next header (ipv6)>,* *<local port range>, <remote port range>,* *<ipsec security parameter index (spi)>,* *<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>,* *<flow label (ipv6)>,* *<direction>,* *<NW packet filter Identifier>* *[…]]*
AT+CGTFTRDP=?	+CGTFTRDP:*(list of <cid>s associated with active contexts)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns the relevant information about Traffic Flow Template for an active secondary or non secondary PDP context specified by *<cid>* together with the additional network assigned values when established by the network. If the parameter *<cid>* is omitted, the Traffic Flow Templates for all active secondary and non secondary PDP contexts are returned.

Parameters of both network and MT/TA initiated PDP contexts are returned.

The test command returns a list of <*cid*>s associated with active secondary and non secondary contexts.

Defined Values

cid

Integer: Specifies a particular secondary or non secondary PDP context definition or Traffic Flows definition (see Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

packet filter identifier

Integer: 1..16.

evaluation precedence index

Integer: 0..255.

remote address, subnet mask

String. Dot-separated numeric (0-255) parameters on the form: `"a1.a2.a3.a4.m1.m2.m3.m4"` for IPv4 or `"a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16"` for IPv6.

protocol number (ipv4) / next header (ipv6)

Integer: 0..255.

local port range

String. Dot-separated numeric (0-65535) parameters of the form "`from.to`".

remote port range

String. Dot-separated numeric (0-65535) parameters of the form "`from.to`".

ipsec security parameter index (spi)

Numeric value in hexadecimal format. The value range is from 00000000 to FFFFFFFF.

type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask

String. Dot-separated numeric (0-255) parameters of the form `"type.mask"`.

flow label (ipv6)

Numeric value in hexadecimal format. The value range is from 00000 to FFFFF. Valid for IPv6 only.

direction

Integer: 0, 1, 2 or 3. Specifies the transmission direction in which the Packet Filter shall be applied.

Table 230. *direction*

Value	Description
0	Pre Release 7 TFT Filter (see 3GPP TS 24.008 [8], table 10.5.162)
1	Uplink
2	Downlink
3	Bidirectional (Used for Uplink and Downlink)

NW packet filter Identifier

Integer: 1..16. In EPS the value is assigned by the network when established

Note: Some of the above listed attributes can coexist in a Packet Filter while others mutually exclude each other. The possible combinations are shown in 3GPP TS 23.060 [47].

Traffic Flow Template: AT+CGTFT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGTFT=*[<cid>,* *[<packet filter identifier>, <evaluation precedence index>* *[,<remote address and subnet mask>* *[,<protocol number (ipv4) / next header (ipv6)>* *[,<local port range>* *[,<remote port range>* *[,<ipsec security parameter index (spi)>* *[,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>* *[,<flow label (ipv6)>* *[,<direction>]]]]]]]]]*	OK ERROR +CME ERROR:*<err>*
AT+CGTFT?	[+CGTFT:*<cid>, <packet filter identifier>,* *<evaluation precedence index>, <remote address and subn* *<protocol number (ipv4) / next header (ipv6)>, <local por* *<remote port range>, <ipsec security parameter index (sp* *<type of service (tos) (ipv4) and mask / traffic class (ipv6)* *<flow label (ipv6)>, <direction>]* [<S3><S4> +CGTFT:*<cid>, <packet filter identifier>,* *<evaluation precedence index>, <remote address and subn* *<protocol number (ipv4) / next header (ipv6)>, <local por* *<remote port range>, <ipsec security parameter index (sp* *<type of service (tos) (ipv4) and mask / traffic class (ipv6)* *<flow label (ipv6)>, <direction>* […]]

Command	Possible Response(s)
AT+CGTFT=?	+CGTFT:<*PDP_type*>, (*list of supported <packet filter identifier>s*), (*list of supported <evaluation precedence index>s*), (*list of supported <remote address and subnet mask>s*), (*list of supported <protocol number (ipv4) / next header (i* (*list of supported <local port range>s*), (*list of supported <remote port range>s*), (*list of supported <ipsec security parameter index (spi)>s*) (*list of supported <type of service (tos) (ipv4) and mask / t* (*list of supported <flow label (ipv6)>s*), (*list of supported <direction>s*) [<S3><S4> +CGTFT:<*PDP_type*>, (*list of supported <packet filter identifier>s*), (*list of supported <evaluation precedence index>s*), (*list of supported <remote address and subnet mask>s*), (*list of supported <protocol number (ipv4) / next header (i* (*list of supported <local port range>s*), (*list of supported <remote port range>s*), (*list of supported <ipsec security parameter index (spi)>s*) (*list of supported <type of service (tos) (ipv4) and mask / t* (*list of supported <flow label (ipv6)>s*), (*list of supported <direction>s*) *[…]]*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command allows the TE to specify a Packet Filter - PF for a Traffic Flow Template - TFT that is used in the GGSN in UMTS/GPRS and Packet GW in EPS for routing of packets onto different QoS flows towards the TE. The concept is further described in the 3GPP TS 23.060 [47]. A TFT consists of from one and up to 16 Packet Filters, each identified by a unique *<packet filter identifier>*. A Packet Filter also has an *<evaluation precedence index>* that is unique within all TFTs associated with all PDP contexts that are associated with the same PDP address.

The set command specifies a Packet Filter that is to be added to the TFT stored in the MT and used for the context identified by the (local) context identification parameter, *<cid>*. The specified TFT will be stored in the GGSN in UMTS/GPRS and Packet GW in EPS only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands, the Traffic Flow Template: AT+CGTFT *(on page 383)* command is effectively an extension to these commands. The Packet Filters consist of a number of parameters, each of which may be set to a separate value.

A special form of the set command, Traffic Flow Template: AT+CGTFT *(on page 383)* causes all of the Packet Filters in the TFT for context number <cid> to become undefined. At any time there may exist only one PDP context with no associated TFT amongst all PDP contexts associated to one PDP address. At an attempt to delete a TFT, which would violate this rule, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for `<err>` values.

The read command returns the current settings for all Packet Filters for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line. TFTs shall be used for PDP-type IP and PPP only. For PDP-type PPP a TFT is applicable only when IP traffic is carried over PPP. If PPP carries header-compressed IP packets, then a TFT cannot be used.

Defined Values

cid

Integer. Specifies a particular PDP context definition (see the Define PDP Context: AT+CGDCONT *(on page 343)* and Define Secondary PDP Context: AT+CGDSCONT *(on page 350)* commands).

PDP_type

String. Specifies the type of packet data protocol (see the Define PDP Context: AT+CGDCONT *(on page 343)* command).

packet filter identifier

Integer: 1..16. See also 3GPP TS 23.060 [47]

evaluation precedence index

Integer: 0..255. See also 3GPP TS 23.060 [47]

remote address, subnet mask

String. The string is given as dot-separated numeric (0-255) parameters of the form: `"a1.a2.a3.a4.m1.m2.m3.m4"` for IPv4 or `"a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16"`, for IPv6.

protocol number (ipv4) / next header (ipv6)

Integer: 0..255.

local port range

String. The string is given as dot-separated numeric (0-65535) parameters of the form "`from.to`".

remote port range

String. The string is given as dot-separated numeric (0-65535) parameters of the form "`from.to`".

ipsec security parameter index (spi)

Numeric value in hexadecimal format. The value range is from 00000000 to FFFFFFFF.

type of service (tos) (ipv4) and mask, traffic class (ipv6) and mask

String. The string is given as dot-separated numeric (0-255) parameters of the form `"t.m"`.

flow label (ipv6)

Numeric value in hexadecimal format. The value range is from 00000 to FFFFF. Valid for IPv6 only.

direction

Integer: 0, 1, 2 or 3. Specifies the transmission direction in which the packet filter shall be applied.

Table 231. *direction*

Value	Description
0	Pre-Release 7 TFT filter (see 3GPP TS 24.008 [8], table 10.5.162)
1	Uplink

Table 231. *direction* (continued)

Value	Description
2	Downlink
3	Bidirectional (Up & Downlink)

Note: Some of the above listed attributes may coexist in a Packet Filter while others mutually exclude each other, the possible combinations are shown in 3GPP TS 23.060 [47].

UE Modes of Operation for EPS: AT+CEMODE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	1 s
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

See the current implementation limitation in the `mode` parameter description.

Syntax

Command	Possible Response(s)
AT+CEMODE=<*mode*>	OK +CME ERROR:<*err*>
AT+CEMODE?	+CEMODE:<*mode*> OK
AT+CEMODE=?	+CEMODE:(*list of supported* <*mode*>*s*) OK

Description

This commands set the MT to operate according to the specified mode of operation for EPS, see 3GPP TS 24.301 [83]. If the requested mode of operation is not supported, an `ERROR` or `+CME ERROR` response is returned. Extended error responses are enabled by the AT+CMEE *(on page 297)* command.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The read command returns the mode of operation set by the TE, regardless of the current serving cell capability and of the current serving cell Access Technology.

The test command is used for requesting information on the supported MT mode of operation.

Defined Values

CAUTION: Only <*mode*> 0 and 2 are currently implemented.

mode

Integer: 0, 1, 2 or 3. Indicates the mode of operation.

Table 232. *mode*

Value	Description
0	PS mode 2 of operation

Table 232. *mode* (continued)

Value	Description
1	CS/PS mode 1 of operation
2	CS/PS mode 2 of operation (default value)
3	PS mode 1 of operation

NOTE: the definition for UE modes of operation can be found in 3GPP TS 24.301 [83]

Chapter 15. SIM Management Commands

Activate USAT Profile: AT+CUSATA

Mode	LTE-M – NBIoT
Type	Synchronous / Asynchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	Network Dependent
Persistency	SIM Persistent, if applicable

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CUSATA[=<*activation*>]	+CUSATA:<*UICC_state*>[,<*additional_profile_support*>] +CME ERROR:<*err*>
AT+CUSATA=?	+CUSATA:(*list of supported <activation>s*)

Description

The command AT+CUSATA retrieves the current UICC state or downloads a profile to the UICC and/or activates handling of the TE profile facilities.

A positive result after a +CUSATA=1 or +CUSATA=3 command (also) enables TE profile facility handling via unsolicited result codes +CUSATP: <proactive_command> and +CUSATEND. The MT uses the unsolicited result code +CUSATP: <proactive_command> to forward to the TE proactive commands issued by the UICC. The unsolicited result code +CUSATEND is issued by the MT when the UICC indicates that the proactive command session is terminated, i.e. in response to a USAT terminal response, the UICC indicates that no other USAT proactive command is pending. Lastly, terminal responses to the proactive commands can now be issued with +CUSATT=<terminal_response> and envelope commands can be issued with +CUSATE=<envelope_command>.

If the action requested by the +CUSATA command can not be performed, the information response +CUSATA: <UICC_state>,[<additional_profile_support>] is returned with appropriate values, followed by the final result code +CME ERROR: 4 (Operation not supported) in case the UICC does not support USAT at all, or the final result code +CME ERROR: 3 (Operation not allowed) in all other cases.

If the UICC is already in active state and the UICC does not support the "Additional TERMINAL PROFILE after UICC activation" feature (see 3GPP TS 31.111 [92]), the TE has the option to perform a reset of the UICC or use AT+CFUN to get back to an initial non-active UICC state. The AT+CUSATD command can be used to set profile handling upon the next restart.

All USAT proactive commands that the MT does not process itself and all terminal responses from the TE are transparently forwarded by the MT. The routing mechanism for USAT commands supported by both entities is specified in 3GPP TS 31.111 [92].

Test command returns values supported as a compound value.

Refer to Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on *<err>*.

Defined Values

activation

Integer: 0, 1, 2 or 3.

Table 233. *activation*

Value	Description
0	Return status information only, in information response:`AT +CUSATA:`*<UICC_state>[,<additional_profile_support>]*.
1	Enable TE profile facility handling only, no profile download. This action can only be used if the combined TE and MT profile was downloaded during start-up (setting Profile Download upon Start-Up: AT+CUSATD *(on page 409)*).
2	Download MT default profile.
3	Download the combined TE and MT profile (merger of the profiles written by Write USAT Profile: AT+CUSATW *(on page 428)*) an enable TE profile facility handling. The rules for merging profiles are defined in 3GPP TS 31.111 [92].

UICC_state

Integer: 0..4. Reports that the UICC entered a new state during start-up or that the UICC ended start-up and entered active state.

Table 234. *UICC_state*

Value	Description
0	UICC start-up in progress, before profile download.
1	UICC start-up halted and ready for profile download. This state is reached if `+CUSATD=2` was issued before restart. UICC start-up will continue upon `+CUSATA=2` or `+CUSATA=3`.
2	Profile download completed, UICC start-up continuing.
3	UICC awaiting PIN verification.
4	UICC active.

additional_profile_support

Integer: 0 or 1. Indicates whether the UICC supports the `"Additional TERMINAL PROFILE after UICC activation"` feature (see 3GPP TS 31.111 [92]). The value may not be available during early phases of start-up.

Table 235. *additional_profile_support*

Value	Description
0	No support.
1	Supported.

proactive_command

Hexadecimal characters. Proactive command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

Change Password: AT+CPWD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4; SIM card must be present; AT+CLCK to lock SIM
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

See the current implementation limitation in *fac* parameter description.

Syntax

Command	Possible Response(s)
AT+CPWD=<*fac*>,<*oldpwd*>,<*newpwd*>	OK +CME ERROR:<*err*>
AT+CPWD=?	+CPWD: *list of supported* (<*fac*>,<*pwdlength*>)*s*

Description

This command sets a new password for the facility lock function defined by command Facility Lock AT+CLCK *(on page 401)*.

The test command returns a list of pairs which present the available facilities and the maximum length of their password.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

fac

String: "SC" or "P2". Facility. See Facility Lock: AT+CLCK *(on page 401)* for other values.

CAUTION: Only the 'SC' and 'P2' facilities are currently implemented.

Table 236. *fac*

Value	Description
"P2"	SIM PIN2
"SC"	SIM (lock SIM/UICC card installed in the currently selected card slot) (SIM/UICC asks password in MT power-up and when this lock command is issued)

oldpwd, newpwd

String. <*oldpwd*> must be the same as password specified for the facility from the MT user interface or with command Change Password AT+CPWD and <*newpwd*> is the new password. The maximum length of password can be determined with <*pwdlength*>.

pwdlength

Integer. Maximum length of the password for the facility.

Change PIN with Application ID: AT+SCPWD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	SIM Persistent

Syntax

Command	Possible Response(s)
AT+SCPWD=*<fac>, <pin>,<newPin>[,<aid>]*	+CME ERROR:*err*

Description

This command allows changing the PIN using the Application ID *aid*.

Defined Values

fac

String. Facility type. Only the facility "SC" is supported.

pin

Integer. Value of PIN code

newpin

Integer. Value of new PIN code

aid

Hexadecimal number. Application ID, if omitted USIM application is used.

Example

```
AT+SCPWD="SC",1234,5678,A0000000871004010203040506070809
OK
```

Change STK APN Configuration: AT+SQNSTKAPNE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	300 ms
Time-out	–
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNSTKAPNE=<*apnname*>, <*iptype*>, <*enabled*>	OK
AT+SQNSTKAPNE?	+SQNSTKAPNE:<*apnname*>,<*iptype*>,<*enabled*> OK
AT+SQNSTKAPNE=?	+SQNSTKAPNE:<*apnname*>, (ip, ipv6, ipv4v6), (0,1) OK

Description

This command changes the STK APN configuration. If the UICC STK application does not provide the APN in the open channel, this configuration is used instead.

CAUTION: This setting is lost at reboot.

The read command returns the current configuration.

The test command returns the possible values.

Note: The maximum usable length for <*apnname*> is 127 bytes. Any longer string is internally truncated to the first 127 bytes.

Defined Values

iptype

String. IP stack description.

Table 237. *iptype*

Value	Description
ip	IPv4 only
ipv6	IPv6 only
ipv4v6	IPv4 and IPv6

enabled

Integer: 0 or 1. Status.

Table 238. *enabled*

Value	Description
0	APN is disabled
1	APN is enabled

Example

Set STK APN:

```
AT+SQNSTKAPNE="stktest","ipv4v6",1
OK
```

Read the current autoconnect setting:

```
AT+SQNSTKAPNE?
+SQNSTKAPNE: stktest,ipv4v6,1
OK
```

Close Logical Channel: AT+CCHC

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CCHC=<*sessiondd*>	+CCHC OK +CME ERROR: <*err*>
AT+CCHC=?	OK

Description

This command asks the ME to close a communication session with the active UICC. The ME closes the previously opened logical channel. The TE will no longer be able to send commands using this logical channel. The UICC closes the logical channel on reception of this command.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

sessionid

Integer. A session Id to be used in order to target a specific application on the smart card (e.g. (U)SIM, WIM, ISIM) using the logical channels mechanism.

Enter PIN2: AT+CPIN2

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	SIM Persistent

Syntax

Command	Possible Response(s)
AT+CPIN2=*<pin>[,<newPin>[,<aid>]]*	+CME ERROR: *<err>* OK

Description

This command allows sending to the USIM the PIN2 and the PUK2 if the SIM supports PUK2. If the PUK2 is sent it must be followed by the new PIN2.

Defined Values

pin

Integer. Value of PIN2 or PUK2

newpin

Integer. Value of new PIN2 if SIM contains PUK2

aid

String. Application ID, if omitted the USIM application is used

Example

Enter PIN2 without *aid*:

```
AT+CPIN2=1234
OK
```

Enter PUK2 and update PIN2 without *aid*:

```
AT+CPIN2=12345678,1234
OK
```

Enter PIN: AT+CPIN

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN = 1 or 4
Time-out	300 ms
Persistency	SIM Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CPIN=<*pin*>[,<*newpin*>]	OK +CME ERROR: <*err*>
AT+CPIN?	+CPIN: <*code*> +CME ERROR: <*err*>
AT+CPIN=?	

Description

This command sends to the MT a password which is necessary before it can be operated (SIM PIN, SIM PUK, PH SIM PIN, etc.). If the PIN is to be entered twice, the TA shall automatically repeat the PIN. If no PIN request is pending, no action is taken towards MT and an error message, +CME ERROR, is returned to TE.

Note: SIM PIN, SIM PUK, PH-SIM PIN, PH-FSIM PIN, PH-FSIM PUK, SIM PIN2 and SIM PUK2 refer to the PIN of the selected application on the UICC. For example, in an UTRAN context, the selected application on the currently selected UICC should be a USIM and the SIM PIN then represents the PIN of the selected USIM. See 3GPP TS 31.101 [65] for further details on application selection on the UICC.

If the PIN required is SIM PUK or SIM PUK2, the second PIN is required. This second PIN, <*newpin*>, is used to replace the old PIN in the SIM.

The read command returns an alphanumeric string indicating whether some password is required or not.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

pin

String: PIN code.

newpin

String: New PIN code.

code

String. Specific code:

Table 239. *code*

Value	Description
READY	MT is not waiting for any password
SIM PIN	MT is waiting for the SIM PIN to be given
SIM PUK	MT is waiting for the SIM PUK to be given
PH-SIM PIN	MT is waiting for the phone to SIM card password to be given
PH-FSIM PIN	MT is waiting for the phone-to-very first SIM card password to be given
PH-FSIM PUK	MT is waiting for the phone-to-very first SIM card unblocking password to be given
SIM PIN2	MT is waiting for theSIM PIN2 to be given (this <*code*> is recommended to be returned only when the last executed command resulted in PIN2 authentication failure (i.e. `+CME ERROR: 17`); if PIN2 is not entered right after the failure, it is recommended that MT does not block its operation)
SIM PUK2	MT is waiting for the SIM PUK2 to be given (this <*code*> is recommended to be returned only when the last executed command resulted in PUK2 authentication failure (i.e. `+CME ERROR: 18`); if PUK2 and new PIN2 are not entered right after the failure, it is recommended that MT does not block its operation)
PH-NET PIN	MT is waiting for thenetwork personalisation password to be given
PH-NET PUK	MT is waiting for the network personalisation unblocking password to be given
PH-NETSUB PIN	MT is waiting for the network subset personalization password to be given
PH-NETSUB PUK	MT is waiting for the network subset personalization unblocking password to be given
PH-SP PIN	MT is waiting for the service provider personalization password to be given
PH-SP PUK	MT is waiting for service provider personalisation unblocking password to be given
PH-CORP PIN	MT is waiting for the corporate personalisation password to be given
PH-CORP PUK	MT is waiting for the corporate personalisation unblocking password to be given

Facility Lock: AT+CLCK

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN = 1 or 4. SIM card present
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

See the current implementation limitation in `fac` parameter description.

Syntax

Command	Possible Response(s)
AT+CLCK=*<fac>,<mode> [,<passwd>[,<class>]]*	+CME ERROR: *<err>* OK When *<mode>*=2 and command successful: +CLCK:*<status>[,<class1>* [<S3><S4>+CLCK:*<status>,<class2>* *[...]]* OK
AT+CLCK=?	+CLCK:*(list of supported <fac>s)*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command is used to lock, unlock or interrogate a MT or a network facility *<fac>*. Password is normally needed to do such actions. When querying the status of a network service (*<mode>*=2) the response for 'not active' case (*<status>=0*) is returned only if service is not active for any *<class>*.

Call barring facilities are based on GSM/UMTS supplementary services (refer 3GPP TS 22.088 [6]). Their interaction with other commands based on other GSM/UMTS supplementary services is described in the GSM/UMTS standard.

The test command returns the facility values supported as a compound value.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

Defined Values

fac

String. Facility:

CAUTION: Only the 'SC', 'FD', 'PN' and 'PS' facilities are currently implemented.

Table 240. *fac*

Value	Description
"PS"	PH USIM (lock PHone to USIM/UICC card installed in the currently selected card slot) (MT asks password when other than current USIM/UICC card inserted; MT may remember some previously used cards, thus not requiring password when they are inserted)
"SC"	USIM (lock USIM/UICC card installed in the currently selected card slot) (USIM/UICC asks password in MT power-up and when this lock command issued)
"AO"	BAOC (Bar All Outgoing Calls) (refer 3GPP TS 22.088 [6] clause 1)
"OI"	BOIC (Bar Outgoing International Calls) (refer 3GPP TS 22.088 [6] clause 1)
"OX"	BOIC exHC (Bar Outgoing International Calls except to Home Country) (refer 3GPP TS 22.088 [6] clause 1)
"AI"	BAIC (Bar All Incoming Calls) (refer 3GPP TS 22.088 [6] clause 2)
"IR"	BIC Roam (Bar Incoming Calls when Roaming outside the home country) (refer 3GPP TS 22.088 [6] clause 2)
"AB"	All Barring services (refer 3GPP TS 22.030 [19]) (applicable only for <*mode*>=0)
"AG"	All outGoing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <*mode*>=0)
"AC"	All inComing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <*mode*>=0)
"FD"	SIM card or active application in the UICC (GSM or USIM) fixed dialling memory feature (if PIN2 authentication has not been done during the current session, PIN2 is required as <*passwd*>)
"PN"	Network Personalization (refer 3GPP TS 22.022 [33])

mode

Integer: 0, 1 or 2. Mode:

Table 241. *mode*

Value	Description
0	Unlock
1	Lock
2	Query status

status

Integer: 0 or 1. Status:

Table 242. *status*

Value	Description
0	Not active
1	Active

passwd

String. Password set for the facility from the MT user interface or with the command AT+CPWD *(on page 392)*.

classx

8-bit bitfield. Each bit represents a class of information. Default is 7 = voice + data + fax.

Table 243. *classx*

Value	Description
1	Voice (telephony)
2	Data (refers to all bearer services; with <*mode*>=2 this may refer only to some bearer service if TA does not support values 16, 32, 64 and 128)
4	Fax (facsimile services)
8	Short message service
16	Data circuit sync
32	Data circuit async
64	Dedicated packet access
128	Dedicated PAD access

Generic SIM Access: AT+CSIM

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	SIM Persistent, if applicable

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CSIM=<*length*>,<*command*>	+CSIM:<*length*>,<*response*> +CME ERROR:<*err*> OK
AT+CSIM=?	

Description

This command transmits <*command*> to the SIM. In the same manner, the SIM <*response*> is handed back to the TA verbatim.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

This command allows a direct control of the SIM by a distant application. Care must taken to process SIM information within the frame specified by GSM/UMTS.

Note: Compared to the Restricted SIM Access command AT+CRSM *(on page 415)*, the definition of AT+CSIM allows the TE more control over the SIM MT interface. The locking and unlocking of the interface can be done using a special <*command*> value or automatically by the TA/MT (interpreting the <*command*> parameter). If the TE application does not use the unlock command (or does not send a <*command*> causing automatic unlock) before a certain time-out value, the MT can release the lock.

Defined Values

length

Integer. Length of the characters that are sent to TE in <*command*> or <*response*> (twice the actual length of the command or response).

command

Hexadecimal characters. Command passed in the format as described in 3GPP TS 51.011 [28]. See also Select TE Character Set: AT+CSCS *(on page 12)*.

response

Hexadecimal characters. Response to the command in the format as described in 3GPP TS 51.011 [28]. See also Select TE Character Set: AT+CSCS *(on page 12)*.

Generic UICC Logical Channel Access: AT+CGLA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	Non Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CGLA=<*sessionid*>,<*length*>,<*command*>	+CGLA:<*length*>, <*response*> OK +CME ERROR: <*err*>
AT+CGLA=?	+CME ERROR: <*err*>

Description

This command transmits the <*command*> to the MT, which forwards it as it is to the selected UICC. In the same manner the UICC <*response*> is forwarded back by the MT to the TA as it is.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

This command allows a direct control of the currently selected UICC by a distant application on the TE. The TE must take care of processing UICC information within the frame specified by GSM/UMTS.

Although the generic UICC Logical Channel Access command AT+CGLA allows TE to take control over the UICC-MT interface, there are some functions of the UICC-MT interface that logically do not need to be accessed from outside the TA/MT. Moreover, for security reasons, the GSM network authentication should not be handled outside the TA/MT. Therefore execution of a Run GSM Algorithm command or an Authenticate command in GSM ETSI 3GPP TS 27.007 version 12.10.0 Release 12 139 ETSI TS 12 007 V12.10.0 (2015-10) context from the TE using AT+CGLA is forbidden at all time, regardless if the +CGLA is locked or unlocked. This policy does not forbid the TE to send Authenticate commands in other security contexts (e.g. EAP security context).

For example, the TA/MT forbids the transfer of the Authenticate command to a USIM application when parameters P2 = 0 (GSM security context). See 3GPP TS 31.102 [59] for USIM authenticate command definition.

Note: Compared to Restricted UICC Access command Restricted UICC Logical Channel Access: AT+CRLA *(on page 417)*, the definition of AT+CGLA allows TE to take more control over the UICC-MT interface. The locking and unlocking of the interface may be done by a special <*command*> value or automatically by the TA/MT (interpreting the <*command*> parameter). In case that the TE application does not use the unlock command (or does not send a <*command*> causing automatic unlock) within a certain time-out value, the MT can release the lock.

Defined Values

sessionid

Integer. Identifier of the session to be used in order to send the APDU commands to the UICC. This id is mandatory to be able to send commands to the UICC when targeting applications on the smart card using a logical channel other than the default channel (channel '0').

length

Integer. Length of the characters that are sent to TE in <*command*> or <*response*> (two times the actual length of the command or response)

command

Hexadecimal characters. Command passed on by the MT to the UICC in the format as described in 3GPP TS 31.101 [65] (refer to Select TE Character Set: AT+CSCS *(on page 12)*)

response

Hexadecimal characters. Response to the command passed on by the UICC to the MT in the format as described in 3GPP TS 31.101 [65] (refer to Select TE Character Set: AT+CSCS *(on page 12)*)

Example

- Lock the SIM interface

```
AT+CGLA=<sessionId>,1,"1"
```

- Unlock the SIM interface:

```
AT+CGLA=<sessionId>,1,"0"
```

ICCID Read: AT+SQNCCID

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNCCID	+SQNCCID:<*iccid*>[,<*euiccid*>] OK +CME ERROR:<*err*>
AT+SQNCCID?	+SQNCCID:<*iccid*>[,<*euiccid*>] OK +CME ERROR:<*err*>
AT+SQNCCID=?	+CME ERROR:<*err*>

Description

This command reads the ICCID (Card Identification Number) on the SIM card.

CAUTION: Reading the CCID of the SIM card is only possible if CFUN=1 or CFUN=4. Any attempt made when the modem is not in one of these two states silently fails (no error returned).

The test command returns an OK result code.

Defined Values

iccid

String. USIM integrated circuit card ID.

euiccid

String. eUICCID of the SIM card.

Open Logical Channel: AT+CCHO

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CCHO=<*dfname*>	<*sessionid*> OK +CME ERROR: <*err*>
AT+CCHO=?	OK

Description

This command causes the MT to return <*sessionid*> to allow the TE to identify a channel that is being allocated by the currently selected UICC, which is attached to ME. The currently selected UICC will open a new logical ETSI 3GPP TS 27.007 version 12.10.0 Release 12 141 ETSI TS 12 007 V12.10.0 (2015-10) channel; select the application identified by the <*dfname*> received with this command and return a session Id as the response. The ME shall restrict the communication between the TE and the UICC to this logical channel.

This <*sessionid*> is to be used when sending commands with the Restricted UICC Logical Channel access AT+CRLA *(on page 417)* or Generic UICC Logical Channel Access: AT+CGLA *(on page 405)* commands.

Note: The logical channel number is contained in the CLASS byte of an APDU command, thus implicitly contained in all APDU commands sent to a UICC. In this case it will be up to the MT to manage the logical channel part of the APDU CLASS byte and to ensure that the chosen logical channel is relevant to the <*sessionid*> indicated in the AT command. See 3GPP TS 31.101 [65] for further information on logical channels in APDU commands protocol.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

dfname

All selectable applications in the UICC are referenced by a DF name coded with 1 to 16 bytes.

sessionid

Integer: A session Id to be used in order to target a specific application on the smart card (e.g. (U)SIM, WIM, ISIM) using the logical channels mechanism.

Profile Download upon Start-Up: AT+CUSATD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CUSATD=[<*download*>[,<*reporting*>]]	+CME ERROR:<*err*> OK
AT+CUSATD?	+CUSATD:<*download*>,<*reporting*> OK
AT+CUSATD=?	+CUSATD:(*list of supported <download>s*), (*list of supported <reporting>s*)

Description

This command determines if any, and optionally which, profile should be downloaded to the UICC automatically upon start-up. If, prior to a restart/start-up, the AT+CUSATD settings have not been altered, then the default settings determine the behaviour upon start-up. However, if the parameters of AT+CUSATD have been set to other than default and a restart is performed (e.g. by AT+CFUN *(on page 299)*), these values determine the behaviour. This is true for only the next restart after altering AT+CUSATD parameters, since they are always restored to their default at the end of the next UICC start-up (i.e. when the USIM initialisation as specified in 3GPP TS 31.102 [98] has been completed).

The command without parameters (AT+CUSATD=) resets the parameters to their default values.

The command can only be used if the UICC is already in active state (<UICC_state> 4, e.g. upon AT+CUSATA) or in download completed state (<UICC_state> 2) and the UICC does not support the "Additional TERMINAL PROFILE after UICC activation" feature (see 3GPP TS 31.111 [92]). In all other cases the command responds with +CME ERROR: 14 (SIM busy).

AT+CUSATD=<download>,1 also enables the unsolicited result code +CUSATS: <UICC_state>. The MT uses this unsolicited result code to indicate that a profile download is performed (setting +CUSATD=0,1 or +CUSATD=1,1) or that it is ready for profile download (setting +CUSATD=2,1). In both cases, the MT also indicates the end of UICC start-up by the unsolicited result code +CUSATS: 4. If the UICC is awaiting PIN verification during start-up, this is also reported.

When using AT+CUSATD=1, the AT+CUSATA=1 command has to be used to enable TE profile facility handling after restart. In the time between profile download and issuance of AT+CUSATA=1, the UICC may already attempt to issue proactive commands. The MT will not send these to the TE, but rather give the UICC the response "terminal currently unable to process command" autonomously. The UICC may implement only a limited number of retries, which can potentially leave USAT in an unwanted state if the AT+CUSATA=1 command arrives late.

Note: Care has to be taken when using AT+CUSATD=2. If no AT+CUSATA=2 or AT+CUSATA=3 is sent during start-up, USAT is also blocked for the MT.

The test command returns supported values as compound values.

Refer to Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on <*err*>.

Defined Values

download

Integer: 0, 1 or 2. When/if to perform a profile download to UICC, and which profile to download. The default value is implementation specific.

Table 244. *download*

Value	Description
0	Download MT default profile automatically during next start-up.
1	Download the combined TE and MT profile (merger of the profiles written by AT +CUSATW) automatically during next start-up. The rules for merging profiles are defined in 3GPP TS 31.111 [92].
2	Halt next UICC start-up when ready for profile download. Profile to download will be selected and download will be triggered by AT+CUSATA.

reporting

Integer: 0 or 1. Enable/disable unsolicited result code +CUSATS: <UICC_state> to notify the TE about a new state during start-up.

Table 245. *reporting*

Value	Description
0	Disable +CUSATS, i.e. no notification.
1	Enable +CUSATS, i.e. notify TE.

UICC_state

Integer: 0..4. Reports that the UICC entered a new state during start-up or that the UICC ended start-up and entered active state.

Table 246. *UICC_state*

Value	Description
0	UICC start-up in progress, before profile download.
1	UICC start-up halted and ready for profile download. This state is reached if +CUSATD=2 was issued before restart. UICC start-up will continue upon +CUSATA=2 or +CUSATA=3.
2	Profile download completed, UICC start-up continuing.
3	UICC awaiting PIN verification.
4	UICC active.

Read USAT Profile: AT+CUSATR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CUSATR[=<*profile_storage*>]	[+CUSATR:<*profile_storage*>,<*profile*>] [<S3><S4>+CUSATR:<*profile_storage*>,<*profile*>] […] +CME ERROR: <*err*> OK
AT+CUSATR=?	+CUSATR:(*list of supported* <*profile_storage*>*s*)

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

The command AT+CUSATR=<profile_storage> returns the profile specified by <*profile_storage*>.

The command issued without parameter (i.e. AT+CUSATR) returns all profiles.

The test command returns values supported as a compound value.

Refer to Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on <*err*>.

Defined Values

profile_storage

Integer: 0..5.

Table 247. *profile_storage*

Value	Description
0	TE profile that can be set with AT+CUSATW.
1	MT profile that can be set with AT+CUSATW.
2	MT default profile that reflects the inherent, default supported facilities of the MT.

Table 247. *profile_storage* (continued)

Value	Description
3	UICC profile that reflects the currently active UICC profile that was sent to the UICC in the last TERMINAL PROFILE command.
4	UICC EF_{UST}. The elementary file that indicates services available in the USIM.
5	List of MT only facilities (facilities that are not allowed to be assigned to the TE, see 3GPP TS 31.111 [92]).

profile

Hexadecimal characters. The profile describing the supported facilities of the referenced <*profile_storage*> as specified for the Terminal Profile in 3GPP TS 31.111 [92] or for the related EF in 3GPP TS 31.102 [59].

Remaining PIN Retries: AT+CPINR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

See the current implementation limitation in *sel_code* parameter description.

Syntax

Command	Possible Response(s)
AT+CPINR*[=<sel_code>]*	+CPINR: <*code*>,<*retries*>*[,<default_retries>]* *[*+CPINR: <*code*>,<*retries*>*[,<default_retries>]* *[…]]]* OK +CME ERROR: <*err*>
AT+CPINR=?	

Description

This command cause the MT to return the number of remaining PIN retries for the MT passwords with intermediate result code: +CPINR: <code>,<retries>[,<default_retries>] for standard PINs. One line with one intermediate result code is returned for every <*code*> or <*ext_code*> selected by <*sel_code*>.

When the command is issued without the optional parameter <*sel_code*>, the intermediate result codes are returned for all <*code*>s and <*ext_code*>s.

In the intermediate result codes, the parameter <*default_retries*> is an optional (manufacturer specific) parameter, per <*code*> and <*ext_code*>.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

retries

Integer. Number of remaining retries per PIN.

default_retries

Integer. Number of default/initial retries per PIN.

code

String: Type of PIN. All values are listed under the description of the Enter PIN: AT+CPIN *(on page 399)* command, <*code*> parameter, except READY.

ext_code

String. Manufacturer specific codes.

sel_code

String. Same values as for the <*code*> and <*ext_code*> parameters. These values are strings and use double quotes.

CAUTION: Restriction for `sel_code` parameter: only "SIM PIN", "SIM PIN2", "SIM PUK" and "SIM PUK2" codes are supported. Matching using the "*" wild card is not supported.

Restricted SIM Access: AT+CRSM

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	SIM Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CRSM=<*command*>[,<*fileid*>[,<*P1*>,<*P2*>,<*P3*>[,<*data*>[,<*pathid*>]]]]	+CRSM:<*sw1*>,<*sw2*>[,<*response*>] +CME ERROR: <*err*> OK
AT+CRSM=?	

Description

By using this command instead of Generic SIM Access Generic SIM Access: AT+CSIM *(on page 404)*, the TE application has an easier, but more limited access, to the SIM database. The command transmits to the MT the SIM <*command*> and its required parameters. If a SIM is installed in the currently selected card slot, the MT handles internally all SIM MT interface locking and file selection routines. As response to the command, MT sends the actual SIM information parameters and response data. An MT error result code +CME ERROR may be returned when the command cannot be passed to the SIM, but a failure in the execution of the command in the SIM is reported in <*sw1*> and <*sw2*> parameters.

Refer to Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on <*err*>.

The coordination between the command requests to SIM and the commands issued by the GSM/UMTS application inside the MT is implementation dependent. However the TE should be aware of the precedence of the GSM/UMTS application commands over the TE commands.

Defined Values

command

Integer: see below. Command passed on by the MT to the SIM. Refer 3GPP TS 51.011 [28].

Table 248. *command*

Value	Description
176	READ BINARY
178	READ RECORD
192	GET RESPONSE
214	UPDATE BINARY

Table 248. *command* (continued)

Value	Description
220	UPDATE RECORD
242	STATUS
203	RETRIEVE DATA
219	SET DATA

All other values are reserved.

Note: The MT internally executes all commands needed to select the desired file before performing the actual command.

fileid

Integer. Identifier of a elementary datafile on SIM. Mandatory for every command except STATUS.

Note: The range of valid file identifiers depends on the actual SIM and is defined in 3GPP TS 51.011 [28]. Optional files may not be present.

P1, P2, P3

Integer. Parameters passed on by the MT to the SIM. These parameters are mandatory for every command, except `GET RESPONSE` and `STATUS`. The values are described in 3GPP TS 51.011.

data

Hexadecimal characters. Information to be written to the SIM. See also Select TE Character Set: AT +CSCS *(on page 12)*.

pathid

Hexadecimal characters. Path of an elementary file on the SIM/UICC in hexadecimal format as defined in ETSI TS 102 221 [60] (e.g. `"7F205F70"` in SIM and UICC case). The <*pathid*> shall only be used in the mode `"select by path from MF"` as defined in ETSI TS 102 221 [60].

Note: Since valid elementary file identifiers may not be unique over all valid dedicated file identifiers, the <*pathid*> indicates the targeted UICC/SIM directory path in case of ambiguous file identifiers. For earlier versions of this specification, or if <*pathid*> is omitted, the selection was implementation specific.

sw1, sw2

Integer. Information from the SIM about the execution of the actual command. These parameters are delivered to the TE on successful or failed execution of the command.

response

Hexadecimal characters. Response of a successful completion of the command previously issued. See also Section Select TE Character Set: AT+CSCS *(on page 12)*. `STATUS` and `GET RESPONSE` return information about the current elementary data field. This information includes the type of file and its size (refer 3GPP TS 51.011 [28]). After the `READ BINARY`, `READ RECORD` and `RETRIEVE DATA` commands the requested data are returned. `<response>` is not returned after a successful `UPDATE BINARY`, `UPDATE RECORD` or `SET DATA` command.

Restricted UICC Logical Channel Access: AT+CRLA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CRLA=<*sessionid*>,<*command*> [,<*fileid*>[,<*P1*>,<*P2*>,<*P3*>[,<*data*>[,<*pathid*>]]]]	+CRLA:<*sw1*>,<*sw2*>[,<*response*>] OK +CME ERROR:<*err*>
AT+CRLA=?	

Description

By using this command instead of the Generic UICC Access Generic UICC Logical Channel Access: AT+CGLA *(on page 405)*, the TE application has easier, but more limited, access to the UICC database. The command transmits to the MT the UICC <*command*> and its required parameters. The MT handles internally, for the selected UICC, all UICC MT interface locking and file selection routines. As response to the command, the MT sends the actual UICC information parameters and response data. MT error result code +CME ERROR may be returned when the command cannot be passed to the UICC, but failure in the execution of the command in the UICC is reported in <*sw1*> and <*sw2*> parameters.

The coordination between command requests to UICC and commands issued by the GSM/UMTS application inside the MT is implementation dependent. However the TE should be aware of the precedence of the GSM/UMTS application commands over the TE commands.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

sessionid

Integer. Identifier of the session to be used in order to send the APDU commands to the UICC. It is mandatory in order to send commands to the UICC when targeting applications on the smart card using a logical channel other than the default channel (channel '0').

command

Integer: see table below. Command passed on by the MT to the UICC; refer 3GPP TS 31.101 [65].

Note: The MT internally executes all commands needed for selecting the desired file before performing the actual command.

Table 249. *command*

Value	Description
176	READ BINARY
178	READ RECORD
192	GET RESPONSE
214	UPDATE BINARY
220	UPDATE RECORD
242	STATUS
203	RETRIEVE DATA
219	SET DATA
Other values	Reserved

fileid

Integer. Identifier of an elementary datafile on UICC. Mandatory for every command except `STATUS`.

Note: The range of valid file identifiers depends on the actual UICC and is defined in 3GPP TS 31.101 [65]. Optional files may not be present at all.

P1, P2, P3

Integer. Parameters passed on by the MT to the UICC. These parameters are mandatory for every command, except `GET RESPONSE` and `STATUS`. The values are described in 3GPP TS 31.101 [65].

data

Hexadecimal characters. Information to be written to the SIM (refer to Select TE Character Set: AT +CSCS *(on page 12)*)

pathid

String. Contains the path of an elementary file on the UICC in hexadecimal format (e.g. "`5F704F30`" for DFSoLSA/EFSAI). The <*pathid*> shall only be used in the mode "select by path from current DF" as defined in ETSI TS 102 221 [60].

sw1, sw2

Integers. Information from the UICC about the execution of the actual command. These parameters are delivered to the TE on successful or failed execution of the command.

response

Hexadecimal characters. Response of a successful completion of the command previously issued (refer to AT+CSCS *(on page 12)*).

`STATUS` and `GET RESPONSE` return data about the current elementary data field. This includes the type of file and its size (refer 3GPP TS 31.101 [65]). After `READ BINARY`, `READ RECORD` or `RETRIEVE DATA` commands, the requested data are returned.

<*response*> is not returned after a successful `UPDATE BINARY`, `UPDATE RECORD` or `SET DATA` command.

Send USAT Envelope Command: AT+CUSATE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	SIM dependent (< 300 ms)
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CUSATE=<*envelope_command*>	OK +CME ERROR: <*err*>
AT+CUSATE=?	

Description

This command allows the TE to send a USAT envelope command to the MT. If the UICC provides response data to the command or indicates that USAT is busy, the information response +CUSATE: <envelope_response>[,<busy>] is returned. A second line of information response +CUSATE2: <sw1>,<sw2> may be provided if the MT presents the status words provided by the UICC.

Refer to Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on <*err*>.

Defined Values

envelope_command

Hexadecimal characters. Envelope command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

envelope_response

Hexadecimal characters. Response to the envelope command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object. An empty string is provided if the UICC does not have any response data to provide.

busy

Integer: 0, 1 or 2.

Table 250. *busy*

Value	Description
0	UICC indicated normal ending of the command.
1	UICC responded with USAT is busy, no retry by the MT.
2	UICC responded with USAT is busy even after one or more retries by the MT.

sw1

Integer. Status word information from the envelope response returned by the UICC as defined in ETSI TS 102 221 [60], sub-clause 10.2. The parameter can be delivered to the TE both in the case of successful and failed execution of the envelope command.

sw2

Integer. For description, see <*sw1*>.

Send USAT Terminal Response: AT+CUSATT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	SIM dependent (< 300 ms)
Persistency	N/A

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CUSATT=<*terminal_response*>	+CUSATT:<*envelope_response*>[,<*busy*>] [<S3><S4>+CUSATE2:<*sw1*>,<*sw2*>] +CME ERROR: <*err*>
AT+CUSATT=?	OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command sends a USAT terminal response to the MT as an answer to a preceding USAT proactive command sent from the UICC with the unsolicited result code AT+CUSATP: <proactive_command> (see Activate USAT Profile: AT+CUSATA *(on page 389)* command description).

Refer to Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on <*err*>.

Defined Values

terminal_response

Hexadecimal characters. Terminal response to a proactive command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

Set Card Slot: AT+CSUS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=0. External SIM card (SIM1) must be enabled
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+CSUS=*[<card_slot>]*	OK +CME ERROR:*<err>*
AT+CSUS?	+CSUS:*<card_slot>* OK
AT+CSUS=?	+CSUS:*(number of supported <card_slot>s)* OK

Description

When a MT is equipped with multiple card slots, this command directs the MT to select the SIM/UICC card installed in the indicated card slot for all future actions that require the use of SIM/UICC.

The SIM/UICC card slot change is authorised only when SIM/UICC is inactive. If write command is issued when a SIM/UICC is active (AT+CFUN=1 *(on page 299)* or Set Phone Functionality: AT+CFUN *(on page 299)*), or if the selected slot is not supported by the product variant, then the command will reject the configuration request and respond with a +CME ERROR message.

See Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for *<err>* values.

The read command returns the currently selected card slot.

The test command returns the number of card slots in the MT as a compound value.

The numbering of card slots is implementation dependent.

SIM/UICC card slot selection persists through device reboots and software upgrades. Configuration update will be applied next time the device is doing a registration to network (Set Phone Functionality: AT+CFUN *(on page 299)*) or the device needs access to the SIM/UICC (Set Phone Functionality: AT+CFUN *(on page 299)*).

Defined Values

card_slot

Integer: 0, 1 or 2. Slot number *n* is SIM*n* when identified on the product data sheet. The default selection depends on the product variant.

Table 251. *card_slot*

Value	Description
0	The SIM/UICC card is installed in card slot 0.
1	The SIM/UICC card is installed in card slot 1 (when available on HW).
2	The SIM/UICC card is installed in card slot 2 (when available on HW).

SIM State: AT+SQNSIMST

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNSIMST=<*enable*>	OK
AT+SQNSIMST?	+SQNSIMST:<*enable*>,<*status*>
AT+SQNSIMST=?	+SQNSIMST:(0-1)
(URC)	+SQNSIMST:<*status*>

Description

This command enables or disables the URC +SQNSIMST which returns the SIM state.

The read command returns the current URC configuration.

The test command returns the supported entry values.

This command should be used to activate +SQNSIMST SIM state change notification. If activated, an +SQNSIMST URC will be issued at every SIM state change.

<*enable*> configuration is volatile and must be refreshed after device reboot. <*enable*> configuration persists during low power states, though.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

enable

Integer: 0 or 1. SIM status change notification enable state.

Table 252. *enable*

Value	Description
0	(default): Notification disabled
1	Notification enabled

status

Integer: 0..10. SIM card status.

Table 253. *status*

Value	Description
0	No SIM card
1	SIM card under initialization
2	SIM locked (PIN/PUK) required
3	Invalid SIM card
4	SIM card failure
5	SIM card ready
6	PH-NET PIN (network personalization password) required
7	PH-SIM PIN (phone-to-SIM card password) required
8	Invalid SIM card in PS domain
9	Invalid SIM card in PS and CS domains
10	Invalid SIM card in CS domain

USIM Data Download Status: AT+SQNSIMDD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNSIMDD=<*enable*>	OK
AT+SQNSIMDD=?	+SQNSIMDD:(0-1)
AT+SQNSIMDD?	+SQNSIMDD:<*enable*>,<*status*>
(URC)	+SQNSIMDD:<*status*>

Description

Read command should be used to retrieve current USIM data download status. This status is maintained until modem's shutdown.

Write command should be used to activate the +SQNSIMDD USIM data download notification. If activated, an URC is issued when an USIM data download starts or stops.

Notes:

- enable: The configuration is preserved at reset. The configuration is also preserved while the modem is in LPM state (suspend state).
- status: preserved while in LPM state (suspend state).

Defined Values

enable

Integer: 0 or 1. USIM data download activity notification enable state.

Table 254. *enable*

Value	Description
0	Notification disabled (default value)
1	Notification enabled

status

Integer: 0, 1 or 2. USIM data download status.

Table 255. *status*

Value	Description
0	None (No USIM data download activity since modem power up)
1	USIM data download in progress
2	USIM data download completed

Write USAT Profile: AT+CUSATW

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	SIM Persistent, if applicable

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CUSATW [=<*profile_storage*>[,<*profile*>]]	+CUSATW:<*profile_storage*>, <*conflict_profile*> +CME ERROR:<*err*> OK
AT+CUSATW=?	+CUSATW:(*list of supported* <*profile_storage*>*s*) OK

Description

The command AT+CUSATW=<profile_storage>, <profile> stores the profile <*profile*> at the key <*profile_storage*>.

The test command returns all the possible keys as a compound value.

Refer to Section Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for details on <*err*>.

Defined Values

profile_storage

Integer: 0 or 1.

Table 256. *profile_storage*

Value	Description
0	TE. The profile is stored in the facilities supported by the TE. The default value is a blank profile with all bits set to zero. This value is applicable both in the command and in the information response.
1	MT. Refers to the profile storage for the facilities to be supported by MT, which can be a subset of the default MT facilities. The TE can choose to register a subset of the MT default profile, typically omitting facilities also supported by the TE profile. Default value is the MT default profile. This value is applicable both in the command and in the information response.

profile

Hexadecimal characters. The profile describing the supported USAT facilities of the referenced <*profile_storage*> as specified for the Terminal Profile in 3GPP TS 31.111 [92].

conflict_profile

Hexadecimal characters. A bitwise AND of two profiles, showing the conflicts, that is, USAT facilities supported by both profiles. See description of Terminal Profile in 3GPP TS 31.111 [92].

Chapter 16. Serial Port Control Commands

Data Set Ready (DSR) Control: AT&S

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	UART0 only. DSR must be enabled.
Time-out	300 ms
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT&S[<*value*>]	OK ERROR

Description

Set command controls the RS232 DSR pin behaviour.

If value 1 is set then the DSR signal is pulled high when the device receives data from the network.

In power saving mode the DSR pin is always low.

If parameter is omitted, the command has the same behaviour as AT&S0.

Note: This command only works if the DSR signal has been enabled using AT+SQNHWCFG *(on page 253)*.

Defined Values

value

Integer: 0, 1 .

Table 257. *value*

Value	Description
0	Always high
1	Follow the GSM traffic indication

Data Terminal Ready Behaviour: AT&D

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	UART0 only. DTR must be enabled.
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *ITU-T V.250*. See Section *References*.

Syntax

Command	Possible Response(s)
AT&D[<*value*>]	OK

Description

This command defines the Circuit 108 (data terminal ready, $\overline{\text{DTR}}$) behaviour.

This parameter determines how the DCE responds when circuit 108/2 is changed from the ON to the OFF condition during online data state.

If the value specified is not recognised, an ERROR result code is issued.

Defined Values

value

Integer: 0, 1 or 2.

Note: The recommended (default) value is 1.

Table 258. value

Value	Description
0	DCE ignores circuit 108/2.
1 (default)	Upon an on-to-off transition of circuit 108/2, the DCE enters online command state and issues an OK result code; the call remains connected.
2	Upon an on-to-off transition of circuit 108/2, the DCE instructs the underlying DCE to perform an orderly clear down of the call. The disposition of any data in the DCE pending transmission to the remote DCE is controlled by the +ETBM parameter (see Error control commands) if implemented; otherwise, this data is sent before the call is cleared, unless the remote DCE clears the call first (in which case pending data is discarded). The DCE disconnects from the line. Automatic answer is disabled while circuit 108/2 remains off.

Flow Control: AT\Q

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Non Reboot Persistent

Syntax

Command	Possible Response(s)
AT\Q[<*n*>]	OK +CME ERROR:<*err*>

Description

AT\Q allows to configure flow control on all the UARTs.

The AT\Q setting is always common for all interfaces and can be changed, for compatibility reasons, on each interface, but is only applicable to the UARTs. AT\Q settings have no effect on the USB ports because the USB protocol integrates a flow control mechanism of its own.

Please see Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

n

Integer: 0, 1, 2 or 3.

Table 259. *n*

Value	Description
0	These values are accepted but don't have any effect. \Q setting is always reported as 3 (\Q3) in active profile (DCE Response Format: ATV *(on page 4)*).
1	
2	
3	RTS/CTS hardware flow control

Local Flow Control Option: AT&K

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Persistent

Syntax

Command	Possible Response(s)
AT&K<*n*>	OK +CME ERROR:<*err*>

Description

The AT&Kn command is used to select the local flow control method for use when the modem is operating in error-control mode or asynchronous mode with Automatic Speed Buffering (ASB). ASB is used for communication environments requiring a 'Fixed Speed Interface' between the modem and the DTE. Note that local flow control is unidirectional in &Q6 mode and bidirectional in &Q5 mode.

S39 stores the current flow control setting. Flow control is always inhibited in command state and is valid only when on-line in error-control mode. Bi-directional flow control regulates the data stream between the DTE and the modem.

Please see Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Defined Values

n

Integer: 0..5. Multiplexer Transparency Mechanism:

Table 260. *n*

Value	Description
0	AT&K0: All flow control is disabled. May be selected for use during error-control mode at the risk of overflowing the buffers and losing data.
1	AT&K1: RTS/CTS flow control is enabled. Note that the DTE-to-modem cable must have the appropriate wires.
2	AT&K2: XON/XOFF flow control is enabled. These characters are not programmable and are fixed at DC1 and DC3, respectively. This method should not be used when XON/XOFF characters will be sent as user data or as part of a file transfer protocol.
3	AT&K3: RTS/CTS flow control is enabled. Note that the DTE-to-modem cable must have the appropriate wires. The &T19 command may be used by software to determine if the cable is properly wired.
4	AT&K4: XON/XOFF flow control is enabled. These characters are not programmable and are fixed at DC1 and DC3, respectively. This method should not be used when XON/XOFF characters will be sent as user data or as part of a file transfer protocol.

Table 260. *n* (continued)

Value	Description
5	AT&K5: Transparent XON/XOFF. The data stream is controlled by characters DC1 and DC3. The characters DLE, DC1, and DC3 are escaped by sending DLE followed by the character XORed (eXclusive ORed) with 0x21.

Multiplexing Mode: AT+CMUX

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	N/A
Persistency	Not Reboot Persistent

Syntax

Command	Possible Response(s)
AT+CMUX=<*transparency*>[,<*subset*>[,<*port_speed*>[,<*N1*>[,<*T1*>[,<*N2*>[,<*T2*>[,<*T3*>[,<*k*>]]]]]]]]	OK +CME ERROR:<*err*>
AT+CMUX?	+CMUX:<*transparency*>[,<*subset*>], <*port_speed*>, <*N1*>, <*T1*>, <*N2*>, <*T2*>, <*T3*>[,<*k*>] OK
AT+CMUX=?	+CMUX:(*list of supported* <*transparency*>*s*), (*list of supported* <*subset*>*s*), (*list of supported* <*port_speed*>*s*), (*list of supported* <*N1*>*s*), (*list of supported* <*T1*>*s*), (*list of supported* <*N2*>*s*), (*list of supported* <*T2*>*s*), (*list of supported* <*T3*>*s*), (*list of supported* <*k*>*s*) OK

Description

This command is used to enable/disable the 3GPP TS 25.010 [45] multiplexing protocol control channel. The AT command sets parameters for the Control Channel. If the parameters are left out, the default value is used.

See Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

The read command returns the current settings.

The test command returns the supported parameters as compound values.

It is recommended that the MT/TA/TE should autobaud to the AT+CMUX command up to and including an interface speed of 9600 bits/s.

The OK or +CME ERROR: <err> response is returned at the speed of the AT+CMUX command prior to entering <*transparency*>.

It is recommended that whenever the multiplexer control channel is released the MT/TA/TE should assume an interface rate of up to and including 9600 bits/s for autobauding purposes irrespective of any previous higher speed that might have been selected.

If a AT+CMUX command is issued whilst in any multiplexer mode then that command is ignored and the MT/TA returns a +CME ERROR: <err> response.

Attention: The current implementation supports only 0 for the <*transparency*> parameter, and all other parameters are silently ignored. The baudrate is set to 921600.

Defined Values

transparency

Integer: 0 or 1. Multiplexer Transparency Mechanism.

Table 261. *transparency*

Value	Description
0	Basic option
1 (unsupported)	Advanced option

subset

Integer: 0, 1 or 2. This parameter defines the way in which the multiplexer control channel is set up. A virtual channel may subsequently be set up differently but in the absence of any negotiation for the settings of a virtual channel, the virtual channel shall be set up according to the control channel <*subset*> setting.

Table 262. *subset*

Value	Description
0	UIH frames used only
1	UI frames used only
2	I frames used only

port_speed

Integer: 0..6. Transmission rate. The default value is implementation specific.

Table 263. *port_speed*

Value	Description
1	9,600 bit/s
2	19,200 bit/s
3	38,400 bit/s
4	57,600 bit/s
5	115,200 bit/s
6	230,400 bits/s

N1

Integer: 1..32768. Maximum frame size. 31 is the default for the basic option and 64 is the default for the advanced option (see <*transparency*>).

T1

Integer: 1..255 (Default: 10). Acknowledgement timer in tens of milliseconds.

N2

Integer: 0..100 (Default: 3). Maximum number of retransmissions.

T2

Integer: 2..255 (Default: 30). Response timer for the multiplexer control channel in tens of milliseconds.

Note: T2 must be longer than T1.

T3

Integer: 1..255 (Default: 10). Wake up response timer in seconds.

k

Integer: 1..7 (Default: 2). Window size, for advanced option with Error-Recovery Mode.

Received Line Signal Detector Behaviour: AT&C

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	UART0 only. AT+SQNHWCFG="DCD","enable" *(on page 253)*
Time-out	–
Persistency	N/A

Note: This command is described in *ITU-T V.250*. See Section *References*.

Syntax

Command	Possible Response(s)
AT&C[<*value*>]	

Description

This command defines the Circuit 109 (Received line signal detector) behaviour.

Important: Changing the <*value*> parameter is not supported.

In AT&C1 mode of operation, circuit 109 is not turned off until all data previously received from the remote DCE is delivered to the local DTE. However, such buffered data shall be discarded and circuit 109 turned off if the DTE turns off circuit 108 (if AT&D1 *(on page 431)* or AT&D2 *(on page 431)* is set).

Defined Values

value

Integer: 0 or 1.

Note: Only value 1 is supported.

Table 264. value

Value	Description
0	(Not supported) The DCE always presents the ON condition on circuit 109.
1	Circuit 109 changes in accordance with the underlying DCE, which may include functions other than the physical layer functions (e.g., ITU-T Recs V.42, V.110, V.120 and V.13).

UART0 Break Line Setting: AT+SQNIBRCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT+SQNIBRCFG=*<moBreakMode>[,<moBreakDuration>]*	+SQNIBRCFG: +CME ERROR:*<err>* OK
AT+SQNIBRCFG?	+SQNIBRCFG:*<moBreakMode>,<moBreakDuration>*
AT+SQNIBRCFG=?	+SQNIBRCFG:(0-1)[,(100-5000)] OK

Description

Break signal may be generated whenever an URC cannot be delivered to MCU and the UART is configured in AT channel/data mode (PPP, Data over AT in online mode).

The AT+SQNIBRCFG command purpose is to configure that break signal behaviour.

Important: The break signal is only available on UART0.

Defined Values

moBreakMode

Integer: 0 or 1. Host handshake mode.

Table 265. *moBreakMode*

Value	Description
0	(default) Events are not indicated by a BREAK line.
1	The break signal is generated whenever an URC cannot be presented to MCU and UART is in data mode (PPP, data over AT in transparent mode).

moBreakDuration

Integer: 100..5000 (Default: 100). MO break signal duration in milliseconds.

Usage Example

```
+SQNIBRCFG=?
+SQNIBRCFG: (0-1)[,(100-5000)]
OK
AT+SQNIBRCFG?
+SQNIBRCFG: 0,100
```

```
OK
AT+SQNIBRCFG
OK
AT+SQNIBRCFG=1,100
OK
AT+SQNIBRCFG?
+SQNIBRCFG: 1,100
OK
```

Chapter 17. Short Message Service (SMS) Commands

Delete Long SMS: AT+SQNSMSDELETE

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN = 1 or 4 if the SMS are stored on SIM
Time-out	Depends on how many SMS are deleted
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSMSDELETE=<*index*>	OK +CME ERROR: <*err*>

Description

This command deletes the message <*index*> from the message storage *mem1*. If the message is segmented, all its segments are deleted.

Defined Values

index

Integer. Index of the message to delete.

Examples

The first command deletes the SMS of index 0. Attempting another deletion of the same index returns an error 321 (Invalid Index).

```
AT+SQNSMSDELETE=1
OK
AT+SQNSMSDELETE=1
+CMS ERROR: 321
```

Delete Message(s): AT+CMGD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	Depends on how many SMS are deleted
Persistency	N/A

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

See the current implementation limitation in *delflag* parameter description.

Syntax

Command	Possible Response(s)
AT+CMGD=*<index>[,<delflag>]*	+CMS ERROR: *<err>*
AT+CMGD=?	+CMGD: *(list of supported <index>s)[,(list of supported <delflag>s)]*

Description

This command deletes message from preferred message storage *mem1* at location *<index>*. If *<delflag>* is present and not set to 0 then the ME ignores *<index>* and follow the rules for *<delflag>* shown below. If deleting fails, the final result code +CMS ERROR: <err> is returned.

The test command shows the valid memory locations and optionally the supported values of *<delflag>*.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

Defined Values

index

Integer. Index of the message to be deleted.

delflag

Integer: 0..4. Indicates multiple message deletion request as follows:

Table 266. *delflag*

Value	Description
0 (or omitted)	Default value if not specified. Delete the message specified in *<index>*.
1	Delete all read messages from preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched
2	Delete all read messages from preferred message storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched
3	Delete all read messages from preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched.

Table 266. *delflag* (continued)

Value	Description
4	Delete all messages from preferred message storage including unread messages.

Get List of Indexes of Received SMS: AT+SQNSMSLIST

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSMSLIST	+SQNSMSLIST: <index>[,<index>[, ...]] +CMS ERROR: *<err>*

Description

This command returns the indexes of all stored messages. For segmented messages, it returns only one index (of one of its segments).

Defined Values

index

Integer. Index of the message in memory.

Example

In the following example, 7 SMS fragments (#0 to #6) are in memory, and the last 3 belong to the same SMS (fragments #4, #5 and #6).

```
AT+SQNSMSLIST
+SQNSMSLIST: 0,1,2,3,4
OK
```

List Messages: AT+CMGL

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	SIM card present; AT+CFUN=0 or 4
Time-out	Depends on the number of SMS read
Persistency	N/A

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CMGL=<*stat*>	• If in text mode (Message Format: AT+CMGF *(on page 447)*), the command is successful and SMS-SUBMITs and/or SMS-DELIVERs: +CMGL:<*index*>,<*stat*>,<*oa/da*>, [<*alpha*>][,<*scts*>][,<*tooa/toda*>,<*length*>] <S3><S4><*data*> [<S3><S4>+CMGL:<*index*>,<*stat*>,<*da/oa*>,[<*alpha*>][,<*scts*>][,<*tooa/toda*>,<*length*> <S3><S4><*data*>[...]] • If in text mode (AT+CMGF=1), the command is successful and SMS-STATUS-REPORTs: +CMGL:<*index*>,<*stat*>,<*fo*>,<*mr*>[,<*ra*>][,<*tora*>],<*scts*>,<*dt*>,<*st*> [<S3><S4>+CMGL:<*index*>,<*stat*>,<*fo*>,<*mr*>[,<*ra*>][,<*tora*>],<*scts*>,<*dt*>,<*st*>[...]] • If in text mode (AT+CMGF=1), the command is successful and SMS-COMMANDs: +CMGL:<*index*>,<*stat*>,<*fo*>,<*ct*> [<S3><S4>+CMGL:<*index*>,<*stat*>,<*fo*>,<*ct*>[...]] • If in text mode (AT+CMGF=1), command successful and CBM storage: +CMGL:<*index*>,<*stat*>,<*sn*>,<*mid*>,<*page*>,<*pages*><S3><S4><*data*> [<S3><S4>+CMGL:<*index*>,<*stat*>,<*sn*>,<*mid*>,<*page*>,<*pages*><S3><S4><*data*>[...]] • Otherwise:+CMS ERROR: <*err*>
AT+CMGL=?	+CMGL:(*list of supported <stat>s*)

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns messages with status value <*stat*> from message storage *mem1* to the TE. Text mode parameters in italics are detailed in Show Text Mode Parameters: AT+CSDH *(on page 479)*. If the status of the message is 'received unread', the status in the storage changes to 'received read'. If listing fails, final result code +CMS ERROR: <err> is returned.

Note: If the selected *mem1* contains different types of SMs (e.g. SMS-DELIVERs, SMS-SUBMITs, SMS-STATUS-REPORTs and SMS-COMMANDs), the response is a sum of the responses of different SM types. The TE application can recognise the response format by examining the third response parameter.

The test command gives a list of all status values supported by the TA.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for <*err*> values.

Defined Values

stat

Integer: 0..4.

Table 267. *stat*

Value	Description
0	"REC UNREAD ": received unread message (i.e. new message)
1	"REC READ": received read message
2	"STO UNSENT": stored unsent message (only applicable to SMs)
3	"STO SENT": stored sent message (only applicable to SMs)
4	"ALL": all messages (only applicable to `AT+CMGL` command)

Message Format: AT+CMGF

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or AT+CFUN=4
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CMGF=*[<mode>]*	OK
AT+CMGF?	+CMGF:*<mode>*
AT+CMGF=?	+CMGF:*(list of supported <index>s) [,(list of supported <mode>s)]*

Description

This command tells the TA which input and output format to use. *<mode>* indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from received messages. Mode can be either PDU mode (entire TP data units used) or text mode (headers and body of the messages given as separate parameters). Text mode uses the value of parameter *<chset>* specified by command Select TE Character Set AT+CSCS *(on page 12)*.

The test command returns supported modes as a compound value.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

Defined Values

mode

Integer: 0 or 1. Indicates multiple message deletion request as follows:

Table 268. *mode*

Value	Description
0	PDU mode (default when implemented).
1	Text mode.

Message Service Failure Result Code: +CMS ERROR

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

	URC
	`+CMS ERROR:<err>`

Description

Final result code `+CMS ERROR: <err>` indicates an error related to the mobile equipment or network. The operation is similar to the `ERROR` result code. None of the following commands in the same command line is executed. Neither `ERROR` nor `OK` result codes are returned. `ERROR` is returned normally if the error is due to bad syntax or invalid parameters.

Defined Values

err

Integer: 0..512. The values used by common messaging commands are:

Table 269. *err*

Value	Description
0...12	3GPP TS 24.011 [6] clause E.2 values
128...255	3GPP TS 23.040 [3] clause 9.2.3.22 values.
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
304	Invalid PDU mode parameter
305	Invalid text mode parameter
310	(U)SIM not inserted
311	(U)SIM PIN required
312	PH-(U)SIM PIN required
313	(U)SIM failure
314	(U)SIM busy
315	(U)SIM wrong
316	(U)SIM PUK required
317	(U)SIM PIN2 required
318	(U)SIM PUK2 required
320	Memory failure

Table 269. *err* (continued)

Value	Description
321	Invalid memory index
322	Memory full
330	SMSC address unknown
331	No network service
332	Network time-out
340	No +CNMA acknowledgement expected
500	Unknown error
...511	Other values in the range 256...511 are reserved
512	Manufacturer specific

More Messages to Send: AT+CMMS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CMMS=<*n*>	
AT+CMMS?	+CMMS:<*n*>

Description

This command controls the continuity of SMS relay protocol link. When the feature is enabled (and supported by the network) multiple messages can be sent at once, which results in a higher throughput.

The test command returns supported values as a compound value.

Defined Values

n

Integer: 0, 1 or 2.

Table 270. *n*

Value	Description
0	Disable.
1	Keep enabled until the time between the response of the latest message send command (Send Message: AT+CMGS *(on page 473)* AT+CMSS *(on page 472)*, etc.) and the next send command exceeds 1 to 5 seconds (the exact value is up to ME implementation), then ME shall close the link and TA switches <*n*> automatically back to 0.
2	Enable. If the time between the response of the latest message send command and the next send command exceeds 1 to 5 seconds (the exact value is up to ME implementation), ME shall close the link but TA does not switch automatically back to <*n*>=0.

New Message Acknowledgement to ME/TA: AT+CNMA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=0 or 4. SIM Card Present
Time-out	Network dependent
Persistency	N/A

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

See the current implementation limitation in command description.

Syntax

Command	Possible Response(s)
If in PDU mode (+CMGF=0): AT+CNMA[=<n>[,<length><S3>*PDU is given*<Ctrl-Z/ESC>	OK +CMS ERROR:<err>
If in text mode (+CMGF=1): AT+CNMA	OK +CMS ERROR:<err>
AT+CNMA=?	If in PDU mode (+CMGF=0): +CNMA:(*list of supported <n>s*) OK If in text mode (+CMGF=1): OK

Note: <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3 *(on page 3)*

Description

- PDU Mode

CAUTION: Only parameter <*n*> is currently supported in PDU mode.

This command confirms the reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer to command New Message Indications to TE: AT+CNMI *(on page 453)* tables). This acknowledgement command is used when AT+CSMS *(on page 465)* parameter <*service*> equals 1. In PDU mode, it is possible to send either positive (RP-ACK) or negative (RP-ERROR) acknowledgement to the network. The parameter <*n*> defines which one will be sent. Optionally (when <*length*> is greater than zero) an acknowledgement TPDU (SMS-DELIVER-REPORT for RP-ACK or RP-ERROR) may be sent to the network. The specification of the PDU is done similarly as specified in command Send Message Send Message: AT+CMGS *(on page 473)*, except that the format of <*ackpdu*> is used instead of <*pdu*> (i.e. the SMSC address field is not present). PDU shall not be bounded by double quotes. TA does not send another +CMT or +CDS result code to TE before previous one is acknowledged.

If the ME does not get the acknowledgement within the required time (network time-out), the ME should respond as specified in 3GPP TS 24.011 [6] to the network. ME/TA automatically disables routing to the TE by setting both <*mt*> and <*ds*> values of New Message Indications to TE: AT+CNMI *(on page 453)* to zero.

- Text Mode

The command confirms the correct reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer to command New Message Indications to TE: AT+CNMI *(on page 453)* tables). This acknowledgement command (causing ME to send RP-ACK to the network) shall be used when the Select Message Service: AT+CSMS *(on page 465)* parameter <*service*> equals 1. The TA shall not send another New Message Indications to TE: AT+CNMI *(on page 453)* or `+CDS` result code to TE before previous one is acknowledged.

If the ME does not get acknowledgement within required time (network time-out), the ME should respond as specified in 3GPP TS 24.011 [6] to the network. The ME/TA automatically disables routing to TE by setting both <*mt*> and <*ds*> values of `+CNMI` to zero.

Note: In case that a directly routed message must be buffered in the ME/TA (possible when New Message Indications to TE: AT+CNMI *(on page 453)* parameter <*mode*> equals 0 or 2) or the AT interpreter remains in a state where result codes cannot be sent to TE for too long (e.g. user is entering a message using AT+CMGS *(on page 473)*), acknowledgement (RP-ACK) must be sent to the network without waiting the `+CNMA` command from TE. Later, when buffered result codes are flushed to the TE, the TE must send the `AT+CNMA` acknowledgement for each result code. In this way, the ME/TA can determine if the message should be placed in non-volatile memory and routing to the TE disabled (`+CNMA` not received). Refer to command New Message Indications to TE: AT+CNMI *(on page 453)* for more details on how to use the <*mode*> parameter reliably.

If the command is executed, but no acknowledgement is expected, or some other ME related error occurs, the final result code `+CMS ERROR: <err>` is returned.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for <*err*> values.

New Message Indications to TE: AT+CNMI

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Non Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

See the current implementation limitation in *mode* and *mt* parameters description.

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Syntax

Command	Possible Response(s)
`AT+CNMI=`*[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]*	`+CMS ERROR:`*<err>*
`AT+CNMI?`	`+CNMI:`*<mode>,<mt>,<bm>,<ds>,<bfr>*
`AT+CNMI=?`	`+CNMI:`*(list of supported <mode>s), (list of supported <mt>s), (list of supported <bm>s), (list of supported <ds>s), (list of supported <bfr>s)*

Description

This command selects the procedure of notification when new messages arrive from the network and the TE is active, e.g. DTR signal is ON. If TE is inactive (e.g. DTR signal is OFF), message receiving should be done as specified in 3GPP TS 23.038 [2].

Note: When DTR signal is not available or the state of the signal is ignored (V.25ter command Data Terminal Ready Behaviour: AT&D *(on page 431)*), reliable message transfer can be assured using AT+CNMA *(on page 451)* acknowledgement procedure.

<mode> controls the processing of the unsolicited result codes specified in this command, *<mt>* sets the result code indication routing for SMS-DELIVERs, *<bm>* for CBMs and *<ds>* for SMS-STATUS-REPORTs. *<bfr>* defines the handling method for buffered result codes when *<mode>* is 1, 2 or 3. If the ME does not support requested item (although TA does), the final result code `+CMS ERROR: <err>` is returned.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

The test command gives the settings supported by the TA as compound values.

Note: The AT+CSMS *(on page 465)* command should be used to detect ME support of mobile terminated SMs and CBMs, and to define whether a message routed directly to TE should be acknowledged or not (refer to command New Message Acknowledgement to ME/TA: AT+CNMA *(on page 451)*).

Defined Values

The following parameters are NOT supported:

- **<mode>: '3'**
- **<bm>: '1'** (broadcast is not supported)

mode

Integer: 0, 1, 2 or 3. The buffering mechanism may as well be located in the ME; the setting affects only to unsolicited result codes specified within this command):

Table 271. *mode*

Value	Description
0	Buffer unsolicited result codes in the TA. If TA result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications.
1	Discard indication and reject new received message unsolicited result codes when the TA-TE link is reserved (e.g. in online data mode). Otherwise forward them directly to the TE.
2	Buffer unsolicited result codes in the TA when the TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation ends. Otherwise forward them directly to the TE.
3	Forward unsolicited result codes directly to the TE. TA-TE link specific inband technique is used to embed result codes and data when TA is in online data mode.

Note: The ME/TA result code buffer can be located in volatile memory. In this case, messages may get lost if the power of ME/TA is switched off before codes are sent to TE. Thus, it is not recommended to use direct message routing (<*mt*>=2 or 3, <*bm*>=2 or 3, or <*ds*>=1) with <*mode*> value 0 or 2.

mt

Integer: 0, 1, 2 or 3. Rules for storing received SMs. These rules depend on its data coding scheme (refer 3GPP TS 23.038 [2]), preferred memory storage (Preferred Message Storage: AT+CPMS *(on page 458)*) setting and this value;

Note: If the AT command interface is acting as the only display device, the ME must support storing of class 0 messages and messages in the message waiting indication group (discard message).

Table 272. *mt*

Value	Description
0	No SMS-DELIVER indications are routed to the TE.

Table 272. *mt* (continued)

Value	Description
1	If SMS-DELIVER is stored into ME/TA, the indication of the memory location is routed to the TE using unsolicited result code: New SMS Reception URC: +CMTI *(on page 457)*
2	SMS-DELIVERs (except class 2 messages and messages in the message waiting indication group (store message)) are routed directly to the TE using unsolicited result code: `+CMT:` *[<alpha>],<length><S3><S4><pdu>* (PDU mode enabled); or `+CMT:` *<oa>[,<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]*`<S3><S4>`*<data>* (text mode enabled. About parameters in italics, refer command Show Text Mode Parameters in Show Text Mode Parameters: AT+CSDH *(on page 479)*) If ME has its own display device then class 0 messages and messages in the message waiting indication group (discard message) may be copied to both ME display and to TE. In this case, ME shall send the acknowledgement to the network (refer to table 2). Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined in *<mt>*=1.
3	Class 3 SMS-DELIVERs are routed directly to TE using unsolicited result codes defined in *<mt>*=2. Messages of other data coding schemes result in indication as defined in *<mt>*=1.

bm

Integer: 0, 1, 2 or 3. Rules for storing received CBMs. These rules depend on its data coding scheme (refer 3GPP TS 23.038 [2]), the setting of Select CBM Types (`AT+CSCB`) and this value;

Table 273. *bm*

Value	Description
0	No CBM indications are routed to the TE.
1	If CBM is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code: `+CBMI: <mem>,<index>`
2	New CBMs are routed directly to the TE using unsolicited result code: `+CBM:` *<length>*`<S3><S4>`*<pdu>* (PDU mode enabled) or `+CBM:` *<sn>,<mid>,<dcs>,<page>,<pages>*`<S3><S4>`*<data>* (text mode enabled). If ME supports data coding groups which define special routing also for messages other than class 3 (e.g. (U)SIM specific messages), ME may choose not to route messages of such data coding schemes into TE (indication of a stored CBM may be given as defined in *<bm>*=1).
3	CBMs are routed directly to TE using unsolicited result codes defined in *<bm>*=2. If CBM storage is supported, messages of other classes result in indication as defined in *<bm>*=1.

ds

Integer: 0, 1 or 2.

Note: Only 0 is supported.

Table 274. *ds*

Value	Description
0	No SMS-STATUS-REPORTs are routed to the TE.
1	(NOT SUPPORTED) SMS-STATUS-REPORTs are routed to the TE using unsolicited result code: `+CDS:` *<length><S3><S4><pdu>* (if PDU mode enabled) or `+CDS:` <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> (if text mode enabled)
2	(NOT SUPPORTED) If SMS-STATUS-REPORT is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code: `+CDSI: <mem>,<index>`

bfr

Integer: 0 or 1. TA buffer of URC flushing policy.

Table 275. *bfr*

Value	Description
0	The TA buffer of unsolicited result codes defined within this command is flushed to the TE when *<mode>* 1...3 is entered (`OK` response shall be given before flushing the codes).
1	The TA buffer of unsolicited result codes defined within this command is cleared when *<mode>* 1...3 is entered.

New SMS Reception URC: +CMTI

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

	URC
	+CMTI:<*mem*>,<*index*>

Description

This URC is sent when a new SMS is received.

Defined Values

mem

String. Message storage area selected to store the message.

index

Integer. Index of the message in the message storage area <*mem*>

Preferred Message Storage: AT+CPMS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	Non Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CPMS=<*mem1*> [,<*mem2*> [,<*mem3*>]]	+CPMS:<*used1*>,<*total1*>,<*used2*>,<*total2*>,<*used3*>,<*total3*> +CMS ERROR:<*err*>
AT+CPMS?	+CPMS:<*mem1*>,<*used1*>,<*total1*>,<*mem2*>,<*used2*>,<*total2*>,<*mem3*>,<*used3*>,<*total3*> +CMS ERROR:<*err*>
AT+CPMS=?	+CPMS:(*list of supported <mem1>s*), (*list of supported <mem2>s*), (*list of supported <mem3>s*)

Description

This command selects the memory storages <*mem1*>, <*mem2*> and <*mem3*> to be used for reading, writing, etc. If the chosen storage is not appropriate for the ME (but is supported by the TA), the final result code +CMS ERROR: <err> is returned.

The test command returns lists of memory storages supported by the TA.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for <*err*> values.

Attention: The settings are lost at reboot.

Read Long SMS: AT+SQNSMSREAD

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSMSREAD=<*index*>	+SQNSMSREAD: <*index*>, <*stat*>, <*send-status*>, <*oa*>, <*scts*>, <*local-ts*>, <*priority*>, <*cbk_number*> <S3><S4> <*text*> OK +CMS ERROR:<*err*>
AT+SQNSMSREAD=?	OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command reads the message <*index*> from the message storage location.

If the message is segmented, the command joins all available segments in the storage.

Defined Values

index

Integer. Index of the message to read.

stat

See AT+CMGL *(on page 445)*.

send_status

String: "UNUSED".

Note: Only "UNUSED" is currently reported.

scts

Integer: Service centre time stamp.

local_ts

String: "00/00/00,00:00:00+00".

Note: Only "00/00/00,00:00:00+00" is currently reported.

oa

String: Originating address.

priority

Integer: 0. Message priority.

Note: Only "0" is currently reported.

cbk_number

String of digits: "". Call back number.

Note: Only "" is currently reported.

Example

```
AT+SQNSMSREAD=2
+SQNSMSREAD: "REC READ","SEND UNSET","5714550728","12/12/04,03:48:20+00",
  "00/00/00,00:00:00+00",0,""
Test msg to check Priority and Call-Back
OK
```

Read Message: AT+CMGR

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card must be present
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CMGR=<*index*>	• If in text mode (Message Format: AT+CMGF *(on page 447)*), the command is successful and SMS-DELIVER: +CMGR:<*stat*>,<*oa*>[,<*alpha*>],<*scts*>[,<*tooa*>,<*fo*>,<*pid*>,<*dcs*>, <*sca*>,<*tosca*>,<*length*>]<S3><S4><*data*> OK • If in text mode (+CMGF=1), the command is successful and SMS-SUBMIT: +CMGR:<*stat*>,<*da*>[,<*alpha*>[,<*toda*>,<*fo*>,<*pid*>,<*dcs*>[,<*vp*>],<*sca*>,<*tosca*>,<*length*>]<S3><S4><*data*> OK • If in text mode (+CMGF=1), the command is successful and SMS-STATUS-REPORT: +CMGR:<*stat*>,<*fo*>,<*mr*>[,<*ra*>][,<*tora*>],<*scts*>,<*dt*>,<*st*> OK • If in text mode (+CMGF=1), the command is successful and SMS-COMMAND: +CMGR:<*stat*>,<*fo*>,<*ct*>[,<*pid*>[,<*mn*>][,<*da*>][,<*toda*>],<*length*><S3><S4><*cdata*>] OK • If in text mode (+CMGF=1), the command successful and CBM storage: +CMGR:<*stat*>,<*sn*>,<*mid*>,<*dcs*>,<*page*>,<*pages*><S3><S4><*data*> OK • otherwise:+CMS ERROR:<*err*>
AT+CMGR=?	

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command returns the message at <*index*> from message storage *mem1* to the TE. For further information on text mode parameters in italics, refer to Show Text Mode Parameters: AT+CSDH *(on page 479)*. If status of the message is 'received unread', the status in the storage changes to 'received read'. If the reading fails, the final result code `+CMS ERROR:` <*err*> is returned.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for <*err*> values.

Defined Values

index

Integer. Index of the message to be read.

Restore Settings: AT+CRES

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	N/A

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

See the current implementation limitation in the parameters description.

Syntax

Command	Possible Response(s)
AT+CRES*[=<profile>]*	+CMS ERROR:*<err>*
AT+CRES=?	+CRES:*(list of supported <profile>s)*

Description

This command restores the message service settings from the non-volatile memory to the active memory. A TA can contain several profiles of settings. The settings specified in commands Service Centre Address: AT+CSCA *(on page 477)*, Set Text Mode Parameters: AT+CSMP *(on page 478)* and Select Cell Broadcast Message Types: AT+CSCB (if implemented) are restored. Certain settings may not be supported by the storage (e.g. (U)SIM SMS parameters) and therefore cannot be restored.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

Defined Values

profile

Integer: 0...255. Manufacturer specific profile number whence settings are to be restored.

Save Settings: AT+CSAS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

See the current implementation limitation in the parameters description.

Syntax

Command	Possible Response(s)
AT+CSAS*[=<profile>]*	+CMS ERROR:*<err>*
AT+CSAS=?	+CSAS:*(list of supported <profile>s)*

Description

This command saves the active message service settings to a non-volatile memory. A TA can contain several profiles of settings. Settings specified in commands Service Centre Address: AT+CSCA *(on page 477)*, AT+CSMP *(on page 478)* and Select Cell Broadcast Message Types: AT+CSCB (if implemented) are saved. Certain settings may not be supported by the storage (e.g. (U)SIM SMS parameters) and therefore are not saved.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

The test command displays the supported profile numbers for reading and writing of settings.

Defined Values

profile

Integer: 0...255. Manufacturer specific profile number where settings are to be stored.

Select Message Service: AT+CSMS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

See the current implementation limitation in the parameters description.

Syntax

Command	Possible Response(s)
AT+CSMS=<*service*>	+CSMS: <*mt*>,<*mo*>,<*bm*> +CMS ERROR: <*err*>
AT+CSMS?	+CSMS: <*service*>,<*mt*>,<*mo*>,<*bm*>
AT+CSMS=?	+CSMS: (*list of supported* <*service*>*s*)

Description

This command selects the messaging service <*service*>. It returns the types of messages supported by the ME: <*mt*> for mobile terminated messages, <*mo*> for mobile originated messages and <*bm*> for broadcast type messages. If the chosen service is not supported by the ME (but is supported by the TA), final result code +CMS ERROR: <err> is returned.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for <*err*> values.

The read command returns the supported message types along with the current service setting.

Test command returns a list of all services supported by the TA.

Defined Values

CAUTION: Restriction: cannot disable <*mt*>, <*mo*> and <*bm*> services.

service

Integer: 0..128.

Table 276. *service*

Value	Description
0	3GPP TS 23.040 [3] and 3GPP TS 23.041 [4]
1	3GPP TS 23.040 [3] and 3GPP TS 23.041 [4]. (The requirement of <*service*> setting 1 is mentioned under corresponding command descriptions)

Table 276. *service* (continued)

Value	Description
2...127	Reserved
128	Manufacturer specific

mt, mo, bm

Integer: 0 or 1.

Table 277. *mt, mo, bm*

Value	Description
0	Type not supported
1	Type supported

Select Service for MO SMS Messages: AT+CGSMS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

See the current implementation limitation in *service* parameter description.

Syntax

Command	Possible Response(s)
AT+CGSMS=*[<service>]*	OK
AT+CGSMS?	+CGSMS:*<service>*
AT+CGSMS=?	+CGSMS:*(list of supported <service>s)*

Description

This command is used to specify the service or service preference that the MT uses to send MO SMS messages.

The read command returns the currently selected service or service preference.

The test command is used to request information on the currently available services and service preferences.

Defined Values

CAUTION: Restriction: only <*service*> 0 and 2 are currently implemented.

service

Integer: 0, 1, 2 or 3. Service, or service preference, to be used

Table 278. *service*

Value	Description
0	Packet Domain
1	Circuit switched
2	Packet Domain preferred (use circuit switched if GPRS not available)
3	Circuit switched preferred (use Packet Domain if circuit switched not available)

Send Command: AT+CMGC

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	Network dependent
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
If text mode (`+CMGF=1`):`+CMGC=`*<fo>,<ct>[,<pid>[,<mn>[,<da>[,<toda>]]]]*`<S3>text<Ctrl-Z/ESC>`	If text mode (`+CMGF=1`) and delivery OK: `+CMGC:`*<mr>[,<scts>]* If delivery fails: `+CMS ERROR:` *<err>*
`AT+CMGC=?`	

Note: <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3 *(on page 3)*

Description

This command sends a command message from a TE to the network (SMS-COMMAND). The entering of text (3GPP TS 23.040 [3] TP-Command-Data) is done similarly as specified in command Send Message Send Message: AT+CMGS *(on page 473)*, but the format is fixed to be a sequence of two IRA character long hexadecimal numbers which ME/TA converts into 8-bit octets (refer to Send Message: AT+CMGS *(on page 473)*). The message reference value *<mr>* is returned to the TE on successful message delivery. Optionally (when Select Message Service: AT +CSMS *(on page 465)* value is 1 and the network supports it) *<scts>* is returned. Values can be used to identify the message after an unsolicited delivery status report result code. If the sending fails in a network or an ME error, final result code `+CMS ERROR: <err>` is returned.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

Send Long SMS: AT+SQNSMSSEND

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSMSSEND=<*to*>, <*text*> [,<*save*>[,<*priority*>[,<*cbk-number*>]]]	[+SQNSMSSEND:STORED,<*mem*>,<*storageId*> <S3><S4>] +SQNSMSSEND:ID,<*internalId*> +SQNSMSSEND:<*internalId*> OK

Note: Quotes are not supported.

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command (optionally stores, and) sends a message from a TE to the network.

The message reference value <*mr*> is returned to the TE via the +SQNSMSSENDRES URC on successful message delivery.

The final result codes OK or ERROR are sent immediately, regardless of the eventual network response.

The command has auto-segmentation feature: if necessary, the text is split into chunks and sent in several consecutive SMS.

Defined Values

to

String. Destination number for the SMS message.

text

String. Text of the SMS message.

save

Integer: 0 or 1. Optional parameter.

Table 279. *save*

Value	Description
0	(default value) Do not save the SMS message. The module replies with: `+SQNSMSSEND:`ID,*<internalId>*
1	Save the SMS message. The module replies with: `+SQNSMSSEND:`*<internalId>*

priority

Integer: 0, 1, 2 or 3. Priority of the message.

Note: This parameter is ignored in the current implementation.

Table 280. *priority*

Value	Description
0	Normal
1	Interactive
2	Urgent
3	Emergency

cbk number

String of digits. Callback number.

Note: This parameter is ignored in the current implementation.

internalId

Integer. Internal identifier used to bind the intermediate response with the subsequent URC.

+SQNSMSSENDRES URC

For each SMS segment, two URCs are sent back. The first is the status of the sending attempt, the second the status of the network response.

1. `+SQNSMSSEND: SENT OK|SENT ERROR,<internalId>,<mr>|<errorCause>`
   `+SQNSMSSEND: SENT OK,0,132`
2. `+SQNSMSSEND: ACK OK|ACK ERROR,<internalId>[,<errorCause>]`
   `+SQNSMSSEND: ACK OK,0`

With:

- `mr`: Integer. TPDU message reference.
- `errorCause`: Integer. Error cause.

Examples

- Send message

```
AT+SQNSMSSEND="123456789","This is the SMS content"
```

- Send message and save

```
AT+SQNSMSSEND="123456789","This is the SMS content",1
```

- Send message without saving and with callback number 11111

```
AT+SQNSMSSEND="123456789","This is the SMS content",0,,"11111"
```

- Full example with Error

```
AT+SQNSMSSEND="1234","01234567890123456789012345678901234567890"
+SQNSMSSEND: ID,6
+SQNSMSSEND: ID,7
OK
+SQNSMSSEND: SENT ERROR,6,500
+SQNSMSSEND: SENT ERROR,7,500
```

- Full example with OK+ACK

```
AT+SQNSMSSEND="1234","01234567890123456789012345678901234567890"
+SQNSMSSEND: ID,6
+SQNSMSSEND: ID,7
OK
+SQNSMSSEND: SENT OK,6,1
+SQNSMSSEND: SENT OK,7,2
+SQNSMSSEND: ACK OK,6 or +SQNSMSSEND: ACK ERROR,6,1
+SQNSMSSEND: ACK OK,7 or +SQNSMSSEND: ACK ERROR,7,1
```

Send Message from Storage: AT+CMSS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	Network dependent
Persistency	N/A

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
`AT+CMSS=`*<index> [,<da>[,<toda>]]*	• If in text mode (`+CMGF=1`) and the sending is successful: `+CMSS:`*<mr>[,<scts>]* • If sending fails: `+CMS ERROR:`*<err>*
`AT+CMSS=?`	

Description

This command sends a message with the location value *<index>* from the preferred message storage *mem2* to the network (SMS-SUBMIT or SMS-COMMAND). If a new recipient address *<da>* is given for SMS-SUBMIT, it is used instead of the one stored in the message. Reference value *<mr>* is returned to the TE on successful message delivery. Optionally (when `+CSMS <service>` value is 1 and the network supports it), *<scts>* is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code `+CMS ERROR: <err>` is returned.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

Defined Values

index

Integer. Index of the message to send.

Send Message: AT+CMGS

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	Network dependent
Persistency	N/A

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
If in text mode (AT+CMGF=1 *(on page 447)*): `AT+CMGS=`*<da>[,<toda>]*`<S3>`*text*`<Ctrl-Z/ESC>`	• If in text mode (Message Format: AT+CMGF *(on page 447)*) and delivery successful: `+CMGS:`*<mr>[,<scts>]* • If delivery failed:`+CMS ERROR:`*<err>*
`AT+CMGS=?`	

Note: In this description, <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command sends a message from a TE to the network (SMS-SUBMIT). The message reference value *<mr>* is returned to the TE on successful message delivery. Optionally (when Select Message Service: AT+CSMS *(on page 465)* value is 1 and the network supports it) *<scts>* is returned. The values can be used to identify the message after an unsolicited delivery status report result code. If the sending fails in a network or an ME error, the final result code `+CMS ERROR: <err>` is returned.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for *<err>* values.

- The entered text (3GPP TS 23.040 [3] TP-Data-Unit) is sent to address *<da>* and all current settings (refer Set Text Mode Parameters AT+CSMP *(on page 478)* and Service Centre Address AT+CSCA *(on page 477)*) are used to construct the actual PDU in ME/TA.
- The TA shall send a four character sequence `<S3><S4><greater_than><space>` (IRA 13, 10, 62, 32) after the command line is terminated with <S3>. Thereafter the text can be transmitted from the TE to the ME/TA.
- The DCD signal must be 'on' while the text is entered.
- The echoing of entered characters back from the TA is controlled by the V.25ter echo command ATE *(on page 6)*.
- The entered text should be formatted as follows:

  - If <*dcs*> (set with `AT+CSMP`) indicates that 3GPP TS 23.038 [2] GSM 7 bit default alphabet is used and <*fo*> indicates that 3GPP TS 23.040 [3] `TP-User-Data-Header-Indication` is not set:
    - If TE character is set to anything other than "HEX" (refer command Select TE Character Set AT+CSCS *(on page 12)* in 3GPP TS 27.007 [9]): ME/TA converts the entered text into the GSM 7 bit default alphabet according to rules of Annex A; backspace can be used to delete the last character and carriage returns can be used (previously mentioned four character sequence shall be sent to the TE after every carriage return entered by the user);
    - If TE character set is "HEX": the entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into the GSM 7 bit default alphabet characters. (e.g. 17 (IRA 49 and 55) will be converted to character (GSM 7 bit default alphabet #23)).
- If <*dcs*> indicates that 8-bit or UCS2 data coding scheme is used or <*fo*> indicates that 3GPP TS 23.040 [3] `TP-User-Data-Header-Indication` is set: the entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into 8-bit octet (e.g. two characters 2A (IRA 50 and 65) will be converted to an octet with integer value 42).
- Sending can be cancelled by outputting the *ESC* character (IRA 25).
- <*Ctrl-Z*> (IRA 26) must be used at the end of the message body.

Send Multi-line SMS: AT+SQNSMSMLSEND

Syntax

Command	Possible Response(s)
AT+SQNSMSMLSEND=<*to*>[,<*save*>[,<*priority*> [,<*cbkNumber*>]]] <S3>text<Ctrl+Z/ESC>	+SQNSMSMLSEND:ID,<*internalId*> [+SQNSMSMLSEND:STORED,<*mem*>,<*storageId*>] OK +CME ERROR: <*err*>
AT+SQNSMSMLSEND=?	+SQNSMSMLSEND:<*to*>[,<*save*>[,<*priority*> [,<*cbkNumber*>]]] <S3>Text<Ctrl+Z/ESC>

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command (optionally stores and) sends a message from a TE to the network.

The message reference value <*mr*> is returned to the TE via URC on successful message delivery. Command behaves as Send Long SMS: AT+SQNSMSSEND *(on page 469)*, except that the text is entered on separate lines after the prompt <S3><S4><greater_than><space> (default: IRA 13, 10, 62, 32).

The result codes, OK or ERROR, are returned immediately, without waiting for the network's response.

The command has an auto-segmentation feature. If necessary, the text is split into chunks and sent in several consecutive SMS.

The operation can be cancelled using the <*ESC*> character (IRA 25). <*Ctrl-Z*> (IRA 26) must be used to conclude the message.

Defined Values

to

String. Destination address.

save

Integer: 0 or 1.

Table 281. *save*

Value	Description
0	Don't store the SMS before sending.
1	Store the SMS before sending.

priority

Integer, 3GPP2 only: 0, 1, 2 or 3.

Note: This parameter is ignored in the current implementation.

Table 282. *priority*

Value	Description
0	NORMAL
1	INTERACTIVE
2	URGENT
3	EMERGENCY

cbkNumber

String, 3GPP2 only. Number to call back.

Note: This parameter is ignored in the current implementation.

internalId

Integer. Internal identifier used to bind intermediate response with subsequent URC.

+SQNSMSSEND URC

For each SMS segment, two URC are sent back: the first is the status of sending attempt and the second is the status of network response.

```
+SQNSMSSEND: SENT OK | SENT ERROR,<internalId>,<mr>|<errorCause>
+SQNSMSSEND: ACK OK | ACK ERROR,<internalId>[,<errorCause>]
```

with:

- *<mr>*: integer type, TPDU message reference.
- *<errorCause>*: integer type, error cause

Example

- Send message:

```
AT+SQNSMSMLSEND="+11325476980"
> This the first line.
> This is the last line.
+SQNSMSMLSEND: ID,4
OK
+SQNSMSMLSEND: SENT OK,4,44
+SQNSMSMLSEND: ACK OK,4
```

- Store and send message:

```
AT+SQNSMSMLSEND="+11325476980",1
> test quotes "abc"
+SQNSMSMLSEND: STORED,ME,1
+SQNSMSMLSEND: 14
OK
+SQNSMSMLSEND: SENT OK,14,49
+SQNSMSMLSEND: ACK OK,14
```

Service Centre Address: AT+CSCA

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	300 ms
Persistency	Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CSCA=<*sca*> [,<*tosca*>]	OK
AT+CSCA?	+CSCA:<*sca*>,<*tosca*> OK
AT+CSCA=?	OK

Description

This command updates the SMSC address, through which mobile originated SMs are transmitted. In text mode, the setting is used by send and write commands. In PDU mode, the setting is used by the same commands, but only when the length of the SMSC address coded into the <*pdu*> parameter equals zero.

Important: It is recommended to backup the Service Center Address in SMS *profile1* with Save Settings: AT+CSAS *(on page 464)*. It can then be restored by Restore Settings: AT+CRES *(on page 463)*.

Note: The output of this command is disabled unless AT+CSDH=1 *(on page 479)* has been used first.

Defined Values

sca

Decimal digits. Service center address (phone number)

tosca

Integer. Type of address, TS 24.011 compliant

Set Text Mode Parameters: AT+CSMP

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1 or 4. SIM card present
Time-out	1 s
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CSMP=*[<fo>[,<vp>[,<pid>[,<dcs>]]]]*	
AT+CSMP?	+CSMP:*<fo>,<vp>,<pid>,<dcs>*
AT+CSMP=?	

Description

This command is used to select values for additional parameters needed when SM is sent to the network or placed in a storage when text format message mode is selected. It is possible to set the validity period starting from when the SM is received by the SMSC (*<vp>* is in range 0..255) or define the absolute time of the validity period termination (*<vp>* is a string). The format of *<vp>* is given by *<fo>*. If TA supports the EVPF, see 3GPP TS 23.040 [3], it shall be given as a hexadecimal coded string (refer e.g. *<pdu>*) with double quotes.

Note: When storing a SMS-DELIVER from the TE to the preferred memory storage in text mode (refer command Write Message to Memory AT+CMGW), *<vp>* field can be used for *<scts>*.

Show Text Mode Parameters: AT+CSDH

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	1 s
Persistency	Not Reboot Persistent

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

Syntax

Command	Possible Response(s)
AT+CSDH*[=<show>]*	
AT+CSDH?	+CSDH:*<show>*
AT+CSDH=?	+CSDH:*(list of supported <show>s)*

Description

This command controls whether detailed header information is shown in the text mode result codes.

The test command returns supported values as a compound value.

Defined Values

show

Integer: 0 or 1.

Table 283. *show*

Value	Description
0	Do not show header values defined in commands AT+CSCA and AT+CSMP (*<sca>*, *<tosca>*, *<fo>*, *<vp>*, *<pid>* and *<dcs>*) nor *<length>*, *<toda>* or *<tooa>* in AT+CMT, AT+CMGL, AT+CMGR result codes for SMSDELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in AT+CMGR result code, do not show *<pid>*, *<mn>*, *<da>*, *<toda>*, *<length>* or *<cdata>*.
1	Show the values in result codes

Stored SMS Statistics: AT+SQNSMSCOUNT

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSMSCOUNT=[=<*mem*>[,<*stat*>]]	+SQNSMSCOUNT:<*count*>,<*mem*>,<*stat*> OK
AT+SQNSMSCOUNT=?	+SQNSMSCOUNT:(*list of possible* <*mem*>*s*), (*list of possible* <*stat*>*s*) OK

Description

This command returns the number of SMS of status <*stat*> stored in given <*mem*>.

If <*mem*> is omitted, then current *mem1* is used. If <*stat*> is omitted, then results is returned for all possible <*stat*>.

The command has no impact on the status of messages (UNREAD or READ).

Defined Values

mem

String. Memory from which the messages are read.

Table 284. *mem*

Value	Description
"ME"	ME message storage
"SM"	(U)SIM message storage
"SR"	Status report storage

stat

String. Status of message in memory.

Table 285. *stat*

Value	Description
"REC UNREAD"	Received unread message
"REC READ"	Received read message
"STO UNSENT"	Stored unsent message
"STO SENT"	Stored sent message

Table 285. *stat* (continued)

Value	Description
"ALL"	All messages

count

Integer. Number of SMS in storage <*mem*> with status <*stat*>.

Examples

```
AT+SQNSMSCOUNT="ME","REC READ"

+SQNSMSCOUNT: 1,ME,REC READ

OK
```

```
AT+SQNSMSCOUNT

+SQNSMSCOUNT: 0,ME,REC UNREAD

+SQNSMSCOUNT: 1,ME,REC READ

+SQNSMSCOUNT: 0,ME,STO UNSENT

+SQNSMSCOUNT: 1,ME,STO SENT

+SQNSMSCOUNT: 2,ME,ALL

OK
```

Write Message to Memory: AT+CMGW

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1. SIM card present
Time-out	300 ms
Persistency	SIM Persistent

Note: This command is described in *3GPP TS 2.005*. See Section *References*.

Syntax

Command	Possible Response(s)

If in text mode (`+CMGF=1`)
`AT+CMGW=[<oa/da>[,<tooa/toda>[,<stat>]]]`
`<S3>(text to enter)<Ctrl-Z/ESC>`
	`+CMGW:<index>`
	`+CMS ERROR:<err>`

`AT+CMGW=?`	

Note: <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3 *(on page 3)*

Description

This command stores a message (either SMS-DELIVER or SMS-SUBMIT) to the memory storage *mem2*. The memory location <*index*> of the stored message is returned. By default, the message status will be set to `'stored unsent'`, but parameter <*stat*> allows also other status values to be given. The text transmission is done as in command AT +CMGS *(on page 473)*. If the writing fails, the final result code `+CMS ERROR: <err>` is returned.

Note that all data are entered first. Parameters analysis and data check are performed only after all data are received.

See also Message Service Failure Result Code: +CMS ERROR *(on page 448)* for <*err*> values.

Note: SMS-COMMANDs and SMS-STATUS-REPORTs cannot be stored in text mode.

Defined Values

oa

String. TP-Originating-Address Address-Value.

da

String. TP-Destination-Address Address-Value.

tooa

Integer. TP-Originating-Address Type-of-Address byte (default: refers to <*toda*>).

toda

Integer. TP-Destination-Address Type-of-Address byte (when first character of <*da*> is + (IRA 43), the default is 145, otherwise the default is 129).

stat

Integer: 0..4 (PDU mode) / string (text mode). Indicates the status of message in memory.

Table 286. *mode*

Value	Description
0 or "REC UNREAD"	Received unread message (i.e. new message)
1 or "REC READ"	Received read message
2 or "STO UNSENT"	Stored unsent message (only applicable to SMs)
3 or "STO SENT"	Stored sent message (only applicable to SMs)
4 or "ALL"	All messages (only applicable to `AT+CMGL` command)

index

Integer. Value in the range of location numbers available in memory.

Chapter 18. System Features Commands

Device Reset to Factory State: AT+SQNSFACTORYRESET

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Needs Subsequent Rebooting
Time-out	10 s
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSFACTORYRESET	OK +CME ERROR:<*err*>
AT+SQNSFACTORYRESET=?	OK

Description

This command causes device to revert to a previously saved state.

This factory reset rewinds all non-volatile parameters of the module back to the last restoration point set by Save Module Configuration: AT+SQNFACTORYSAVE *(on page 267)*. The detail of the restoration point please refer to Save Module Configuration: AT+SQNFACTORYSAVE *(on page 267)*. If no restoration point has been created, the parameters are overwritten with their factory defaults.

Note that this AT command also flushes any data cached by the LTE modem, such as last used cell, eDRX/PSM settings, autoconnect setting, RING config, CEREG, CMEE and the user certificates/the private keys.

A reboot is needed to commit the command.

Attention: The manufacturing command AT+SQNFACTORYSAVE must be used during the manufacturing process to define a restoration point for the AT+SQNSFACTORYRESET. Failing to create a restoration point can result in undefined behaviour.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

Device Shutdown: AT+SQNSSHDN

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	1 s
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNSSHDN	OK +CME ERROR:<*err*>
AT+SQNSSHDN=?	OK

Description

This command causes the device to detach from the network and shut down. Before turning off, it returns a final OK acknowledgement. This command proceeds despite any active or pending activity. The device does not accept any further command.

Attention: On restart, the module MUST be reset using the RESETN line. Powering the power up is not enough to reboot the module.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <*err*> values.

URC +SHUTDOWN

The +SHUTDOWN URC is issued on the AT port when the power down process is about to complete. However, since sending this URC requires some resources to remain active, the power must not be turned off immediately after its reception, but rather after a small delay, typically 1 s. Failing to observe this delay could result in data loss. More details about the shutdown sequence can be found in the module hardware documentation.

Forces Console Log on UART: AT+SMLOG

Syntax

Command	Possible Response(s)
AT+SMLOG=<*log*>	OK
AT+SMLOG?	+SMLOG:<*log*>
AT+SMLOG=?	+SMLOG *(list of supported <log>)*

Description

This command is only available in manufacturing mode (CFUN=5).

This command forces logs to be printed on the specified UART, regardless of their normal function.

Defined Values

log

String: UART the log is sent to.

- "LOG_DISABLE": The logs are discarded (/dev/null)
- "LOG_INHERIT": The logs are printed on the UART configured in 'console' mode (default)
- "LOG_FORCE_UART0": The logs are printed on UART 0
- "LOG_FORCE_UART1": The logs are printed on UART 1
- "LOG_FORCE_UART2": The logs are printed on UART 2

Hard Reset: AT^RESET

Mode	LTE-M – NBIoT
Type	Asynchronous
Prerequisite	–
Time-out	1 s
Persistency	N/A

Syntax

Command	Possible Response(s)
AT^RESET	Device is reset
	+SHUTDOWN … +SYSSTART

Description

This command performs a hardware reset.

In order to optimise power consumption, the behaviour of this command differs slightly from a power-down/power-up cycle or a RESETN signal assertion. In particular, it does not invalidate the DNS cache, nor does it close an active TLS session. DNS cache entries, as well as active TLS sessions, remain valid after the module has rebooted.

Unsolicited Responses +SHUTDOWN, +SYSSTART

Please refer to Shutdown/Start-up URC: +SHUTDOWN, +SYSSTART *(on page 496)*.

List All Available AT Commands: AT+CLAC

Note: This command is described in *3GPP TS 27.007*. See Section *References*.

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	–
Time-out	300 ms
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+CLAC	<AT Command1> [<S3><S4> <AT Command2>] […] OK
AT+CLAC=?	+CME ERROR: *<err>*

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

Execution command causes the modem to return one or more lines of AT Commands.

Attention: This command only returns the AT commands that are available for the user in the current mode.

See also Mobile Termination Error Result Code: +CME ERROR *(on page 282)* for <err> values.

Defined Values

AT Command

String. Defines the AT command including the prefix AT. Text shall not contain the sequence 0<*CR*> or OK<*CR*>

LWM2M Server Registration Status Inquiry: AT+SQNDMST

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	AT+CFUN=1, LwM2M client active
Time-out	–
Persistency	N/A

Syntax

Command	Possible Response(s)
AT+SQNDMST	+SQNDMST: "bs", <Server ID>, <BS Status>, <hold-Off Timer>, <BS Update Timer> … +SQNDMST: "dm", <Server ID>, <"DM Status">, <DM Life Time>, <DM Update Timer> … OK

Description

This command provides LwM2M Bootstrap server and Device Management servers registration status. The command returns ERROR as long as the UE is not attached to LTE network or if the LwM2M client is disabled.

Defined Values

Server ID

Integer: 1..65535. The Short Server ID (bootstrap server or device management server) that uniquely identifies the carrier's LwM2M server.

BS Status

String. Bootstrap server registration status.

Table 287. BS Status possible values

String	Signification
"BS_HOLD_OFF"	Waiting for hold-off timer expiration before starting the bootstrap process
"BS_INITIATED"	Bootstrap request message sent
"BS_PENDING"	Bootstrap ongoing
"BS_FAILING"	A bootstrap error occurred
"BS_FAILED"	The bootstrap failed
"BS_FINISHING"	Bootstrap finished message received from the server
"BS_FINISHED"	Bootstrap done

Hold-off Timer

Integer. How long (in seconds) the UE must wait after its initial attachment before starting the bootstrap process. This parameter is carrier defined.

BS Update Time

Integer. How long (in seconds) before the bootstrap starts. -1 if the bootstrap has already started or is already over.

DM Status

String. Device Management server registration status.

Table 288. DM Status possible values

String	Signification
"DEREGISTERED"	Not registered
"REG_PENDING"	Registration Pending
"REGISTERED"	Successfully Registered
"REG_FAILED"	Last Registration Attempt Failed
"REG_UPDATE_PENDING"	Registration Update Pending
"REG_UPDATE_NEEDED"	Registration Update Needed
"DEREG_PENDING"	De-registration Pending
"REG_DISABLE"	Registration is Disabled
"REG_NEEDED"	New Registration is Needed

DM Life Time

Integer. Value of the server's lifetime timer in seconds. Registration update begins when this timer fires. -1 if the registration process has already begun.

DM Update Timer

Integer. How long (in seconds) remains before registration starts.

Examples

```
AT+SQNDMST
+SQNDMST: "bs",100,"BS_HOLD_OFF",10,7
+SQNDMST: "dm",101,"DEREGISTERED",86400,86397
OK
```

In this example, the boostrap process is delayed by the carrier's hold off timer. It will start in 7 seconds.

```
AT+SQNDMST
+SQNDMST: "bs",100,"BS_INITIATED",10,-1
+SQNDMST: "dm",101,"DEREGISTERED",86400,86363
OK
```

In this example, the boostrap process is on going. The <*BS Status*> string can take several other values during the bootstrap process.

```
AT+SQNDMST
+SQNDMST: "bs",100,"BS_FINISHED",10,-1
+SQNDMST: "dm",102,"DEREGISTERED",2592000,22
+SQNDMST: "dm",101,"REG_PENDING",86400,-1
OK
```

In this example:

- The bootstrap process was successful.
- 2 device management servers have been setup by the bootstrap server:

- Server 102 registration will start in 22 seconds.
- Server 101 registration is on going. The <*DM Status*> string can take several other values during the server registration process.

```
AT+SQNDMST
+SQNDMST: "bs",100,"BS_FINISHED",10,-1
+SQNDMST: "dm",102,"DEREGISTERED",2592000,18
+SQNDMST: "dm",101,"REGISTERED",86400,84597
OK
```

In this example:

- The boostrap process was successful.
- 2 device management servers have been setup by the bootstrap server:
  - Server 102 registration will start in 18 seconds.
  - Server 101 registration is on going. Registration update period is 24 h. The next registration update is scheduled in 84,597 s.

```
AT+SQNDMST
+SQNDMST: "bs",100,"BS_FINISHED",10,-1
+SQNDMST: "dm",102,"REGISTERED",2592000,2587603
+SQNDMST: "dm",101,"REGISTERED",86400,81965
OK
```

In this example:

- The boostrap process was successful.
- 2 device management servers have been setup by the bootstrap server:
  - Server 102 registration was successful. Registration update period is 30 days (2,592,000 seconds). The next registration update is scheduled in 2,587,603 s.
  - Server 101 registration is under way. Registration update period is 24 h. The next registration is scheduled in 81,965 s.

PXL Configuration: AT+SQNPXLCFG

Mode	LTE-M – NBIoT
Type	Synchronous
Prerequisite	Needs Subsequent Rebooting
Time-out	–
Persistency	Reboot Persistent

Syntax

Command	Possible Response(s)
AT +SQNPXLCFG=*[<enable>]*	OK
AT+SQNPXLCFG?	+SQNPXLCFG:*<enable>* OK
AT+SQNPXLCFG=?	+SQNPXLCFG:(0-1) OK

Description

This command should be used to activate or deactivate the PXL application.

CAUTION: The change must be followed by a device's reboot. The configuration is lost during software upgrade or factory reset.

Defined Values

enable

Integer: 0 or 1. PXL application state:

Table 289. *enable*

Value	Description
0	PXL application disabled.
1	Default value. PXL application enabled.

Query Boot Mode: AT+SMOD

Syntax

Command	Possible Response(s)
AT+SMOD?	<*mode*> OK

Description

This command reports the current boot mode.

Defined values

mode

Integer 0..4.

Table 290. mode

mode	Description
0	FFH, bootloader is waiting for firmware
1	FFH, mtools.elf firmware present
2	FFF
3	Updater
4	Recovery

Report Boot Mode: AT+BMOD

Syntax

Command	Possible Response(s)
AT+BMOD?	+BMOD:<*mode*>,<*reason*>

Description

This command reports the current firmware boot mode as well as the reason of the last reboot.

Defined Values

mode

String: "FFH", "FFF", "UPDATER", "RECOVERY". Current active boot mode.

uart

String: "FATAL", "SLEEP", "SOFT", "POWERON". Last reboot reason.

Select Next Boot Mode: AT+SMSWBOOT

Syntax

Command	Possible Response(s)
AT+SMSWBOOT=<*mode*>,<*reboot*>	OK
AT+SMSWBOOT?	<*mode*> OK
AT+SMSWBOOT=?	+SMSWBOOT: mode[,reboot] mode: 0=FFH, 1=FFF, 2=UPDATER, 3=RECOVERY, 4=ECOPAGING reboot: 0=Do not reboot, 1=reboot

Description

This command selects the mode the module enters after the next reboot.

Defined values

mode

Integer 0..4. 0: FFH; 1: FFF; 2: UPDATER; 3: RECOVERY; 4: RESERVED

reboot

Integer: 0 or 1. If 1 the module reboots immediately after the command is executed.

Shutdown/Start-up URC: +SHUTDOWN, +SYSSTART

Syntax

Command	Possible Response(s)
	+SYSSTART
	+SHUTDOWN

Description

The +SYSSTART URC indicates that the ME has started (or restarted after a AT^RESET) and is ready to operate.

The +SHUTDOWN URC indicates that the ME has completed the shutdown procedure and is about to restart.

Wake Lock Management: AT+SQNWL

Syntax

Command	Possible Response(s)
AT+SQNWL=*<app>[,<wl_mask>]*	+CME ERROR:*<err>* +SQNWL:*<app>,<wl_mask>* OK
AT+SQNWL?	+SQNWL:*<app1>,<mask1>* [<S3><S4> … <S3><S4>+SQNWL:*<appN>,<maskN>*[…]] OK
AT+SQNWL=?	+SQNWL:"",(0-3) OK

Note: <S3> and <S4> represents the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 *(on page 3)* and Response Formatting Character: ATS4 *(on page 10)*

Description

This command manages resources wake locks. An application running on the Host CPU needs wake locks to secure full and immediate availability of device resources, which implies preventing these resources to enter sleep mode.

Currently, the wake-lockable system resources are:

- The CPU and the external interfaces (UART, GPIO)
- The device memory (RAM)

The command sets and releases the wake locks based on the resource identified by the bitmask *<wl_mask>*. To set the wake locks and prevent the sleep mode for the specified resource(s), *<wl_mask>* bit(s) should be set to 1. To release the wake locks and allow sleep mode for the specified resource(s), *<wl_mask>* bit(s) should be set to 0.

Note: The wake locks configuration is volatile. It is lost at reboot.

The command without a bitmask returns the wake lock defined by the *<app>* client application.

The read command returns the list of client applications using wake locks and lock status.

CAUTION: It is very important to release the wake locks as soon as possible to avoid draining the device's battery excessively. Each application must clear its wake locks when it doesn't need the resource any more.

Defined Values

app

String: Client application name.

wl_mask

Two-bit wide bitfield. Resources to keep available. Bits set to 1 to keep the resource available and prevent sleep mode.

Table 291. *wl_mask*

Value	Description
0	Default value. No system resource locked
Bit 0 (0x01)	Keep CPU and external interfaces (UART, GPIO) active. Prevents the CPU and external interfaces to enter sleep mode.
Bit 1 (0x02)	Keep device's RAM memory active. Prevents the device's RAM memory to enter sleep mode.
Bits 0 and 1 (0x03)	Keep CPU, external interfaces (UART, GPIO) and device's RAM memory active. Prevents the CPU, external interfaces and device's RAM memory to enter sleep mode.