

RYZ024 Modules

User's Manual: AT Commands

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16. Appendix: Abbreviations 269

17. Revision History 270

1. AT Channel Control Commands

1.1 Repeat Command Line: A/

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

1.1.1 Syntax

Command	Possible Response(s)
A/	

1.1.2 Description

If the prefix 'A/' or 'a/' is received, the DCE shall immediately re-execute 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).

1.2 Set to Factory-Defined Configuration: AT&F

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

1.2.1 Syntax

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

1.2.2 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 (for example, , Q, V, S3, S4) 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.

1.2.3 Defined Values

value Integer

Table 1. value

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

1.3 View Configuration Profiles: AT&V

1.3.1 Syntax

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

1.3.2 Description

This command reads the current settings of the system for various parameters set by AT commands and stored by Write Active Profile in Memory:AT&W.

1.3.3 Example

```
AT&V
E: 0; V: 1; Q: 0; &C: 1; &D: 25%; &S: 0;
S3 : 013; S4 : 010; +IFC : 25%,2; +ICF: 3;
+IPR : 925%1600; OK
      AT+CFUN?
+CFUN: 0 OK
```

1.4 Write Active Profile in Memory:AT&W

1.4.1 Syntax

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

1.4.2 Description

AT&W 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.

1.5 List All Available AT Commands: AT+CLAC

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

1.5.1 Syntax

Command	Possible Response(s)
AT+CLAC	<AT Command1> [<CR><LF> <AT Command2> [...]]
AT+CLAC=?	+CME ERROR: <err>

1.5.2 Description

This 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: AT+CME ERROR for <err> values.

1.5.3 Defined Values

AT Command String. Defines the AT command including the prefix AT. Text shall not contain the sequence 0<CR> or OK<CR>

1.6 Select TE Character Set: AT+CSCS

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

1.6.1 Syntax

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

1.6.2 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 bits wide, the highest bit shall be set to zero.

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

The Read command shows the current setting. The Test command displays conversion schemes implemented in the TA.

1.6.3 Defined Values

charset Character: character set as a string type (other conversion schemes not listed here can be implemented by manufacturers).

CAUTION: Only the 'GSM', 'UCS2' and 'UTF-8' types are **currently implemented**.

Table 2. charset

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; for example, '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/IEC 10646 [32]); UCS2 character strings are converted to hexadecimal numbers ranging from 0000 to FFFF; for example, '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 ≤ n ≤ 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

Value	Description
'8859-H'	ISO 8859 Latin/Hebrew character set

1.7 Enable Smart Terminal: AT+SMART

1.7.1 Syntax

Command	Possible response(s)
AT+SMART[= <i>enable</i>]	
AT+SMART=?	

1.7.2 Description

This command switches the AT command interface between the default 'dumb' text-based terminal mode and a human-friendly smart terminal mode.

1.7.3 Defined Values

The following values are defined:

enable Whether to enable or disable the smart terminal:

- 0: Disable smart terminal.
- 1: Enable smart terminal. The default value is 1.

1.8 Echo: ATE

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

1.8.1 Syntax

Command	Possible Response(s)
ATE< <i>value</i> >	

1.8.2 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.

1.8.3 Defined Values

value Integer.

Note: The default value is 0, that is, 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.

1.9 Result Code Suppression: ATQ

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

1.9.1 Syntax

Command	Possible Response(s)
ATQ[< <i>value</i> >]	OK if value is 0. (none) if value is 1 (because result codes are suppressed). ERROR for unsupported values (if previous value was Q0). (none) for unsupported values (if previous value was Q1).

1.9.2 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.

1.9.3 Defined Values

value Integer.

Note: The recommended default value is 0.\

Table 4. value

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

1.10 Command Line Termination Character: ATS3

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

1.10.1 Syntax

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

1.10.2 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.

1.10.3 Defined Values

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

1.11 Response Formatting Character: ATS4

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

1.11.1 Syntax

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

1.11.2 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.

1.11.3 Defined Values

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

1.12 Command Line Editing Character: ATS5

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

1.12.1 Syntax

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

1.12.2 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.

1.12.3 Defined Values

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

1.13 DCE Response Format: ATV

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

1.13.1 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).

1.13.2 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 5 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 5.

Table 5. 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><verbosecode><s3><s4>

1.13.3 Defined Values

value Integer.

Note: The recommended default value is 1.

Table 6. value

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

1.14 Reset to Default Configuration: ATZ

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

1.14.1 Syntax

Command	Possible Response(s)
ATZ[<value>]	OK if <value> is recognized. ERROR if <value> is not recognized or not supported.

1.14.2 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+SQNFACTORYRESET instead.

2. Data Communication Equipment Identification Commands

2.1 Request Manufacturer Identification: +CGMI

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

2.1.1 Syntax

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

2.1.2 Description

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

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

2.1.3 Defined Values

manufacturer

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

2.2 Request Model Identification: AT+CGMM

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

2.2.1 Syntax

Command	Possible Response(s)
AT+CGMM	<model>

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

2.2.2 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: AT+CME ERROR for <err> values.

2.2.3 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 0<CR> or OK<CR>.

2.3 Request Revision Identification: AT+CGMR

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

2.3.1 Syntax

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

2.3.2 Description

This 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: AT+CME ERROR for <err> values.

2.3.3 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 0<CR> or OK<CR>.

2.4 Request Product Serial Number Identification: AT+CGSN

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

2.4.1 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

2.4.2 Description

This 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: AT+CME ERROR 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.

2.4.3 Defined Values

snt

Integer type containing the serial number type that has been requested.

Table 7. 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 0<CR> or OK<CR>.

imei

String type in decimal format indicating the IMEI; refer to 3GPP TS 23.003 [7], subclause 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.

imeisv

String type in decimal format indicating the IMEISV; refer to 3GPP TS 23.003 [7], subclause 6.2.2. The 16 digits of IMEISV are composed of the Type Allocation Code (TAC) (8 digits), the Serial Number (SNR) (6 digits) 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 by using the command Select TE Character Set: AT+CSCS.

svn

String type in decimal format indicating the current SVN which is a part of IMEISV; refer to 3GPP TS 23.003 [7], subclause 6.2.2. This allows identifying different software versions of a given mobile. Character set used in <svn> is specified by using the command Select TE Character Set: AT+CSCS.

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

2.4.4 Informative 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
```

2.5 Request International Mobile Subscriber Identity: AT+CIMI

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

2.5.1 Syntax

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

2.5.2 Description

This 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: AT+CME ERROR for <err> values.

2.5.3 Defined Values

IMSI

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

2.6 Request Product Serial Number Identification: AT+GSN

Note: This command is described in ITU-T V.250. See Section *References*. See also Request Product Serial Number Identification: AT+CGSN command.

2.6.1 Syntax

Command	Possible Response(s)
AT+GSN	OK

2.6.2 Description

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, so that the user of the DCE can identify the individual device. Typically, the text will consist of a single line alphanumeric string, but manufacturers may elect to provide further information.

The total number of characters, including line terminators, in the information text returned must not exceed 2048 characters. Note that the information text must not contain the sequence "0 <CR>" (3/0, 0/13) or "OK<CR>" (4/15, 4/11, 0/13), to avoid premature end detection.

2.7 Request Identification Information: ATI

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

2.7.1 Syntax

Command	Possible Response(s)
ATI[<value>]	
ATI or ATIO	<manufacturer><CR><LF> <model><CR><LF> <ue_version>
ATI1	<ue_version><CR><LF> <lr_version>
ATI2	serial: <serial> imeisv: <imeisv> OK

2.7.2 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 AT+IO command to indicate which other features and commands are implemented in a DCE dooms software to certain failure, since manufacturer implementations differ widely, even among devices that may, coincidentally, respond with identical values. Software developers should use AT+I 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 be prepared to receive ERROR responses if the value passed is not recognized.

ATI or AT+IO write commands reports device MT manufacturer, MT model and the UE software version.

AT+I1 write commands reports the UE and LR software versions.

AT+I2 reports the device serial number and IMEISV.

2.7.3 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], subclause 6.2.2. The 16 digits of IMEISV are composed of the Type Allocation Code (TAC) (8 digits), the 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.

2.7.4 Example

```
ATI
Sequans
VZ120Q
UE4.3.0.0-21466
OK

AT+I1
UE4.3.0.0-21466
LR4.3.1.1-ER1-22900
OK

AT+I2
SERIAL: G2Q2106160008013 IMEISV: 0157700008800111
OK
```

2.8 Host Device Identity Configuration: AT+ODIS

2.8.1 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

2.8.2 Description

This reads and writes the host device identity:

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

The device is pre-provisioned with two host device instances described in Table 8.

Table 8. 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' behaviors depend on module state:

- When in operational or screening mode:
 - The read command displays all host device identity resources except for the 'Host Device 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`).

2.8.3 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.

2.8.4 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
```

3. Device Upgrade

3.1 Device Upgrade: AT+SQNSUPGRADE

3.1.1 Syntax

Command	Possible Response(s)
AT+SQNSUPGRADE=<firmware_url>, [<reboot> [,<report_progress>, [<command>, [<spld>]]]]	+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 <spld>)

3.1.2 Description

The command trigger a device upgrade with firmware fetched from an external server, 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 finalize the system upgrade. Any kind of reboot is acceptable (AT^RESET, AT+SQNSSHDN, hardware reset). The <reboot> parameter controls automatic reboot after the downloaded firmware has been validated and installed. The upgrade can be launched in foreground or background as specified by

<command> value. User can cancel upgrade by sending `cancel <command>` any time before device reboot. 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", and so on). 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 timings: the user calls this command to trigger the firmware upgrade and/or to cancel the operation.

See also Mobile Termination Error Result Code: `AT+CME ERROR` 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 values supported as a compound value.

3.1.3 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)://..."
- If the firmware is fetched from the local file system:
 <firmware_url> = "file:///..." using an absolute path to the file

reboot

Integer

Table 9. reboot

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

report_progress

Integer

Table 10. report_progress

Value	Description
0	Don't report download progress
1..100	report download progress using <code>+SQNSUPGRADE: "downloading", <percent_downloaded></code> URC.

command

integer

Table 11. 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 upgrade if any has started or does nothing, then returns OK. In case of a network-initiated firmware upgrade, the network will be notified with upgrade cancel error code.

spld

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 <spld> parameter. Any attempt to open a secure connection without a valid security profile will fail.

upgrade_state

String

Table 12. upgrade_state

Value	Description
"canceled"	The upgrade has been canceled
"downloading"	Report the downloading progress. This state is followed with <percent_downloaded>. This information is displayed only if <report_progress> has been set different than 0
"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 that finalizes the system upgrade.

percent_downloaded

Integer. Percentage of image downloaded. Range is 0..100.

3.1.4 Example

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

The following error codes may be returned through +CME ERROR.

Table 13. +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

3.2 Device Upgrade Configuration AT+SQNSUPGRADECFG

3.2.1 Syntax

Command	Possible Response(s)
AT+SQNSUPGRADECFG=<mode>,<reportStage>,<reportProgress>	+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>)

3.2.2 Description

The write command is used to configure the device behavior 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 the background. After downloading the new firmware, the module automatically applies it, then reboots. The user is notified of progress (firmware downloading, firmware installed, upgrade canceled, rebooting...) by +SQNSUPGRADE unsolicited result code based on the debug level configured by <reportStage> and <reportProgress> parameters.

In "manual" mode, 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.

<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: AT+CME ERROR for <err> values.

3.2.3 Defined Values

mode

Integer

Table 14. mode

Value	Description
0	Default value. 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.
1	Manual mode. Host assisted: the host can delay/cancel the upgrade

reportStage

Integer

Table 15. 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 16. reportProgress

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

3.2.4 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
```

4. Hardware FunctionsControl Commands

4.1 Read ADC value: AT+SQNADC

4.1.1 Syntax

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

4.1.2 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 mVolt of the specified ADC channel input. If the specified ADC channel is invalid or disabled (See AT+SQNHWCFG), the command returns ERROR.

The test command returns the list of enabled ADC channels.

4.1.3 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.

4.2 GPIO Pin Configuration: AT +SQNGPIO

4.2.1 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

4.2.2 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:

All GPIOs are shut down when the module goes into deep sleep mode. RYZ024-based modules do not drive GPIOs in deep sleep mode and may require an external pull-up. GPIOs, however, remain active in the sleep, standby, and active modes. Please refer to the *Module Integration Guide* and the *Module datasheet* for further information.

After the module exits deep sleep mode, the value set with this command is restored.

The value set does not persist after a reboot (hardware or software).

Input GPIOs do not wake the IC from deep sleep. This must be done using dedicated wake pins.

4.2.3 Defined Values

gpio

String, name of GPIO given in the product's data sheet.

direction

String

Table 17. direction

Value
"output"
"input"

polarity

String

Table 18. 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

value

String

Table 19. value

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

4.2.4 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.

4.3 Set LED Blink Mode: +SQNLED

4.3.1 Syntax

Command	Possible Response(s)
AT+SQNLED=<mode>	OK ERROR +CME ERROR:<err>
AT+SQNLED?	+SQNLED: <mode_as_bitfield> OK
AT+SQNLED=?	+SQNLED: (list of possible <mode>) OK

4.3.2 Description

The set form of the command turns the device LEDs on or off:

- LTE LED for a visual check of the modem state.
- When applicable: GNSS LED for a visual check of the GNSS state.

Note: LEDs availability depends on the board hardware.

The read command returns the current mode as a bit field of all LEDs. The test command returns the list of possible modes.

4.3.3 Defined Values

mode

Integer. Configures a LED mode.

Table 20. 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

mode_as_bitfield

Integer. LEDs mode state as a bit field. Bit 0 indicates LTE LED mode and bit 1 indicates GNSS LED mode (when applicable). The table below lists the resulting values and meanings.

Table 21. mode_as_bitfield

Value of Bit	Description
0x0	LED is switched off
0x1	LED is active

5. IoT Low Power Optimization Commands

5.1 eDRX Read Dynamic Parameters: AT+CEDRXRDP

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

5.1.1 Syntax

Command	Possible Response(s)
AT+CEDRXRDP	+CEDRXRDP: <AcT-type> [,<Requested_eDRX_value> [,<NW-provided_eDRX_value> [,<Paging_time_window>]]]
AT+CEDRXRDP=?	

5.1.2 Description

This 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 to.

If the cell that the MS is currently registered to is not using eDRX, AcT-type=0 is returned.

5.1.3 Defined Values

AcT-type

Integer type, 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 22. 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 (lu mode)

4	E-UTRAN (WB-S1 mode)
5	E-UTRAN (NB-S1 mode)

Requested_eDRX_value

String type; nibble (half byte). The eDRX value refers to bit 4 to 1 of octet 3 of the *Extended DRX parameters information element* (see subclause 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 type; nibble (half byte). The eDRX value refers to bit 4 to 1 of octet 3 of the *Extended DRX parameters information element* (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). or 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 type; nibble (half byte). The paging time window refers to bit 8 to 5 of octet 3 of the *Extended DRX parameters information element* (see subclause 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.

5.2 eDRX Setting: AT+CEDRXS

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

5.2.1 Syntax

Command	Possible Response(s)
AT+CEDRXS=[<mode> [, <AcT-type> [, <Requested_eDRX_value>]]]	+CME ERROR: <err>
AT+CEDRXS?	[+CEDRXS: <AcT-type>, <Requested_eDRX_value> [<CR><LF>+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)

5.2.2 Description

This command controls the setting of the UEs eDRX parameters. The command controls whether the UE wants to apply eDRX or not, as well as the requested eDRX value for each specified type of access technology.

This command also controls the presentation of an unsolicited result code +CEDRXP:<AcT-type>

[, <Requested_eDRX_value>
[, <NW-provided_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: AT+CME ERROR 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.

5.2.3 Defined Values

mode

Integer type, tells whether to disable or enable the use of eDRX in the UE. This parameter is applicable to all specified types of access technologies, that is, the most recent setting of <mode> takes effect for all specified values of <AcT>.

Table 23. 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_e DRX_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 type, 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 24. 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 type; nibble. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 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 type; nibble. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 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 type; nibble. The paging time window refers to bit 8 to 5 of octet 3 of the Extended DRX parameters information element (see subclause 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.

5.3 Coverage Enhancement Mode Information: AT+CEINFO

5.3.1 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>
	+CEINFO: <Reporting>, <CE Enabled>, <UE State>, <Downlink Repetition Factor>, <Uplink Repetition Factor>, <RSRP>, <CINR>

5.3.2 Description

This 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').

5.3.3 Defined Values

Reporting

Integer. Unsolicited notifications activation status.

Table 25. Reporting

Value	Description
0	Disable unsolicited report +CEINFO
1	Enable unsolicited report +CEINFO

CE Enabled

Integer. CE mode A/B serving cell capability .

Table 26. 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 27. 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 NB-IoT.
- 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 NB-IoT.

Uplink Repetition Factor

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 NB-IoT.

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

5.3.4 Example

```
AT+CEINFO=1 OK
+CEINFO:1,1,R,8,1,-88,25%5
+CEINFO:1,1,I,8,1,-89,15
+CEINFO:1,1,C,8,1,-88,25%0
```

5.4 Power Saving Mode Setting: AT+CPSMS

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

5.4.1 Syntax

Command	Possible Response(s)
<code>+CPSMS=[<mode></code>	OK
<code>[,<Request ed_Periodic-RAU></code>	<code>+CME ERROR: <err></code>
<code>[,<Requested_GPRSREADYtimer></code>	
<code>[,< Requested_Periodic- TAU></code>	

Command	Possible Response(s)
[,<Requested_Active- Time>]]]]]	
+CPSMS?	+CPSMS: <mode> [,<Requested_Periodic- RAU>] [,<Requested_GPRS-READYtimer>] [,<Requested_Periodic-TAU>] [,<Requested_Active-Time>]
+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)

5.4.2 Description

This command alters of 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 commands +CGREG for the Active Time value, the extended periodic RAU value and the GPRS READY timer value that are allocated to the UE by the network in GERAN/UTRAN and +CEREG for the Active Time value and the extended periodic TAU value that are allocated to the UE by the network in E-UTRAN.

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 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: AT+CME ERROR on page 148 for <err> values.

5.4.3 Defined Values

mode

Integer type. Indication to disable or enable the use of PSM in the UE.

Table 27. 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 type; 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 (for example, "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 25%4.008 [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 type; 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 (for example, "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 type; 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 (for example, "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 type; 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 (for example, "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.

5.5 Device-Initiated Data InactivityMonitoring: AT+SQNDIT

5.5.1 Syntax

Command	Possible Response(s)
AT+SQNDIT=<enable> [,<data_inactivity_timer>]	OK
AT+SQNDIT=?	+SQNDIT: (0-1), (30-65535) OK
AT+SQNDIT?	+SQNDIT: <enable>, <data_inactivity_timer> OK

5.5.2 Description

This command is used to configure device-initiated data inactivity monitoring feature. This feature is activated by default with a data inactivity timer set to 120 seconds.

The 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 the eNB advertises data inactivity feature support, eNB configuration will take precedence over the AT+SQNDIT user configuration.

The configuration persists through device reboots and modem power states. Changes are applied at the next reconnection to the network (CFUN=1).

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 3× 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 desynchronization). Any configuration change is under the device owner's responsibility.

5.5.3 Defined Values

enable

Integer in range 0..1. Device-initiated data inactivity monitoring enable

Table 28. enable

Value	Description
0	Device-initiated data inactivity monitoring is disabled
1	Device-initiated data inactivity monitoring is enabled

data_inactivity_time

Integer in range 30..65535. Custom data inactivity timer in seconds.

5.6 Dynamic Power Reduction Mode Configuration: AT+SQNDPR

5.6.1 Syntax

Command	Possible Response(s)
AT+SQNDPR=<mode> [, <state>]	OK
AT+SQNDPR?	+SQNDPR=<mode>, <state> OK
AT+SQNDPR=?	+SQNDPR=(0-1), (0-1) OK

5.6.2 Description

The write form is used to configure dynamic power reduction (DPR) rules policy. Dynamic power reduction values are configured using the AT+SQNTPWR command.

Two <mode>s are available: 'manual' and 'automatic'.

- In manual mode, the MCU dynamically enable/disable power reduction by using the AT+SQNDPR command (<state> parameter);
- Automatic mode is currently not supported.

The read form returns the DPR application <mode> as well as the instant backoff application <state>.

The DPR <mode> configuration is stored in non-volatile memory and persist through device reboots and software upgrades. In manual mode, the instant DPR <state> is volatile but survives modem low power states. DPR <mode> and <state> configuration changes are applied on the fly.

5.6.3 Defined Values

mode

Integer. Dynamic power reduction mode.

Table 29. mode

Value	Description
0 (Default)	Manual
1	Automatic (not yet supported)

state

Integer. Dynamic power reduction instant state.

Table 30. state

Value	Description
0 (Default)	DPR disabled.
1	DPR enabled.

5.7 Specific eDRX Settings: AT+SQNEDRX

5.7.1 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> [,<Requested_eDRX_value>, <Requested_ptw_value>, <enforce_uicc_deactivation> [,<uicc_deactivation>]]
AT+SQNEDRX=?	+SQNEDRX: (0-3), (4), ("0000"- "1111"), ("0000"- "1111")

5.7.2 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 Setting: AT+CEDRXS, returning <mode> on read command.

5.7.3 Defined Values

mode

Integer type, 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 31. 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_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 type, 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 32. 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 (lu mode)
4	E-UTRAN (WB-S1 mode)
5	E-UTRAN (NB-S1 mode)

Requested_eDRX_value

String type; nibble (half byte). The eDRX value refers to bits 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 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 type; nibble (half byte). The paging time window refers to bits 8 to 5 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the Extended DRX.

NW-provided_eDRX_value

String type; nibble (half byte). The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 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 type; nibble (half byte). The paging time window refers to bit 8 to 5 of octet 3 of the Extended DRX parameters information element (see subclause 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.

5.8 Release Assistance Configuration:AT+SQNRACFG

5.8.1 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> ...

Command	Possible Response(s)
AT+SQNRACFG=?	+SQNRACFG: (list of supported <rat>s), (list of supported <operator>s), (0, 1), (0-10000)

5.8.2 Description

This AT command allows configuring the release assistance for the modem. Both Radio Access Technologies (<rat>s) and identified <operator> are configurable. Available <operator> names correspond to names as defined in AT+SQNCTM. By default, release assistance is disabled for all operators.

Release Assistance 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 AT+SQNCTM.

- Notes:
- Using this AT command with an aggressive <timeout> when using request/ response-based protocols or TCP-based protocols could result in unnecessary signaling 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.
 - 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.

5.8.3 Defined Values

rat

Integer in [0; 1]: Radio Access Technology.

Table 33. rat

Value	Description
0	LTE Cat M1
1	Reserved

operator

String. Operator mode as defined with AT+SQNCTM.

Table 34. 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, 1].

Table 35. rai_en

Value	Description
0	RAI is disabled (default)
1	RAI is enabled

rai_timeout

Integer range in milliseconds [0, 10000]. Default is 1000 (1 s). Optional parameter to add a timeout in milliseconds before requesting to the network the release of the connection when the modem has no more data to send. A null value will request the release immediately. 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.

5.9 Ready for Release: AT+SQNRFR

5.9.1 Syntax

Command	Possible Response(s)
AT+SQNRFR=[<timeout>]	ERROR +CME ERROR: <err> OK

5.9.2 Description

AT+SQNRFR requests the LTE modem to trigger a release request to the LTE network. In order for this AT command to work, the Release Assistance must be enabled (see AT+SQNRACFG), 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.

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:
- Using this AT command with an aggressive <timeout> when using request/ response-based protocols or TCP-based protocols could result in unnecessary signaling 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.
 - 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.

5.9.3 Defined Values

timeout

Integer in range 0..10000 milliseconds. Default value is 1000 (1 s). Optional parameter to add a timeout in milliseconds 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

5.10 Relaxed Monitoring Configuration:AT+SQNRMON

5.10.1 Syntax

Command	Possible Response(s)
AT+SQNRMON=<enhance>, <device>, <rsrp_hyst>, <cinr_thold>, <resel_before_tx_timer>	OK ERROR +CME ERROR: <err>
AT+SQNRMON?	+SQNRMON: <enhance>, <device>, <rsrp_hyst>, <cinr_thold>, <resel_before_tx_timer> OK
AT+SQNRMON=?	+SQNRMON: (0,1), (0,1), <rsrp_hyst>, <cinr_thold>, <resel_before_tx_timer>

5.10.2 Description

This command sets the relaxed monitoring criterion in the UE. Relaxed monitoring has been introduced in 3GPP release 14, and it is described in 3GPP 36.304 5.2.4.12. It allows the UE to skip neighbor cell measurements for cell reselection purpose according to some configuration parameters (*SsearchDeltaP*, *TsearchDeltaP*).

An additional the module's condition, *<cinr_threshold>*, based on the measured CINR, has been added, so that relaxed monitoring is applied only when the CINR measurement exceeds *<cinr_threshold>*.

The *<enhance>* parameter is not supported yet.

<rsrp_hyst> and *<resel_before_tx_timer>* replace *SsearchDeltaP* and *TsearchDeltaP* of 3GPP 36.304 5.2.4.12 when no eNb configuration is received. Consequently, the modem follows the following activation rules in order:

- If the eNB advertises relaxed monitoring configuration (*SsearchDeltaP*, *TsearchDeltaP*), the modem uses these parameters and ignores *<rsrp_hyst>* and *<resel_before_tx_timer>*
- Otherwise, the modem uses the configuration set by this command
- If no configuration has been set, the modem defaults to the firmware configuration 'Device' driven relaxed monitoring is an autonomous relaxed monitoring and is non-3GPP compliant. The operator must allow its use. It is disabled by default.

The configuration survives device reboots and software upgrades. A new configuration is applied at the next reconnection to network (CFUN=1).

CAUTION: The read command **only** reports the configuration set by the AT+SQNRMON command, which might not be the actual configuration if the modem uses the eNb parameters.

Default values may change based on future deployment experience.

5.10.3 Defined Values

enhance

Integer: 0 or 1. Enable or disable enhanced relaxed monitoring.

Not implemented yet.

device

Integer: 0 or 1. Enable or disable device driven relaxed monitoring. Default: disabled.

rsrp_hyst

RSRP hysteresis in hundredths of dB.

cinr_thold

CINR threshold in hundredths of dB. Defines the SRV CINR threshold above which the relaxed monitoring is active (3GPP or device driven). Default: -90 dB.

resel_before_tx_timer

Defines the required validity duration (in ms) for the criterion. Default value is 81,920 ms. The value is internally rounded to the nearest multiple of 100 (for example, 76435 gives 76400).

5.11 Maximum Transmission Power Configuration: AT+SQNTPWR

5.11.1 Syntax

Command	Possible Response(s)
AT+SQNTPWR=<rat>, <band> [,<maxTxPwr>] [,<dprBackoff>]]	+SQNTPWR:<rat>, <band>, <maxTxPwr>, <dprBackoff> OK ERROR

Command	Possible Response(s)
AT+SQNTPWR=?	+SQNTPWR: (list of supported <rat>s), (list of supported <band>s), (range of <maxTxPwr>), (range of <dprBackoff>) OK
AT+SQNTPWR?	+SQNTPWR: <rat_1>,<band_1>,<maxTxPwr_1>,<dprBackoff_1> ... +SQNTPWR: <rat_n>,<band_n>,<maxTxPwr_n>,<dprBackoff_n> OK

5.11.2 Description

By default, maximum transmission power is set depending on the 3GPP device power class definition (23 dBm for power class 3) and dynamic power reduction is set to 0 dB.

The write command enables the device manufacturer to customize the maximum transmission power per 4G LTE <band> for a given radio access technology (<rat>).

The dynamic power reduction backoff can also be configured and used for various purposes such as regulatory FCC SAR rule implementation (proximity protection), power consumption reduction or thermal mitigation.

The dynamic power reduction application mode is configured using the AT+SQNDPR command.

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: Warning: Any change to the transmission power configuration should be carefully evaluated as it may impact regulatory certification. Any configuration change is the device owner's 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 <https://www.fcc.gov/general/specific-absorption-rate-sar-cellular-telephones> for more information.

5.11.3 Defined Values

ra

Integer in [0-1]: Radio Access Technology

Table 36. rat

Value	Description
0	LTE Cat M1
1	LTE Cat NB1

band

Integer type. Band number as defined by 3GPP standard TS 36.101

maxTxPwr

Integer in [0-2400]: Maximum transmission power. Power unit is in 100th of dBm. Default: the maximum transmission power as defined by the device power class (2300 for class 3 devices)

dprBackoff

Integer type in [0-2000]: Dynamic power reduction. Backoff unit is in 100th of dB. Default value is 0.

5.11.4 Example

- To customize band 2 with 8 dB backoff on a class 3 category M1 device:

```
AT+SQNTPWR=0,2,,800
+SQNTPWR: 0,2,23000,800 OK
```

- To customize band 4 maximum transmission power to 20.5 dBm on category M1 device:

```
AT+SQNTPWR=0,4,2050
+SQNTPWR: 0,4,2050,0
OK
```

- To dump custom transmission power configuration:

```
AT+SQNTPWR?
+SQNTPWR: 0,2,23000,800
+SQNTPWR: 0,4,2050,0
```

6. IP Data Services Commands

6.1 Ping Echo Request: AT+PING

6.1.1 Syntax

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

6.1.2 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 <ttd> = -1.

6.1.3 Defined Values

replyld

Integer: Echo reply number.

IPAddr

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

time

Integer: Max allowed time required to receive a response (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: Wait interval seconds between sending each ICMP Echo Request (default: 1)

timeout

Integer 1-60: Time to wait for an 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: Time to live of the Echo Reply message.

cid

Integer 0-6: PDP context identifier (default: Internet PDN)

6.1.4 Example

```
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.com"
+CME ERROR: no network service
```

6.2 Configure Ping Echo Request: AT+PINGCFG

6.2.1 Syntax

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

6.2.2 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.

6.2.3 Defined Values

command

Integer type: configuration command.

Table 37. command

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

mode

Integer type: current operation mode.

Table 38. mode

Value	Description
0	Default. Synchronous mode
1	Asynchronous mode

downcount

Integer type, amount of remaining ping echo requests. Applicable only in asynchronous mode.

IPaddr

String type, remote host IP Address. Applicable only in asynchronous mode.

len

Integer type, length of the ping echo request (default: 32). Applicable only in asynchronous mode.

interval

Integer type, wait interval in seconds between each ping echo request (default: 1). Applicable only in asynchronous mode.

timeout

Integer type, time to wait for a echo reply in seconds (default: 10). Applicable only in asynchronous mode.

ttl

Integer type, time to live of the Echo Reply message. Applicable only in asynchronous mode.

cid

Integer type, PDP context identifier (default: Internet PDN). Applicable only in asynchronous mode.

6.3 CoAP Context Close: AT+SQNCOAPCLOSE

6.3.1 Syntax

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

6.3.2 Description

This command closes a CoAP context.

See Mobile Termination Error Result Code: AT+CME ERROR 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.

6.3.3 Defined Values

prof_id

Integer in range [0-2]. Numeric parameter indicating the profile identifier.

reason

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

Table 39. reason

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

6.4 CoAP Context Create: AT+SQNCOAPCREATE

6.4.1 Syntax

Command	Possible Response(s)
AT+SQNCOAPCREATE=<prof_id> [,<server_address> [,<server_port> [,<local_port> [,<dtls_enabled> [,<timeout> [,<cid> [,<spld>]]]]]]	OK
AT+SQNCOAPCREATE?	+SQNCOAPCREATE: <prof_id1>, <server_address1>, <server_port1>,

Command	Possible Response(s)
	<pre> <local_port1>, <dtls_enabled1>, <timeout1>, <cid1>, <spId1> ... +SQNCOAPCREATE:<prof_idN>, <server_addressN>, <server_portN>, <local_portN>, <dtls_enabledN>, <timeoutN>, <cidN>, <spIdN> </pre>
AT+SQNCOAPCREATE=?	+SQNCOAPCREATE:[possible values or maximum length for each parameter]
	<pre> +SQNCOAPCONNECTED:<prof_id> [,<server_address> [,<server_port> [,<local_port> [,<dtls_enabled>]]]] </pre>

6.4.2 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 +SQNCOAPSEND, +SQNCOAPOPT or +SQNCOAPRCV.

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 +SQNCOAPCLOSE.

See Mobile Termination Error Result Code: AT+CME ERROR for <err> values. Read command returns the current settings for each profile.

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

6.4.3 Defined Values

prof_id

Integer in range [0-2]. 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 in range [0-65535]. Numeric parameter indicating the UDP remote port of the CoAP server to connect to.

local_port

Integer in range [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 in range [0-1].

Table 40. dtls_enabled

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

timeout

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

sp_id

Integer type. The index of the secure profile previously set with AT+SQNSPCFG command. If dtls_enabled is set to 1, this must be present.

6.5 CoAP Set Header: AT+SQNCOAPHDR

6.5.1 Syntax

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

6.5.2 Description

This optional command sets the CoAP header (message ID and token) for the next message to send over +SQNCOAPSEND. The header value depends on these conditions:

- If this command is not used before +SQNCOAPSEND, 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 +SQNCOAPHDR.

The test form returns the options supported.

6.5.3 Defined Values

prof_id

Integer in range [0-2]. Numeric parameter indicating the profile identifier.

msg_id

Integer in range [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.

6.6 CoAP Set Options: AT+SQNCOAPOPT

6.6.1 Syntax

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

Command	Possible Response(s)
AT+SQNCOAPOPT=?	+SQNCOAPOPT : <range of prof_id>, (0,1), <list of possible values of opt_code>

6.6.2 Description

This command allows configuring CoAP options for the next message to send over +SQNCOAPSEND. The write command allows:

- 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 +SQNCOAPOPT are not saved to NVM, they are lost after a reboot.

6.6.3 Defined Values

prof_id

Integer in range [0-2]. Numeric parameter indicating the profile identifier.

action

Table 41. 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 as per RFC 7252. Supported options are:

Table 42. opt_code

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

Value	Description	Repeatable
19	TOKEN	
20	LOCATION_QUERY	x
23	BLOCK2	
27	BLOCK1	
28	SIZE2	
35	PROXY_URI	
60	SIZE1	

opt_value

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

Table 43. 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

6.7 CoAP Receive Data: AT+SQNCOAPRCVD

6.7.1 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> [<CR><LF><payload>]]] OK
AT+SQNCOAPRCV=?	+SQNCOAPRCV:[possible values or maximum length for each parameter of write command]

6.7.2 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 is null.

6.7.3 Defined Values

prof_id

Integer in range [0-2]. Numeric parameter indicating the profile identifier.

msg_id

Integer in range [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 in range [0, 1024]. Default 1024.

6.8 CoAP Receive Options: AT+SQNCOAPRCVO

6.8.1 Syntax

Command	Possible Response(s)
---------	----------------------

<p>AT+SQNCOAPRCVO=<prof_id>,<msg_id>, [max_opt]</p>	<p>+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</p>
<p>AT+SQNCOAPRCVO=?</p>	<p>+SQNCOAPRCVO: [possible values or maximum length for each parameter of write command]</p>

6.8.2 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.

6.8.3 Defined Values

prof_id

Integer in range [0-2]. Numeric parameter indicating the profile identifier.

msg_id

Integer in range [0-65535]. The message ID of the CoAP header. This value can be retrieved from the URC +SQNCOAPRING.

max_opt

Integer in range [0, 32]. Default 32. Maximum options that can be shown in the response. For the possible values of the response, check +SQNCOAPOPT.

6.9 CoAP Send Data: AT+SQNCOAPSEND

6.9.1 Syntax

Command	Possible Response(s)
AT+SQNCOAPSEND=<prof_id>,<type>,<method/rsp_code>, [<length><CR><LF><payload>]	OK
AT+SQNCOAPSEND=?	+SQNCOAPSEND: [possible values or maximum length for each parameter]
	+SQNCOAPRING: <prof_id>, <msg_id>, <req_resp>, <type>, <method/rsp_code>, <length>

6.9.2 Description

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

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

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 +SQNCOAPSEND will return 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 +SQNCOAPRCV.

6.9.3 Defined Values

prof_id

Integer in range [0-2]. Numeric parameter indicating the profile identifier.

type

Integer. See table below.

Table 44. type

Value	Description
0	CON
1	NON
2	ACK
3	RST

method

Integer. See table below.

Table 45. method

Value	Description
1	GET
2	POST
3	PUT
4	DELETE

rsp_code

Integer. See table below.

Table 46. rsp_code

Value	Description
201	CREATED
202	DELETED
203	VALID
204	CHANGED
205	CONTENT
400	BAD_REQUEST
401	UNAUTHORIZED
402	BAD_OPTION
403	FORBIDDEN
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 in the range [0, 1024]. The length of the payload.

payload

Binary data

req_resp

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

Table 47. 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 in range [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 `+SQNCOAPRCVD` and `+SQNCOAPRCVO`.

6.10 DNS Query: AT+SQNDNSLKUP**6.10.1 Syntax**

Command	Possible Response(s)
AT +SQNDNSLKUP=<hostName> [,<ipType>]	+SQNDNSLKUP:<hostName>,<ipAddress>
AT+SQNDNSLKUP=?	+SQNDNSLKUP:<hostName> [,<ipType>]

6.10.2 Description

The write form triggers an 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 AT+CGDCONT), then the AAAA (IPv6) query is sent first. If that query fails for whatever reason, the A query is used as a failsafe.

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, then host IP address will be reported in result code: +SQNDNSLKUP: <hostName>, <ipAddress>.

In case of a DNS request failure, the command returns ERROR.

Write command returns ERROR if the data APN is not yet activated (see AT+CGDCONT).

6.10.3 Defined Values

hostName

Domain name, string.

ipType

IP address family requested: 0 or 1.

Table 48. ipType

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

ipAddress

host IP address, string.

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. IPv6 print format can be chosen using AT+CGPIAF settings.

6.10.4 Example

```
AT+CGPIAF?
+CGPIAF: 0,0,0,0
```

```
OK
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 AT+CGPIAF=1,0,0,0 OK
AT+SQNDNSLKUP="www.example.com",0
+SQNDNSLKUP: www.example.com,93.184.216.34
```

```
OK
AT+SQNDNSLKUP="www.example.com",1
+SQNDNSLKUP: www.example.com,2606:2800:220:1:248:1893:25c8:1946
```

```
OK
```

6.11 Modem Ready for Data Traffic: AT+SQNDRDY

6.11.1 Syntax

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

6.11.2 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.

6.11.3 Defined Values

enable

Integer 0 or 1.

Table 49. enable

Value	Description
0	Turn the +SQNDRDY notification on
1	Turn the +SQNDRDY notification off

ready

Integer: 0 or 1.

Table 50. 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).

6.12 File Download: +SQNFGET

6.12.1 Syntax

Command	Possible Response(s)
AT+SQNFGET=<remote_url> [, <sync>] [, <local_filename>] [, <spId>]]	+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

6.12.2 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 `AT+SQNSPCFG` 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 `AT+SQNSPCFG` and HCE storage mode), asynchronous download mode is mandatory to enable signature AT command exchanges (`AT+SQNSHCESIGN`) 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: `AT+CME ERROR` for `<err>` values.

6.12.3 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 51. 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>` onto 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, host handles error handling.

Note: If `<local_filename>` is not specified and `<sync>` is 0, then the received data is accumulated in internal buffers that can be read using the AT+SQNFGETDATA command. If `<local_filename>` is not specified and `<sync>` is 0, every answer from the server triggers +SQNFGETRING URC.

6.12.4 Download Status URC: +SQNFGETREPORT

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

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

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

status

String. File download status

Table 52. 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

6.12.5 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)
	+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.

6.12.6 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

```

6.13 Read Asynchronously Receiveddata: AT+SQNFGETDATA

6.13.1 Syntax

Command	Possible Response(s)
AT+SQNFGETDATA=<max_bytes>	+CME ERROR: <err>
AT+SQNFGETDATA=?	+SQNFGETDATA:[<max_bytes>] OK

6.13.2 Description

This command dumps the internal buffer where the file received after an AT+SQNFGET command in asynchronous mode with no <local_filename> specified has been stored.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

6.13.3 Defined Values

max_bytes

Integer: either 0 or in the range 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 53. max_bytes

Value	Description
0	Read all the buffer. (Default)
64-1500	Read the specified quantity of bytes.

6.13.4 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
    
```

6.14 File Upload: AT+SQNFPUT

6.14.1 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), (0-1), (1000), (256) [, [(1000)]] [, [(1500)]] [, [(0-1)]] [, (0-65535)]]]] OK

6.14.2 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 AT+SQNSPCFG and HCE storage mode) require an asynchronous HTTP connection creation with AT+SQNHHTTPCONNECT 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

+SQNHHTTPRING:<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: AT+SQNHHTTPRING 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 +SQNHHTTPRING URC is emitted.

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

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

6.14.3 Defined Values

prof_id

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

command

Integer: 0 or 1. HTTP request type.

Table 54. command

Value	Description
0	POST
1	PUT

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 55. 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+SQNHHTPCFG <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+SQNHHTPCFG <max_to_sec> parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/disconnection

Table 56. disconnect

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

6.15 Hosted Crypto Engine Signature:AT+SQNHCESIGN

6.15.1 Syntax

Command	Possible Response(s)
AT+SQNSHCESIGN=<ctxId>,<statusCode> [,<signatureLen>,<signatureData>]	OK +CME ERROR:<err>
AT+SQNSHCESIGN=?	+SQNHCESIGN:<ctxId>,<statusCode> [,<signatureLen>,<signatureData>]<CR><LF>

6.15.2 Description

This command is used to send back the HCE (Hardware Crypto Engine) computed signature to the modem.

6.15.3 Defined Values

ctxId

Integer type; Signature context ID (token).

This token corresponds to the *ctxId* sent by the modem using an +SQNHCESIGN URC (see below).

statusCode

Integer type; signature process status code.

Table 57. statusCode

Value	Description
0	Success
1	Failure

signatureLen

Integer type: Signature length in bytes.

signatureData

Binary type: 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 $2048 \div 8 = 256$ 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).

6.15.4 +SQNHCE SIGN URC

Command	Possible Response(s)
	+SQNHCE SIGN: <ctxId>, <clientPrivateKeyId>, <msgLen>, <msgData>

ctxId

Integer type: Signature context ID.

ID generated by the module, to be used as a token for the response (see above).

clientPrivateKeyId

Integer type: Private key ID. Identifies which private key ID to use on the HCE side.

msgLen

Integer type: Message length in bytes.

msgData

Binary type: Raw binary message data in hexadecimal encoding (from 00 to FF) without the '0x' C-style prefix.

6.16 HTTP Configure: AT+SQNHTTPCFG**6.16.1 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>]]]]]]]]]	+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> ... +SQNHTTPCFG: <prof_idN>, <server_addressN>, <server_portN>, <auth_typeN>, <usernameN>, <passwordN>, <ssl_enabledN>, <max_to_secN>,

Command	Possible Response(s)
	<cidN>,<spIdN>,<cnx_to_secN> OK
AT+SQNHTTPCFG=?	+SQNHTTPCFG: (0-2) [, (1500) [, [(0-65535), [(0-1), [(100), [(100), [(0-1), [(0-65535), [(1-8), [(1-6), (1-120)]]]]]]]]]]] OK

6.16.2 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 (AT+SQNHTTSPND, AT+SQNHTTPQRY).

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: AT+CME ERROR 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.

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

6.16.3 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 58. auth_type

Value	Description
0	(Default) No authentication
1	Basic authentication

username

String. Authentication username for HTTP. Empty by default.

password

String. Authentication password for HTTP. Empty by default.

ssl_enabled

Integer: 0 or 1. SSL encryption status.

Table 59. 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 (AT+SQNHTTPCONNECT). In the case of AT+SQNHTTPSEND/QUERY, 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 (AT+SQNHTTPCONNECT/ SEND/QUERY) 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 in range [1-8]. PDN Context Identifier. Default: 3.

spld

Integer in range [1-6]. Security Profile identifier to be used for HTTPS request if <ssl_enabled>=1. Default: 1.

s_length

Integer. Maximum length of the <server_address> parameter.

6.17 HTTP Connection Open: AT+SQNHTTPCONNECT**6.17.1 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>

6.17.2 Description

This command initiates a new HTTP connection previously configured using the AT+SQNHTTPCFG 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 AT+SQNHTTPSEND, AT+SQNHTTPPUT, or AT+SQNHTTPQUERY commands.

For secure HTTP connections using a private key stored in a Hosted Cryptographic Engine (see AT+SQNSPCFG 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+SQNHTTPSEND, AT+SQNHTTPPUT, and AT+SQNHTTPQUERY 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 `AT+SQNHTTPSEND`, `AT+SQNHTTPPUT` and `AT+SQNHTTPQUERY`, which create the connection and immediately proceed with the HTTP data transfer.

Test command returns values supported as a compound value.

6.17.3 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 60. rc

Value	Description
0	connection success
Other	A CURL error code (available in the public CURL documentation)

6.18 HTTP Connection Close: AT+SQNHTTPDISCONNECT

6.18.1 Syntax

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

6.18.2 Description

This command closes a HTTP connection previously opened with the `AT+SQNHTTPCONNECT` 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 succeeds.

6.18.3 Defined Values

prof_id

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

6.19 HTTP Query: AT+SQNHTTPQRY

6.19.1 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

6.19.2 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 and HCE storage mode) require an asynchronous HTTP connection creation with AT+SQNHTTPCONNECT 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 +SQNHTTPRING URC is emitted asynchronously with the HTTP response code, content type and size (see HTTP Response URC: AT+SQNHTTPRING 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 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: AT+CME ERROR for <err> values.

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

6.19.3 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 61. 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+SQNHHTPCFG <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+SQNHHTPCFG <max_to_sec> parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/disconnection

Table 62. disconnect

Value	Description
0	Connection remains open after the HTTP request completion
1 (default)	Connection is closed at the end of the HTTP request

6.20 HTTP Receive: AT+SQNHHTPCV

6.20.1 Syntax

Command	Possible Response(s)
AT+SQNHHTPCV=<prof_id> [,<maxbytes>]	OK ERROR +CME ERROR:<err>
AT+SQNHHTPCV=?	+SQNHHTPCV: (0-2) [, (0, 64-1500)] OK

6.20.2 Description

This command reads the HTTP response content data received with the last HTTP response (the HTTP response reception advertised by the +SQNHHTPRING notification, see HTTP Response URC: AT+SQNHHTPRING).

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 +SQNHHTPRING 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+SQNHHTPCV with an acceptable <max_bytes> value until the entire HTTP response body is transferred (total received bytes equal to the +SQNHHTPRING <data_size> parameter) or ERROR is received.

Notes:

- The response is buffered in the modem volatile memory until it is read.
- Buffered data are lost if the modem enters deep sleep.

- 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 `AT+SQNHTTPCFG/SND/QRY <max_to_sec>` parameter).

Note: When reading large packets, use hardware flow control to minimize the risk of data loss

See also Mobile Termination Error Result Code: `AT+CME ERROR` for `<err>` values.

Test command returns values supported as a compound value.

6.20.3 Defined Values

prof_id

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

max_bytes

Integer. Max number of bytes to read at a time, either 0 or an integer between 64 and 1500. Default: 0, which means infinite size.

Note: If `<max_byte>` is unspecified, the server data is transferred in one go. If the data are not present or if the `+SQNHTTPRING <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: `AT+SQNHTTPRING`, then the host application has to use the `+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 `+SQNHTTPRING` URC is received.

http_status_code

Integer. Status code, as received from the server (see RFC 2616).

6.20.4 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 `+SQNHTTPRING` 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 an infinite reading of the server's response.

```
AT+SQNHTTPRCV=1
<<<<HTML>
<HEAD>
... output omitted ...
</ADDRESS></BODY>
</HTML>
```

```
OK
```

6.21 HTTP Response URC: AT+SQNHTTTPRING

6.21.1 Syntax

Command	Possible Response(s)
	+SQNHTTTPRING: <prof_id>, <http_status_code>, <content_type>, <data_size>

6.21.2 Description

This URC is emitted when:

- An answer from a HTTP server is received.
- A HTTP response has timed-out (see AT+SQNHTTTPCFG <max_to_sec> timeout parameter).

In the former case, the URC contains the HTTP response code, the content type and size. AT+SQNHTTTPRCV retrieves the HTTP response data.

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 +SQNHTTTPRING URC presentation time. Consequently, AT+SQNHTTTPRCV command will block AT interface until requested number of bytes to read reception, HTTP response message reception complete or HTTP error (timeout, connection unexpected closure, etc.).

6.21.3 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.

6.22 HTTP Connection Closing URC: AT+SQNHTTTPSH

6.22.1 Syntax

Command	Possible Response(s)
	+SQNHTTTPSH: <prof_id>, <rc>

6.22.2 Description

This URC is shown when the connection with the HTTP server is unexpectedly closed.

6.22.3 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.

6.23 HTTP Send: AT+SQNHTTTPSND

6.23.1 Syntax

Command	Possible Response(s)
AT +SQNHTTTPSND=<prof_id>, <command>, <resource>, <data_len>	+CME ERROR:<err>

Command	Possible Response(s)
[, [<post_param>] [, [<extra_header_line>] [, [<disconnect>] [, [<max_to_sec>]]]	
AT+SQNHTTPSND=?	+SQNHTTPSND: (0-2), (0-1), (1000), (0-16777215) [, [(1000)] [, [(1500)] [, [(0-1)] [, (0-65535)]]]] OK

6.23.2 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 AT+SQNSPCFG and HCE storage mode) require an asynchronous HTTP connection creation with AT+SQNHTTPCONNECT 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

+SQNHTTPRING:<prof_id>,<http_status_code>,<content_type>,<data_size>

URC (when supported) is emitted on the serial port. See HTTP Response URC: AT+SQNHTTPRING 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 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: AT+CME ERROR for <err> values. The test command returns the values supported as a compound value.

6.23.3 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 63. 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 because it waits 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 64. 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 <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 <max_to_sec> parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/disconnection

Table 65. disconnect

Value	Description
0	Connection remains open after completion of the transaction
1 (default)	Immediate disconnection after the HTTP transaction ends

6.24 Socket Accept: AT+SQNSA

6.24.1 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)]

6.24.2 Description

This command accepts an incoming socket connection after an unsolicited result code `+SQNSRING:<connId>`. Note that this `+SQNSRING` URC is the consequence of the creation of a 'socket listen' (`AT+SQNSL`).

Trying to execute this command before receiving a `+SQNSRING` URC results in an `ERROR` indication, with indication that a connection request has not yet been received.

Use `AT+SQNSH` command to reject the connection.

See also Mobile Termination Error Result Code: `AT+CME ERROR` for `<err>` values. The test command returns the range of supported values for all the parameters.

6.24.3 Defined Values

connId

Socket connection identifier, integer from 1 to 6.

connMode

Connection mode, optional, integer: 0 or 1.

Table 66. connMode

Value	Description
0	Default. Online data mode.
1	Command mode.

6.24.4 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 <CR>.

```
AT+SQNSSEND=1
Some text <Ctrl+Z>
OK
```

- Shutdown connection.

```
AT+SQNSH=1
OK
```

6.25 Socket Configuration: AT+SQNSCFG

6.25.1 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><CR><LF> ... +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

6.25.2 Description

This command sets the socket configuration parameters.

Note: These values are automatically saved in the device's NVRAM.

6.25.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

cid

Integer in range 0..6. PDP context identifier.

pktSz

Integer in range 0..1500. Packet size to be used by the TCP/ UDP/IP stack for data sending. Used for online data mode only.

Table 67. pktSz

Value	Description
0	Automatically chosen by the device (default: 300)
1..1500	Packet size in bytes.

maxTo

Integer in range 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 68. maxTo

Value	Description
0	No timeout.
1..65535	Timeout value in seconds (default: 90 s.).

connTo

Integer: either 0 or any number in the range 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).

Table 69. connTo

Value	Description
0	No timeout.
10..1200	Timeout value in tenths of second (default: 600)

txTo

Integer in the range 0..255. Data sending timeout. The data are sent after this delay, regardless of their size. Used for online data mode only.

Table 70. txTo

Value	Description
0	No timeout.
1..255	Timeout value in tenths of second (default 50).

6.25.4 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

6.26 Socket Configuration Extended: AT+SQNSCFGEXT

6.26.1 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><CR><LF> ... +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

6.26.2 Description

This command sets the socket configuration extended parameters.

Note: These values are automatically saved in the device's NVRAM.

6.26.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

srMode

Integer: 0, 1 or 2. SQNSRING URC mode.

Table 71. 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 72. recvDataMode

Value	Description
0	Data represented as text (default)
1	Data represented as a sequence of hexadecimal bytes (from 00 to FF). Note that this parameter changes the presentation of the <code>SQNSRING</code> URC but not <code>SQNSSEND</code> . No conversion is done on the data before sending them on the network.

keepalive

Integer type [0-240]. Currently unused.

listenAutoRsp

Integer: 0 or 1. 'Listen auto-response mode' that affects the `AT+SQNSL` command.

Table 73. listenAutoRsp

Value	Description
0	Disabled (default). Use <code>AT+SQNSA</code> 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 74. sendDataMode

Value	Description
0	Data represented as text (default)
1	Data represented as a sequence of hexadecimal bytes (from 00 to FF).

6.26.4 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
    
```

6.27 Socket Dial: AT+SQNSD

6.27.1 Syntax

Command	Possible Response(s)
	Possible intermediate responses:
AT+SQNSD=<connId>,<txProt>,<rPort>,<IPAddr>	CONNECT
[,<closureType>	OK
[,<IPort>	ERROR
[,<connMode>	NO CARRIER
[,<acceptAnyRemote>	+CME ERROR:<err>
[,<connSetup>]]]]]	
AT+SQNSD=?	+SQNSD: (1-6), (0-1), (0-65535),<IPAddr>
	[, (0,255)
	[, (0-65535)
	[, (0-1)
	[, (0-2)]]]]
	OK

6.27.2 Description

This command 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 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.

Notes1. 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) by using the Socket Restore: AT+SQNSO 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 +SQNSD has been issued with <connMode> set to 'command mode' connection), these data are buffered and the SQNSRING URC is sent (SQNSRING presentation format depends on the last +SQNSCFGEXT setting). It is possible to read

these data later with `+SQNSRECV`. Under the same conditions, it is possible to send data while in 'command mode' using `+SQNSSEND`.

Notes on Asynchronous Connection:

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.

An asynchronous connection setup mode (`<connSetup>=1`) is mandatory if the socket is secured (see `AT+SQNSSCFG`) and the security profile uses a private key stored in a Hosted Cryptographic Engine (see `AT+SQNSPCFG` and HCE storage mode). If the asynchronous connection setup is disabled (`<connSetup>=0`) while HCE is enabled, the `AT+SQNSD` command fails.

Online connection mode (`<connMode>=0`) is not compatible with an asynchronous connection setup configuration (`<connSetup>=0`). 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 `AT+SQNSO`

While connection setup is in progress, whatever `<connSetup>` mode, the socket status reported by `AT+SQNSS` command is 'Socket in opening process'.

Calling socket `AT+SQNSD` dial-up command while an asynchronous connection setup is in progress returns `ERROR`.

The `+SQNSD` notification is only issued once after an asynchronous connection setup request.

6.27.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

txProt

Integer: 0 or 1. Transmission protocol

Table 75. txProt

Value	Description
0	TCP
1	UDP

rPort

Integer type 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 type. Socket closure behavior for TCP, has 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 76. closureType

Value	Description
0	Local host hangs up immediately after remote does (default)
255	Local host closes after an escape sequence (<code>+++</code>)

IPort

Integer type in range 0..65535. UDP connection local port, ignored for TCP connections.

connMode

Integer: 0 or 1. Connection mode.

Table 77. 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 78. acceptAnyRemote

Value	Description
0	Disabled (default)
1	The modem accepts data from any host other than <IPAddr>:<rPort>
2	The modem receives data from any host other than <IPAddr>:<rPort> and can send data to any address besides <IPAddr>:<rPort> in the same socket family using the +SQNSSEND command.

connSetup

Integer. Connection setup mode

Table 79. connSetup

Value	Description
0 (default)	Synchronous connection setup (default)
1	Asynchronous connection setup

rc

Integer. Connection setup result code. List below not exhaustive.

Table 80. 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

6.27.4 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
```

6.28 Socket Shutdown: AT+SQNSH

6.28.1 Syntax

Command	Possible Response(s)
AT+SQNSH=<connId>	OK ERROR +CME ERROR:<err>
AT+SQNSH=?	+SQNSH: (1-6) OK
	(Unsollicited response) +SQNSH: <connId>

6.28.2 Description

This command closes a socket connection.

Note: A socket connection can be closed only when it is in suspended mode (even if data is pending). Trying to close an active socket connection results in error.

6.28.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

6.28.4 Example

```
AT+SQNSH=?
+SQNSH: (1-6)
OK
```

```
AT+SQNSH=1
OK
```

6.29 Socket Information: AT+SQNSI

6.29.1 Syntax

Command	Possible Response(s)
AT+SQNSI=<connId>	+SQNSI: <connId>,<sent>,<received>,<buff_in>,<ack_waiting> OK ERROR NO CARRIER +CME ERROR<err>
AT+SQNSI	+SQNSI: <connId1>,<sent1>,<received1>,<buff_in1>,<ack_waiting1><CR><LF> ... +SQNSI: <connId6>,<sent6>,<received6>,<buff_in6>,<ack_waiting6> OK
AT+SQNSI=?	+SQNSI: (1-6)

6.29.2 Description

This command reports information about the socket data traffic.

The test command reports the possible range for the parameter <connId>.

Important: On an encrypted connection, the returned data traffic information includes the encryption overhead (information is taken at IP layer).

6.29.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

sent

Total amount (in bytes) of sent data since the last time the socket number <connId> has been opened.

received

Total amount (in bytes) of received data since the last time the socket connection number <connId> has been opened.

buff_in

Total amount (in bytes) of data just arrived through the socket connection number <connId> and currently waiting to be read.

ack_waiting

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 null for UDP connections.

6.29.4 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
```

6.30 Socket Listen: AT+SQNSL

6.30.1 Syntax

Command	Possible Response(s)
AT+SQNSL=<connId>,<listenState>,<listenPort> [,<lingerT>]	OK ERROR +CME ERROR:<err>
AT+SQNSL?	+SQNSL: <connId1><CR><LF> ... +SQNSL: <connIdN>
AT+SQNSL=?	+SQNSL: (1-6), (0-2), (0-65535), (0,255)

6.30.2 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 +SQNSRING: <connId> URC is sent.

The user can use [Socket Accept: AT+SQNSA](#) to accept the connection or [Socket Shutdown: AT+SQNSH](#) to reject it. <listenPort> is optional when closing the socket.

If the *ListenAutoRsp* flag of the +SQNSCFGEXT 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 +SQNSH: <connId> URC.

See also Mobile Termination Error Result Code: AT+CME ERROR 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.

6.30.3 Defined Values

connId

Socket connection identifier, integer in the range 1..6.

listenState

Integer: 0, 1 or 2. Open or close the listening socket.

Table 81. 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 in the range 0..65535. Local listening TCP port.

lingerT

Integer in range 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 82. lingerT

Value	Description
0	Default value. Hang up after remote disconnection.
255	Socket is closed after an escape sequence (+++) or after the remote host disconnection.

6.30.4 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
    
```

6.31 Socket Listen UDP: AT+SQNSLUDP

6.31.1 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)

6.31.2 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: <connId> is received.

The user can use +SQNSA to accept the connection or +SQNSH to reject it. <listenPort> is optional when closing the socket.

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: AT+CME ERROR for <err> values.

6.31.3 Defined Values

connId

Integer 1..6: Socket connection identifier.

listenState

Integer: 0, 1 or 2: Open or close the listening socket.

Table 83. listenState

Value	Description
0	Close listening socket
1	Open a listening IPv4 socket. (If PDN does not have IPv4 address then IPv6 is used)
2	Open a listening IPv6 socket. (If PDN does not have IPv6 address then IPv4 is used)

listenPort

Integer 0..65535: The UDP port the socket listens to.

6.31.4 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
```

6.31.5 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.

6.32 Initiate a Client Configuration: AT+SQNSMQTTCFG**6.32.1 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]

6.32.2 Description

This command configures the MQTT stack with the client id, user name, and password (if required) for the remote broker, and the CA cert name to use for server authentication.

Note: This command should be executed before any other `AT+SQNSMQTT` command.

6.32.3 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 null.

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 AT+SQNSPCFG command.

Important: If not specified, the modem does not establish a secure connection.

6.33 Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT

6.33.1 Syntax

Command	Possible Response(s)
AT+SQNSMQTTCONNECT=<id>,<host> [,<port> [,<keepalive>	OK ERROR
AT+SQNSMQTTCONNECT=?	+SQNSMQTTCONNECT : <id>,<host> [,<port> [,<keepalive>
URC	+SQNSMQTTONCONNECT : <id>,<rc>

6.33.2 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 established, 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 URC to be sent.

6.33.3 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 `+SQNSMQTTTTONCONNECT`.

Table 84. rc

Value	Description
0	SQNSMQTT_ERR_SUCCESS,
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVALID
-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

6.34 Client Disconnect: AT+SQNSMQTTDISCONNECT**6.34.1 Syntax**

Command	Possible Response(s)
AT+SQNSMQTTDISCONNECT=<id>	OK ERROR
AT+SQNSMQTTDISCONNECT=?	+SQNSMQTTDISCONNECT: <id>
URC	+SQNSMQTTDISCONNECT: <id>, <rc>

6.34.2 Description

This command disconnects from a broker. Connection must have been previously initiated with the `+SQNSMQTTCONNECT` command.

Note: This command initiates the disconnection.

The URC `+SQNSMQTTDISCONNECT: <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.

6.34.3 Defined Values

id

Integer: 0. The id of MQTT client.

Note: The only supported value is 0 (only one client is supported).

rc

Integer: subscription return code.

Table 85. rc

Value	Description
-1	PENDING
0	SUCCESS
1	NOMEM
2	PROTOCOL
3	INVALID
4	NO_CONNECTION
5	CONNECTION_REFUSED
6	NOT_FOUND
7	CONNECTION_LOST
8	TLS ERROR
9	PAYLOAD_SIZE_INVALID
10	NOT_SUPPORTED
11	AUTHENTICATION_ERROR
12	ACL_DENIED
13	UNKNOWN
14	ERRNO
15	EAI
16	PROXY ERROR

6.35 Publish to a Topic: AT+SQNSMQTTPUBLISH

6.35.1 Syntax

Command	Possible Response(s)
AT+SQNSMQTTPUBLISH=<id>,<topic> [,<qos> ,<length><CR><LF><payload>	(prompt to payload)+SQNSMQTTPUBLISH:<pmid> OK ERROR
AT+SQNSMQTTPUBLISH=?	+SQNSMQTTPUBLISH:<id>,<topic> [,<qos> ,<length><CR><LF><payload>
URC	+SQNSMQTTONPUBLISH:<id>,<pmid>,<rc>

6.35.2 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 behavior is similar to the AT+SQNSNVW command (see Write Data in NVM: AT+SQNSNVW).

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.

6.35.3 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: The quality of service level to request for the subscription.

Table 86. qos

Value	Description
0	At most once (default value)
1	At least once
2	Exactly once

length

Integer in the range 1..65535: Indicates the amount of bytes to publish.

payload

String: the actual multi-line message to send.

pmid

Integer: Publishing message ID.

rc

Integer: subscription return code.

Table 87. rc

Value	Description
-1	PENDING
0	SUCCESS
1	NOMEM
2	PROTOCOL
3	INVALID
4	NO_CONNECTION
5	CONNECTION_REFUSED
6	NOT_FOUND
7	CONNECTION_LOST
8	TLS_ERROR
9	PAYLOAD_SIZE_INVALID
10	NOT_SUPPORTED
11	AUTHENTICATION_ERROR
12	ACL_DENIED
13	UNKNOWN
14	ERRNO
15	EAI
16	PROXY_ERROR

6.35.4 Usage Example

```
AT+SQNSMQTTPUBLISH=?
+SQNSMQTTPUBLISH: (0), <topic>
[, (0-2)], (1-65535) <CR><LF><payload>

OK
AT+SQNSMQTTPUBLISH=0, "sqn/test", , 5
> Test message 1
+SQNSMQTTPUBLISH: 2
OK
+SQNSMQTTONPUBLISH: 0, 2, 0
```

6.36 Receive a Message: AT+SQNSMQTTRCVMESSAGE

6.36.1 Syntax

Command	Possible Response(s)
AT+SQNSMQTTRCVMESSAGE= <i>id,topic</i> [, <i>mid</i>] [, <i>max_length</i>]	OK ERROR
AT+SQNSMQTTRCVMESSAGE=?	+SQNSMQTTRCVMESSAGE: <i>id,topic</i> [, <i>mid</i>] [, <i>max_length</i>]
URC	+SQNSMQTTONMESSAGE: < <i>id</i> >, < <i>topic</i> >, < <i>msg_length</i> >, < <i>qos</i> > [, < <i>mid</i> >]

6.36.2 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 AT+SQNSMQTTCONNECT 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>.

6.36.3 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 from 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 before +SQNSMQTTRCVMESSAGE is emitted. If the queue overflows, 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..1024: Maximum length to read from the message.

Default is 1024. Currently only messages with payloads up to 1024 characters are supported.

qos

Integer: Quality of service level to request for the subscription.

Table 88. qos

Value	Description
0	At most once
1	At least once
2	Exactly once

msg_length

Integer: size of the message payload.

6.37 Subscribe to a Topic: AT+SQNSMQTTSUBSCRIBE**6.37.1 Syntax**

Command	Possible Response(s)
AT+SQNSMQTTSUBSCRIBE=<id>,<topic> [,<qos>]	OK ERROR
AT+SQNSMQTTSUBSCRIBE=?	+SQNSMQTTSUBSCRIBE : <id>,<topic> [,<qos>]
URC	+SQNSMQTTTONSUBSCRIBE : <id>,<topic>,<rc>

6.37.2 Description

This command subscribes to a topic on a broker host previously contacted with AT+SQNSMQTTCONNECT. This command performs the subscription.

The +SQNSMQTTTONSUBSCRIBE:<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 +SQNSMQTTTONCONNECT URC with <rc>=0, confirming that the connection is established.

6.37.3 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: the quality of service level requested for the subscription.

Table 89. qos

Value	Description
0	At most once
1	At least once
2	Exactly once

rc

Integer: subscription return code.

Table 90. rc

Value	Description
-1	PENDING
0	SUCCESS
1	NOMEM
2	PROTOCOL
3	INVALID
4	NO_CONNECTION
5	CONNECTION_REFUSED
6	NOT_FOUND
7	CONNECTION_LOST
8	TLS_ERROR
9	PAYLOAD_SIZE_INVALID
10	NOT_SUPPORTED
11	AUTHENTICATION_ERROR
12	ACL_DENIED
13	UNKNOWN
14	ERRNO
15	EAI
16	PROXY_ERROR

6.38 Socket Restore: AT+SQNSO

6.38.1 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

6.38.2 Description

This command resumes a socket connection suspended after an escape sequence.

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.

6.38.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

6.38.4 Example

```
AT+SQNSO=?
+SQNSO: (1-6)
OK
```

```
AT+SQNSO=1
CONNECT
```

6.39 SSL/TLS Security Profile Configuration: AT+SQNSPCFG

6.39.1 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	+SQNSPR:1, <version1>, <cipherSpecs1>, <certValidLevel1>, <caCertificateID1>, <clientCertificateID1>, <clientPrivateKeyID1>, <psk1>, <pskIdentity1>, <storageId1>, <resume1>, <lifetime1><CR><LF> ... +SQNSPR: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

6.39.2 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 covers the following SSL/TLS connections properties:

SSL/TLS protocol <version> to use:

- TLS v1.0
- TLS v1.1
- TLS v1.2
- TLS v1.3

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.

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

Certificate to be used for server authentication (stored using `AT+SQNSNVW="certificate"` command):

- *<caCertificateID>* (num): The trusted Certificate Authority certificate

Certificate to be used for client authentication (stored using `AT+SQNSNVW="certificate"` command):

- *<clientCertificateID>* (num): The client certificate

Private key to be used for client authentication (stored using `AT+SQNSNVW="privatekey"` command):

- *<clientPrivateKeyID>* (num): The client private key (password protected keys are not supported)

Pre-shared key *<psk>* used for connection (when a `TLS_PSK_*` cipher suite is used).

Pre-shared key identity *<pskIdentity>* used for connection (when a `TLS_PSK_*` cipher suite is used).

<storageId> used to identify whether the private key is stored in NVM or HCE (Hardware Crypto Engine).

<resume>: 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.

<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).

6.39.3 Defined Values

spId

Integer in range 1..6: Security Profile identifier,

version

Integer in the range 0..3 or 255: SSL/TLS version.

Table 91. 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 in the range 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 AT

+SQNSNVW="certificate" command. When this parameter is omitted (default), no certificate is referenced.

clientCertificateID

Integer in the range 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 AT+SQNSNVW="certificate" command. When this parameter is omitted (default), no certificate is referenced.

clientPrivateKeyID

Integer in the range 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 AT+SQNSNVW="certificate" 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 (for example, "734c61425224655f...")

The factory default value is an empty string, meaning no pre-shared key is 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

storaged

Integer: 0, 1 or 2. Private key storage id used to identify whether key stored on NVM or HCE.

Table 92. storaged

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 93. resume

Value	Description
0	Session resumption feature disabled (default)
1	Session resumption feature enabled

lifetime

Integer. Maximum TLS client session duration in seconds.

Table 94. 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

6.39.4 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:

- AT+SQNSNVR and AT+SQNSNVW: Read/write X.509 certificates and private keys from/to the non-volatile (NV) memory. Up to 20 certificates/keys can be stored.
- AT+SQNSPCFG: 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:

- AT+SQNSSCFG: Secure socket configuration
- AT+SQNMQTT: MQTT protocol over TLS

6.40 Receive Data in Command Mode:AT+SQNSRECV

6.40.1 Syntax

Command	Possible Response(s)
AT+SQNSRECV=<connId>,<maxByte>	+SQNSRECV: <connId>,<maxByte> [,<IPAddr>,<rPort>]<CR><LF> <data> OK ERROR +CME ERROR: <err>
AT+SQNSRECV=?	+SQNSRECV: (1-6) , (1-1500) OK

6.40.2 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 SQNSRING URC, whose presentation format depends on the last AT+SQNSCFGEXT setting.

- Notes:
1. Attempting AT+SQNSRECV when no data is buffered raises an error.
 2. <IPAddr> and <rPort> are showed only if <acceptAnyRemote>=2.

6.40.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

cid

Integer in range 1..1500. Maximum number of bytes to read.

6.40.4 Example

```
AT+SQNSRECV=?
+SQNSRECV: (1-6), (1-1500)
OK

AT+SQNSRECV=1, 5
+SQNSRECV: 1, 5
hello+OK
```

6.41 Socket Activity Notification: AT+SQNSRING

6.41.1 Syntax

	Unsolicited Response(s)
	<ul style="list-style-type: none"> 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>

6.41.2 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 AT+SQNSL command.

Note:

- After a data arrival notification, the received bytes must be read using the AT+SQNSRECV command.
- The internal buffering is limited and the +SQNSRING notification will stop until the host starts reading the data with the AT+SQNSRECV command. The URC will be sent again if enough data has been read and if new data keeps coming.

6.41.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

recData

Integer in range 1..1500. Maximum number of bytes to read.

data

Data to read.

6.41.4 Example

```
AT+SQNSCFGEXT=1, 0, 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, 0
OK
```

```
(...)
+SQNSRING: 2,1500

AT+SQNSCFGEXT=3,2,0,0,0,0,0,0
OK(...)
+SQNSRING: 3,264,fdkkkkkkkkkkkkkkmoSDQFfdd...
+SQNSRING: 3,264,fgiojnerogijoiijopfdsqpioiop...
+SQNSRING: 3,168,gGgGgGgGgGgGgGgGgGgGgGgGgGgU...

AT+SQNSL?
+SQNSL: 4 OK
+SQNSRING: 4
```

6.42 Socket Status: AT+SQNSS

6.42.1 Syntax

Command	Possible Response(s)
AT+SQNSS	+SQNSS: <connId1>,<state1>,<locIP1>,<locPort1>,<remIP1>,<remPort1>,<txProt1><CR><LF> > ... +SQNSS: <connId6>,<state6>,<locIP6>,<locPort6>,<remIP6>,<remPort6>,<txProt6> <CR><LF> OK
AT+SQNSS?	+SQNSS: <connId1>,<state1>,<locIP1>,<locPort1>,<remIP1>,<remPort1>,<txProt1><CR><LF> > ... +SQNSS: <connId6>,<state6>,<locIP6>,<locPort6>,<remIP6>,<remPort6>,<txProt6> <CR><LF> OK
AT+SQNSS=?	OK

Note: If a channel is closed (<state> value 0), then <locIP>, <locPort>, <remIP>, <remPort> and <txProt> parameters are omitted.

6.42.2 Description

This command reports the current status of the sockets.

6.42.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

state

Integer in range 0..6. Current state of the socket.

Table 95. 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 96. state

Value	Description
0	TCP
1	UDP

6.42.4 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
```

6.43 Secure Socket Configuration: AT+SQNSSCFG

6.43.1 Syntax

Command	Possible Response(s)
AT+SQNSSCFG=<connId>,<enable>,<spld>	+SQNSSCFG: <connId>,<enable>,<spld> +CME ERROR: <err> OK
AT+SQNSSCFG?	+SQNSSCFG: 1, <enable1>,<spld1><CR><LF> ... +SQNSSCFG: 6, <enable6>,<spld6> OK
AT+SQNSSCFG=?	+SQNSSCFG: (1-6), (0-1), (1-6) OK

6.43.2 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 `AT+SQNSPCFG`.

The `<sp/d>` 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 (`AT+SQNSL` command).

3. Enabling/disabling or modifying the security profile must be performed when the socket is not active (socket dial with `AT+SQNSD` 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 (`AT+SQNSL`, `AT+SQNSLUDP`) will fail.

6.43.3 Defined Values

spld

Integer in range 1..6. Security profile identifier. See `AT+SQNSPCFG` for security profile details.

connId

Integer in range 1..6. Socket connection identifier.

enable

Integer: 0 or 1. Security enable status.

Table 97. state

Value	Description
0	No security (default value).
1	Activate SSL/TLS on the socket.

6.43.4 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
```


6.44 Send Data in Command Mode: AT+SQNSSEND

6.44.1 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

6.44.2 Description

This command sends data through a connected socket when the module is in 'command mode'.

Ctrl-Z char (0x1A in hexadecimal) validates the data. An ESC char (0x1B in hexadecimal) cancels the operation.

If the data are successfully sent, then the response is OK. If the transmission fails, an error code is reported.

- 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 AT+SQNSD.
 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 AT+SQNSD command

6.44.3 Defined Values

connId

Integer in range 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 command.

Note: This parameter is present only if <acceptAnyRemote>=2.

rPort

Integer in range 0..65535. Remote host port to connect to. If <rPort> parameter is not passed, its value is inferred from the +SQNSD command.

Note: This parameter is present only if <acceptAnyRemote>=2.

RAI

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)

Note: This parameter applies only for NB-IoT applications.

Table 98. 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

6.44.4 Example

```
AT+SQNSSEND=?
+SQNSSEND: (1-6), [<IPAddr>, (0-65535), (0-25%)]
OK
AT+SQNSDEND=1
>hello
OK
```

6.45 Extended Send Data In CommandMode: AT+SQNSSENDEXT

6.45.1 Syntax

Command	Possible Response(s)
AT+SQNSSENDEXT=<connId>,<bytesToSend> [,<RAI>]	Intermediate result code: > OK ERROR NO CARRIER +CME ERROR:<err>
AT+SQNSSENDEXT=?	+SQNSSENDEXT: (1-6), (1-1500) [, (0-2)] OK

6.45.2 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 <bytetosend> bytes have been sent, the operation is automatically completed.

If the data are successfully received by the modem, the response is OK. If data reception 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. It is configurable using the AT+SQNSCFGEXT command.
 2. The maximum number of bytes to send is 1500.
 3. It is possible to use AT+SQNSSENDEXT only if the connection was opened using AT+SQNSD.
 4. All special characters, for example BS, are sent as regular data.

6.45.3 Defined Values

connId

Integer in range 1..6. Socket connection identifier.

bytesToSend

Integer in range 1..1500. 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). 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 99. 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

6.45.4 Example

```
AT+SQNSSENDEXT=?
+SQNSSENDEXT: (1-6), (1-1500)
[, (0-25%)]
OK
```

```
AT+SQNSSENDEXT=1,11
>hello again
```

6.46 Setup PPP Connection: ATD*99

6.46.1 Syntax

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

6.46.2 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 AT 'command mode'.

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

6.46.3 Defined Values

protocol

String: The only supported value is "PPP".

cid

Integer in the range 1..8: Internet Primary Context ID.

6.47 Hang-Up: ATH

6.47.1 Syntax

Command	Possible Response(s)
ATH	OK

6.47.2 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 terminate dial-up connections.

PPP calls an LCP Terminate procedure and is considered ended after the NO CARRIER notification is sent.

6.47.3 Example

```
ATH
OK
```

6.48 Return to Online Data State: ATO

6.48.1 Syntax

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

6.48.2 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 AT+CGDATA without establishing the external network access.

6.48.3 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 100. 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 recognized or supported

6.48.4 Example

ATO OK

7. Location Services

Note: Please contact your Sequans or PoLTE representative to get access to PoLTE- specific AT commands.

7.1 Informal Network Scanning: AT+SQNINS

7.1.1 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>

7.1.2 Description

The write form triggers an informal network scanning (INS).

This operation consists in discovering the surrounding cells available in all bands supported by the modem, then collecting information about them.

Refer to the AT Commands Use Cases manual for further information on this command.

7.1.3 Defined Values

action

Integer. Type of scan.

Table 101. 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	Fast network scanning. Uses information extracted from the MIB (Master information Block) only.

rb

Integer. Radio band (band_id)

ratINS

Integer: 7. Radio Access Technology.

Table 102. ratINS

Value	Description
7	E-UTRAN.

cell_Id

Integer. Cell ID

tac

Integer. Tracking Area Code

plmn

Integer. Numeric PLMN, including 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. 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 103. bandwidthDownload

Value	Description
1.4	1400 kHz
3	3000 kHz
5	5000 kHz
10	10000 kHz
15	15000 kHz
20	20000 kHz

Please refer to the software release notes for the list of bandwidths supported.

rsrp

Float. Reference Signal Received Power in dBm.

rsrq

Float. Reference Signal Received Quality in dB.

7.1.4 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

Fast scanning

AT+SQNINS=1

```
+SQNINS: 1,13,7,"1A2E005","0001","00101",5230,5,10,-94.50,-3.60
+SQNINS: 1,4,7,"0","0000","000000",2050,2,1.4,-104.90,-2.90
+SQNINS: 1,4,7,"1A2D006","0001","00101",2350,6,10,-107.90,-5.90
```

OK

Test command

AT+SQNINS=?
(0-1)

OK

8. Manufacturing Commands

The AT commands listed in this section are only available in Manufacturing Mode. These AT commands cannot be used in another context. To enter manufacturing mode, use AT+CFUN=5.

It is impossible to exit the Manufacturing Mode once entered. A device reboot is needed to re-enter the operational mode.

8.1 Downlink Continuous Wave Receiver: AT+SMCWRX

8.1.1 Syntax

Command	Possible response(s)
AT+SMCWRX= <i>earfcn</i>	+SMCWRX: <level> +SMT ERROR: <i>err</i>
AT+SMCWRX?	
AT+SMCWRX=?	

8.1.2 Description

This command starts a downlink continuous wave service. The input signal should be generated with a sine wave generator at the exact frequency and band.

8.1.3 Defined Values

The following values are defined:

earfcn

An E-UTRA Absolute Radio Frequency Channel Number.

level

RF input power level of the continuous wave signal, in hundredths of dBm

8.2 Uplink Continuous Wave Transmitter: AT+SMCWTX

8.2.1 Syntax

Command	Possible response(s)
AT +SMCWTX=<enable>,<earfcn>,<level>	+SMT ERROR: <i>err</i>
AT+SMCWTX?	+SMCWTX: <enable> [,<earfcn>] [,<level>]
AT+SMCWTX=?	

8.2.2 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 automatically cancels the previous one.

8.2.3 Defined Values

The following values are defined:

enable

1 to start; 0 to stop.

earfcn

An E-UTRA Absolute Radio Frequency Channel Number. Note that command should not be used within 300 kHz of band edge.

level

RF output power level of the continuous wave signal, in hundredths of dBm.

8.3 MIO Test: AT+SMGD

8.3.1 Syntax

Command	Possible response(s)
AT+SMGD= <i>mask</i> , <i>value</i>	
AT+SMGD=?	

8.3.2 Description

This command sets the MIO (multipurpose I/O) pads (RFDATA) to arbitrary values.

If mask only is selected, the pin from the mask will be selected as open drain (no change to others).

Note: When MIO tests are done this command must be used without any parameters to restore MIOs to their initial state because MIOs are configured as GPIOs. A backup is made at the first command call.

8.3.3 Defined Values

The following values are defined:

mask

Most and least significant 32 bits respectively of a mask denoting affected MIO with bit 0 corresponding to MIO 0 and so on. Any MIOs selected in this way will be enabled and set to GPIOs in output mode.

value

Most and least significant 32 bits respectively of the value to drive on MIO pins selected by the above *mask*. If bit *x* is set to 1 then MIO pin *x* will be driven high; otherwise low.

8.4 GPIO Input Tests: AT+SMGI

8.4.1 Syntax

Command	Possible response(s)
AT+SMGI= <i>mHi, mMed, mLo, pHi, pMed, pLo</i>	
AT+SMGI?	+SMGI : <i>vHi, vMed, vLo</i>
AT+SMGI=?	

8.4.2 Description

This command configures the general purpose I/O pins (GPIO) in input mode with arbitrary polarity. If mask only is selected, the 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).

8.4.3 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 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.

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.

8.5 GPIO Tests: AT+SMGT

8.5.1 Syntax

Command	Possible response(s)
AT+SMGT= <i>mHi, mMed, mLo, vHi, vMed, vLo, pHi, pMed, pLo</i>	
AT+SMGT=?	

8.5.2 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, the pin from the mask will be selected in open drain mode. There is no change for the other modes.

8.5.3 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.

8.6 Module Hardware ID Configuration: AT+SMMHID

8.6.1 Syntax

Command	Possible Response(s)
AT+SMMHID?	+SMMHID:<mhid> OK +SMT ERROR: <err>
AT+SMMHID=?	OK

8.6.2 Description

This module manufacturing command reads the Module Hardware ID, if it exists. If not, it returns `ERROR` with the code 'NA'.

8.6.3 Defined Values

mhid

String: Module Hardware ID string. Printable character only.

Max length: 16 chars.

err

String. Error code.

Table 104. err

Value	Description
NA	Module Hardware ID not available

8.7 SIM Network Personalization: AT+SMNP

8.7.1 Syntax

Command	Possible response(s)
AT+SMNP= <i>plmn0,plmn1</i> [,..., <i>plmn11</i>]	+SMNP : <i>plmn0,plmn1</i> [,..., <i>plmn11</i>]
AT+SMNPK?	

8.7.2 Description

This configuration allows up to 12 PLMNs. The chosen PLMN number survives resets and upgrades.

8.7.3 Defined Values

The following value is defined:

plmn

The PLMN allowed.

8.8 RF Path Losses Configuration: AT+SMPL

8.8.1 Syntax

Command	Possible response(s)
AT+SMPL=< <i>band</i> >,[< <i>txPathLoss</i> >]	OK ERROR
AT+SMPL=?	+SMPL : (1-255) , (-100-100) OK
AT+SMPL?	+SMPL : < <i>band1</i> >,< <i>txPathLoss_band1</i> > ... +SMPL : +SMPL=< <i>bandN</i> >,< <i>txPathLoss_bandN</i> > OK

8.8.2 Description

This command sets the RF Transmission path loss per band.

Path losses are provided in 1/100 of dB.

An empty path loss parameter means no change to it. Erase a path loss 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.

8.8.3 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 1/100 of dB.

8.9 SIM Test: AT+SMST

8.9.1 Syntax

Command	Possible response(s)
AT+SMST[=<interface>]	+SMST=<status> +SMT ERROR:<err>
AT+SMST=?	

8.9.2 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** the device is powered up.

8.9.3 Defined Values

The following values are defined:

interface

Optional parameter to select the SIM interface.

- 0: selects the SC10 interface (default interface)
- 1: selects the SC11 interface

status

Test result:

- OK: The test passed
- NO SIM: No SIM card was detected
- NOK: The test detected a problem

err

Error code. The only possible error code is `ITF UNKNOWN` if the <interface> is out of range.

8.10 Wake Input Test: AT+SMWAKE

8.10.1 Syntax

Command	Possible response(s)
AT+SMWAKE?	+SMWAKE : <wakeIds>

8.10.2 Description

8.10.3 Defined Values

The following value is defined:

wakelds

List of current wakes index.

8.11 Device Management Configuration:AT+SQNDMCFG

8.11.1 Syntax

Command	Possible Response(s)
AT+SQNDMCFG=<dmProfile> [, <cfgGrp> [, <serverId> [, <serverIP>] [, <pskId>], [<pskSecret>]]]	OK ERROR
AT+SQNDMCFG=<dmProfile>, "psk", <serverId> [, <serverIP>] [, <pskId>] [,<pskSecret>]	OK ERROR
AT+SQNDMCFG=<dmProfile>, "service", <autoStart>	OK ERROR
AT+SQNDMCFG=<dmProfile>, "psk"	+SQNDMCFG: <dmProfile>, "psk", <serverID>, <serverIP>, <pkdId>, <pskSecret> OK ERROR
AT+SQNDMCFG=<dmProfile>, "service"	+SQNDMCFG:<dmProfile>, "service", <autoStart> OK ERROR
AT+SQNDMCFG?	+SQNDMCFG: (list of supported <dmProfile>s)
AT+SQNDMCFG=?	+SQNDMCFG: <dmProfile>, <cfgGrp>, <serverID>, <serverIP>, <pskId>, <pskSecret> OK

8.11.2 Description

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

This command:

- Enables or disables the LwM2M service configuration when used with the parameter "service";
- Edits the LwM2M bootstrap/device management pre-shared key (PSK) provisioning when used with the parameter "psk".

The AT+SQNDMCFG? command lists all available modified profiles.

AT+SQNDMCFG=<dmProfile> dumps the contents of a given profile.

Device Management configuration profiles are preloaded in the system using operator device management service requirements, but the user can override some of them for testing security rules enforcement, for example. The edit form of the command is used to select and configure the device's 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>, "psk"... command. Currently, the editable configuration is:

- The server address (IP address or server name)
- The pre-shared key identity (psk identity)
- The pre-share key secret (psk secret)

Before the first connection to the device management server, some configuration items may be reported as empty, because they are generated during the first connection to the server. This happens typically with the pre-shared key: if psk information is not provided by the user, it is automatically generated at the first connection to the server, according to device management requirements (which depends on the DM profile).

Device Management configuration profiles are stored in non-volatile memory and survive device reboots, software upgrades, and factory resets. Pending configuration updates are applied when the device registers to a network (`AT+CFUN=1`).

Warning: Any default device management connectivity configuration override is the user's own responsibility and may lead to connectivity failure or non-compliance with device management service security rules.

8.11.3 Defined Values

dmProfile

String. Device management server profile name ("verizon", "att_prod", "att_test", "docomo", etc).

cfgGrp

String. Device management configuration group identification:

- "service": service's main configuration
- "psk": pre-shared key (PSK) provisioning

autoStart

Integer: 0 or 1. Enable or disable automatic LwM2M service start-up during the module's power-on and `<dmProfile>` activation (ex: after operator mode change):

- 0: LwM2M service disabled
- 1: LwM2M service enabled

serverID

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

serverIP

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).

8.11.4 Examples

```
AT+CFUN=5
OK
```

```
AT+SQNDMCFG="docomo","service",0
OK
```

```
AT+SQNDMCFG="att_prod","psk",100,"coaps://
lwm2m.cloud:5694","urn:imei:004402280070131","616162626363"
OK
```

```
AT^RESET
OK
```

```
AT+CFUN=5
OK
```

```
AT+SQNDMCFG?
+SQNDMCFG: att_prod,psk,100,coaps://
lwm2m.cloud:5694,urn:imei:004402280070131,616162626363
+SQNDMCFG: docomo, service, 0
OK
```

```
AT+SQNDMCFG="docomo"
+SQNDMCFG: docomo, service, 0
OK
```

```
AT+SQNDMCFG="att_prod","psk"
+SQNDMCFG: att_prod,psk,100,coaps://
lwm2m.cloud:5694,urn:imei:004402280070131,616162626363
OK
```

```
AT+SQNDMCFG="att_prod","psk",100
OK
```

```
AT+SQNDMCFG="att_prod","psk"
OK
```

```
AT^RESET
OK
```

```
AT+CFUN=1
OK
```

8.12 Save Module Configuration: AT+SQNFACTORYSAVE

8.12.1 Syntax

Command	Possible Response(s)
AT +SQNFACTORYSAVE=<label>	OK ERROR
AT+SQNFACTORYSAVE?	+SQNFACTORYSAVE:<label> OK ERROR
AT+SQNFACTORYSAVE=?	OK

8.12.2 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 AT+SQNFACTORYRESET.

The restoration point includes:

- The hardware configuration of the module, set with AT+SQNHWCFG;
- The persistent settings of the following AT commands: AT+SQNCTM, AT+SQNBANDSEL, AT+SQNDMCFG

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.

8.12.3 Defined Values

label

String (max. 128 bytes): tag used to identify the restoration point. The same tag can be used multiple times.

8.13 Hardware Function Configuration:AT+SQNHWCFG

8.13.1 Syntax

Command	Possible Response(s)
AT+SQNHWCFG=<function> [, <enable>, [<polarity>]]	OK
AT+SQNHWCFG="<adcId>" [, <enable>]	OK
AT+SQNHWCFG="antennaTuning" [, <enable> [, <rfdDataMask>, <rfdDataDefaultValue>, <rfdDataValuePerBand>]]	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="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>]	OK
AT+SQNHWCFG="uartId" [, <enable>]	OK

Command	Possible Response(s)
[,<rtscts> [,<rate> [,<format> [,<parity> [,<stopbits> [,<application>]]]]]]	
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

8.13.2 Description

The write command configures 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 states (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.

- Analog 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:
 - Write command:
AT+SQNHWCFG="antennaTuning"
[,<enable>
[,<rfdDataMask>,<rfdDataDefaultValue>,<rfdDataValuePerBand>]]

- Read command output:


```
+SQNHWCFCG:"antennaTuning"
[,<enable>
[,<rfdDataMask>,<rfdDataDefaultValue>,<rfdDataValuePerBand>]]
```

 - **<enable>**: "enable" or "disable" to activate/deactivate the associated PWM.
 - **<rfdDataDefaultValue>**: Default antenna gain control line values (in hexadecimal)
 - **<rfdDataValuePerBand>**: antenna gain control line configuration per frequency range.

String format for **<rfdDataDefaultValue>** and **<rfdDataValuePerBand>** is:

```
"<minFreqMhz>,<maxFreqMhz>,<rfdDataValue>
[,<minFreqMhz>,<maxFreqMhz>,<rfdDataValue>] ...
[,<minFreqMhz>,<maxFreqMhz>,<rfdDataValue>]"
```

with a maximum of eight frequency ranges defined by two variables: The frequency range, from **<minFreqMhz>** to **<maxFreqMhz>** (in MHz) and the antenna gain control line value **<rfdDataValue>** (in hexadecimal).

Note: For all frequencies out of the configured zone, **<rfdDataDefaultValue>** is used.

- Modem UART I/O configuration:
 - Write commands: AT+SQNHWCFCG="dcd"
 - [,<enable>] AT+SQNHWCFCG="dsr"
 - [,<enable>] AT+SQNHWCFCG="dtr"
 - [,<enable>]
 - Read commands outputs:


```
+SQNHWCFCG:"dcd"
[,<enable>]
+SQNHWCFCG:"dsr"
[,<enable>]
+SQNHWCFCG:"dtr"
[,<enable>]
```

 - **<enable>**: "enable" or "disable" to enable or disable the I/O function.
- Boot source function control (Boot From Flash or Boot From Host):
 - Write command:


```
AT+SQNHWCFCG="fff_ffh"
[,<enable>
[,<polarity>]]
```
 - Read command output:


```
+SQNHWCFCG:"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+SQNHWCFCG="gpioId"
 - [,<enable>]
 - [,<polarity>,<direction>]
 - [,<value>]]]
 - Read command output:


```
+SQNHWCFCG:"gpioId"
[,<enable>
[,<polarity>,<direction>
[,<value>]]]
```


- `gpioid`: defines the GPIO function, for example "gpio4".
- `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.
- 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 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 ("*siml^{tf}*": 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 HW 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>]
```

— Read command output:

```
+SQNHWCFG:"txIndicator"
[,<enable>]
```

- <enable>: "enable" or "disable" to activate/deactivate the RF Psi Tx Indicator.

This command will enable the "tx_ind" hardware pin.

- Change UART configuration (uartId: uart0, uart1, uart2, uart3) 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
 - uart3: UART3 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") 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: WAKE on SIM interface
- <enable>: "enable" or "disable" to activate/deactivate the interface
- <polarity> : "normal" or "inversed" if possible.

Note: Polarity setting is possible only for wake0, wake1 , wake2, wake3 and wake4. wakeRTS0, wakeRTS1, wakeSim0 do not support this hardware setting.

AT command usage and syntax depends on the function to activate/deactivate. See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

8.13.3 Defined Values

function

String. Function name.

Table 105. function

Value	Description
antennaTuning	
dcd	

Value	Description
dsr	
dtr	
fff_ffh	
gpibold	
i2c	
jtag	
ps_status	
pwm0, pwm1	
ring0, ring1	
sim0, sim1, sim2	
spi	
status_led	
txIndicator	
uart0, uart1, uart2, uart3	
wake0, wake1, wake2, wake3, wake4, wakeRTS0, wakeRTS1, wakeSim0	

enabled

Integer: 0 or 1. Function enable state.

Table 106. enabled

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

rfdataMask

rfdataDefaultValue

rfdataValuePerBand

polling

Integer: 0 or 1. Activate SW polling or use SIM_DETECT pin activity.

Table 107. polling

Value	Description
0	SIM_DETECT pin activity
1	SW polling

rtscts

String. Flow control type

Table 108. rtscts

Value	Description
none	No flow control
rtscts	RTS/CTS flow control

rate

Integer. Standard baudrate in (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200). Default value is 115200.

format

Integer. Word length in (5, 6, 7, 8). Default value is 8.

parity

String. Parity possible values in (none, even, odd, mark, space). Default is "none"

stopBits

Integer. Number of stop bits in (1, 1.5, 2). Default value is 2.

application

String. Usage of the UART port in (none, AT, CONSOLE, DCP)

Table 109. application

Value	Description
none	
AT	
CONSOLE	
DCP	

8.14 Restore Module Configuration: AT+SQNHWCFGRESTORE**8.14.1 Syntax**

Command	Possible Response(s)
AT+SQNHWCFGRESTORE=<source> [,<force>]	OK
AT+SQNHWCFGRESTORE=?	+SQNHWCFGRESTORE:[SQN/OEM], [force]

8.14.2 Description

This command restores the module configuration, including the manufacturing board configuration.

8.14.3 Defined Values**source**

String.

Table 110. source

Value	Description
"sqn"	Restore Sequans's module configuration
"oem"	Restore a client's module configuration

force

Integer: 0 or 1.

Table 111. force

Value	Description
1	Force configuration to original hardware configuration if there is no saved configuration

8.15 Save Module Configuration: AT+SQNHWCFGSAVE**8.15.1 Syntax**

Command	Possible Response(s)
AT+SQNHWCFGSAVE=<type> [,<keepall>]	OK
AT+SQNHWCFGSAVE=?	+SQNHWCFGSAVE: ("SQN", "OEM"), [keepall]

8.15.2 Description

Important: This command is deprecated. Please consider using [Save Module Configuration: AT+SQNFACTORYSAVE](#) instead.

This command saves the full hardware configuration settings into a backup file. Two sets of configuration parameters can be defined and saved independently in the file system.

The set of configuration parameters labelled "SQN" (Sequans's default) should include the initial updates after flash burn, including typically calibration and identities. This configuration will be used as a reference backup to restore the parameters during a factory reset.

The set of configuration parameters labelled "OEM" (OEM's default) should include additional updates on the hardware configuration, such as I/O configuration (GPIOs, UARTs...). This is a superset of the parameters present in the "SQN" backup file.

Note: All information will be written in file system.

8.15.3 Defined Values

type

String. Selection of the type of backup.

Table 112. type

Value	Description
"SQN"	Saving configuration parameters defined as Sequans's default, including calibration and identities. The configuration is saved in file <code>sqn/psisqn.save</code>
"OEM"	Saving configuration parameters defined as OEM's default, including Sequans's default, plus additional parameters such as IO configuration (GPIO, UART...). The configuration is saved in file <code>sqn/psioem.save</code>

keepall

Integer: 0 or 1.

Table 113. keepall

Value	Description
0 (default)	Keep only the changes applied since the initial software release configuration
1	Keep all the current configuration parameters set

8.16 Show Version: AT+SVER

8.16.1 Syntax

Command	Possible response(s)
+SVER	+SVER : <i>component,version</i>
+SVER=?	

8.16.2 Description

This command displays the versions of various components of the stack.

8.16.3 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

9. Mobile Equipment Control and Status Commands

9.1 Alarm: AT+CALA

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

9.1.1 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>] [<CR><LF>+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>

9.1.2 Description

This 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, +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 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: AT+CME ERROR for <err> values.

9.1.3 Defined Values

time

See parameter *time* in Clock: AT+CCLK.

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 (for example, sound, volume, LED); values and default are manufacturer specific.

text

String. Text to be displayed when alarm time is reached; maximum length *<length>*; values and default are manufacturer specific.

length

Integer. Maximum length of *<text>*.

recur

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

Table 114. recur

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 in the week, Monday (1) to Sunday (7). The string "1,2,3,4,5" sets an alarm for every weekdays.

rlength

Integer. Maximum length of *<recur>*

silent

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

Table 115. silent

Value	Description
0	The alarm is not silent
1	The alarm will be silent and the only result from the alarm is the unsolicited result code effect is to send a +CALV URC

9.2 Delete Alarm: AT+CALD

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

9.2.1 Syntax

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

9.2.2 Description

This command deletes an alarm in the MT. If the command fails in, +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: AT+CME ERROR <err> values.

9.2.3 Defined Values

n

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

9.3 Clock: AT+CCLK

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

9.3.1 Syntax

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

9.3.2 Description

This command sets the real time clock of the MT. If the setting fails, +CME ERROR: <err> is returned. See Mobile Termination Error Result Code: AT+CME ERROR.

The read command returns the current setting of the clock.

9.3.3 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 CC, computed as (indicates the difference in quarters of an hour, between the local legal time and GMT; range -96...+96). For example, 6th of May 1994, 10:10:00 PM GMT+2 hours equals to "94/05/06, 22:10:00+08".

Note: If the MT does not support time zone information then the three last characters of <time> are not returned by +CCLK?.

9.4 Extended Error Report: AT+CEER

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

9.4.1 Syntax

Command	Possible Response(s)
AT+CEER	+CEER: <report>
AT+CEER=?	

9.4.2 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 GPRS attach or unsuccessful PDP context activation;
- the last GPRS detach or PDP context deactivation.

Typically, the text will consist of a single line containing the cause information given by GSM/UMTS network in textual format.

9.4.3 Defined Values

report

String. The total number of characters, including line terminators, of the information text must not exceed 2041 characters. Text must not contain the sequence 0<CR> or OK<CR>.

9.5 Extended Signal Quality: AT+CESQ

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

9.5.1 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)

9.5.2 Description

This command returns received signal quality parameters. If the current serving cell is not a GERAN cell, <rxlev> and <ber> are set to 99. If the current serving cell is not a UTRA FDD or UTRA TDD cell, <rscp> is set to 255. If the current serving cell is not a UTRA FDD cell, <ecno> is set to 255. If the current serving cell is not an E-UTRA cell, <rsrq> and <rsrp> are set to 255.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

Test command returns values supported as compound values.

9.5.3 Defined Values

rxlev

Integer. Received signal strength level (see 3GPP TS 45.008 [20] subclause 8.1.4).

Table 116. rxlev

Value	Description
0	rsrp < -110 dBm
1	-110 dBm ≤ rsrp < -109 dBm
2	-109 dBm ≤ rsrp < -108 dBm
...	...
61	-50 dBm ≤ rsrp < -49 dBm
62	-49 dBm ≤ rsrp < -48 dBm
63	-48 dBm ≤ rsrp
99	not known or not detectable

ber

Integer. Channel bit error rate (in percent).

Table 117. ber

Value	Description
0 ... 7	XQUAL values in the table in 3GPP TS 45.008 [20] subclause 8.2.4
99	Not known or not detectable

rscp

Integer. Received signal code power (see 3GPP TS 25.133 [95] subclause 9.1.1.3 and 3GPP TS 25.123 [96] subclause 9.1.1.1.3).

Table 118. rscp

Value	Description
0	rscp < -120 dBm
1	-120 dBm ≤ rscp < -119 dBm
2	-119 dBm ≤ rscp < -118 dBm
...	...
94	-27 dBm ≤ rscp < -26 dBm

Value	Description
95	$-26 \text{ dBm} \leq \text{rscp} < -25 \text{ dBm}$
96	$-25 \text{ dBm} \leq \text{rscp}$
255	Not known or not detectable

ecno

Integer. Ratio of the received energy per PN chip to the total received power spectral density (see 3GPP TS 25.133 [95] subclause).

Table 119. ecno

Value	Description
0	$\text{Ec/lo} < -24 \text{ dB}$
1	$-24 \text{ dB} \leq \text{Ec/lo} < -23.5 \text{ dB}$
2	$-23.5 \text{ dB} \leq \text{Ec/lo} < -23 \text{ dB}$
...	...
47	$-1 \text{ dB} \leq \text{Ec/lo} < -0.5 \text{ dB}$
48	$-0.5 \text{ dB} \leq \text{Ec/lo} < 0 \text{ dB}$
49	$0 \text{ dB} \leq \text{Ec/lo}$
255	Not known or not detectable

rsrq

Integer. Reference signal received quality (see 3GPP TS 36.133 [96] subclause 9.1.7).

Table 120. rsrq

Value	Description
0	$\text{rsrq} < -19.5 \text{ dB}$
1	$-19.5 \text{ dB} \leq \text{rsrq} < -19 \text{ dB}$
2	$-19 \text{ dB} \leq \text{rsrq} < -18.5 \text{ dB}$
...	...
32	$-4 \text{ dB} \leq \text{rsrq} < -3.5 \text{ dB}$
33	$-3.5 \text{ dB} \leq \text{rsrq} < 3 \text{ dB}$
34	$-3 \text{ dB} \leq \text{rsrq}$
255	Not known or not detectable

rsrp

Integer. Reference signal received power (see 3GPP TS 36.133 [96] subclause 9.1.4).

Table 121. rsrp

Value	Description
0	$\text{rsrp} < -140 \text{ dBm}$
1	$-140 \text{ dBm} \leq \text{rsrp} < -139 \text{ dBm}$
2	$-139 \text{ dBm} \leq \text{rsrp} < -138 \text{ dBm}$
...	...
95	$-46 \text{ dBm} \leq \text{rsrp} < -45 \text{ dBm}$
96	$-45 \text{ dBm} \leq \text{rsrp} < -44 \text{ dBm}$
97	$-44 \text{ dBm} \leq \text{rsrp}$
255	Not known or not detectable

9.6 Set Phone Functionality: AT+CFUN

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

See the current implementation limitation in **fun** parameter description.

9.6.1 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)

9.6.2 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 minimum 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: AT+CME ERROR for <err> values.

9.6.3 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 both 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.

Table 122. fun

Value	Description
0	Minimum functionality
1	Full functionality
2, 3	Reserved
4	Disable RF
5	Disable RF and enable manufacturing mode. Mandatory to use manufacturing AT commands (see Section Manufacturing Commands).
6..12	Reserved
1	Full functionality

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 signaled with the subsequent CREG URC.

Important: The AT+CFUN=0 command is synchronous. The OK response is sent once the modem has successfully detached from the network. The CREG:0 URC (if enabled) follows immediately after the OK response

rst

Integer: 0 or 1. Reset required indication.

Table 123. rst

Value	Description
0	Do not reset the MT before setting it to <fun> power level. Note: This shall be always default when <rst> is not given.
1	Reset the MT before setting it to <fun> functional level

9.7 Indicator Control: AT+CIND

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

9.7.1 Syntax

Command	Possible Response(s)
AT+CIND=[<ind>[,<ind>,...]]	+CME ERROR: <err>
AT+CIND?	+CIND: <ind>[,<ind>[...]] +CME ERROR: <err>
AT+CIND=?	+CIND: ("signal", (0-5)), ("service", (0-1)), ("roam", (0-1)), ("messages", (0-1)), ("smsfull", (0-1)) +CME ERROR: <err>

9.7.2 Description

The command is used to set the values of MT indicators. <ind> value 0 means that the indicator is off (or in a state which can be interpreted as 'off'), 1 means that indicator is on (or in a state which is more "active" than the 'off' state), 2 is still more active than 1, and so on. If the indicator is a simple binary element, it can take values 0 and 1. The number of elements is MT specific. If the MT does not allow setting of indicators or the MT is not currently reachable, +CME ERROR: <err> is returned.

If an indicator is not settable, its setting is ignored. If parameter is empty, the indicator is unchanged.

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: AT+CME ERROR for <err> values.

Note: MT manufacturer should offer the description of supported indicators not listed here and their value ranges and default values.

9.7.3 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 124. 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)

9.8 Report Mobile Termination Error: AT+CMEE

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

9.8.1 Syntax

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

9.8.2 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: AT+CME ERROR for <err> values.

9.8.3 Defined Values

n

Integer: 0, 1, or 2. Defines the form of the final result code.

Table 125. 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

9.9 Mobile Termination Error Result Code: AT+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*.

9.9.1 Syntax

Command	Possible Response(s)
	+CME ERROR: <err>

9.9.2 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 command +CMEE. See Report Mobile Termination Error: AT+CMEE.

9.9.3 CME/CMS Error Defined Values

err

Integer. Error code.

Table 126. 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
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 Personalization PIN Required
41	Network Personalization PUK Required
42	Network Subset Personalization PIN Required
43	Network Subset Personalization PUK Required
44	Service Provider Personalization PIN Required
45	Service Provider Personalization PUK Required
46	Corporate personalization PIN Required
47	Corporate Personalization PUK Required
48	Hidden Key Required (See Note 2)
49	EAP Method Not Supported
50	Incorrect Parameters

Code	Description
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

Table 127. GPRS related "CME ERROR" Codes (3GPP TS 27.007)

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 128. 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)
142	Syntax Error in the TFT Operation (#42)
143	Unknown PDP Context (#43)
144	Semantic Errors in Packet Filter(s) (#44)

Code	Description
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.
 2. Values in parentheses for error code 181 are 3GPP TS 24.301 [83] cause codes.

Table 129. 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.
 2. Values in parentheses are 3GPP TS 24.301 [83] cause codes.
 3. The numeric error code for 'Last PDN disconnection not allowed (#49)' changed to 171 since 3GPP Rel 11.

Table 130. 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
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 +SQNHHTTPSH Notification for Failure Cause)
587	HTTP Failure, Internal Data Buffer Full
588	HTTP Failure, No Pending Data

9.10 Mobile Termination Event Reporting: AT+CMER

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

See the current implementation limitation in the parameter's description.

9.10.1 Syntax

Command	Possible Response(s)
AT+CMER=[<mode>] [,<keyp>] [,<disp>] [,<ind>] [,<bfr>] [,<tsrn>]	+CME ERROR: <err>

Command	Possible Response(s)
[,<orientation>]]]]]]	
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)

9.10.2 Description

The 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: AT+CME ERROR for <err> values.

9.10.3 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 notification +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, 3.

Table 131. 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 (for example, 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 (for example, 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 inband technique used to embed result codes and data when TA is in online data mode

keyp

Integer: 0, 1, 2.

Table 132. 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 subclause '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.

2	Keypad event reporting using the 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 133. 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 134. 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 135. 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. Touch screen event.

Table 136. 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.

Value	Description
	Note 4: When this mode is enabled, the corresponding result codes of alltouch screen actions are flushed to the TA regardless of the <code><bfr></code> setting.
3	<p>Verbose mode. Touch screen event reporting using the unsolicited result code <code>+CTEV: <action>, <x>, <y></code>. This is a special mode where intermediate depressed result codes (<code>+CTEV: 1, <x>, <y></code>) are generated for each new <code><x>, <y></code> 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 <code>AT+CTSA</code> are indicated by the TA to the TE.</p> <p>Note 5: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of the <code><bfr></code> setting.</p>
4	<p>Enhanced touch screen event reporting using the unsolicited result code <code>+CTEV: <action>, <x>, <y>, <id>[, <duration>]</code>. The <code><x>, <y></code> parameters indicate the x, y coordinates on the touch screen device (as specified for <code>+CTSA</code>), the <code><duration></code> parameter indicates the duration of the touch (as specified for <code>AT+CTSA</code>) and, the <code><id></code> identifies any simultaneous touch (as specified for <code>AT+CTSA</code>). Only the touch screen events not caused by <code>AT+CTSA</code> are indicated by the TA to the TE. The <code><action></code> parameter indicates the action performed on the screen, if the <code><duration></code> parameter is: 0, it is valid for the <code><action></code> 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 <code><action></code> parameter to indicate 0 for screen released.</p> <p>Note 6: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <code><bfr></code> setting.</p>
5	<p>Enhanced touch screen event reporting using the unsolicited result code <code>+CTEV: <action>, <x>, <y>, <id>[, <duration>]</code>. See description of <code><tscrm></code> set to 4 for the valid for the <code><action></code> parameter. All touch screen events shall be directed from the TA to the TE.</p> <p>Note 7: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <code><bfr></code> setting.</p>
6	<p>Verbose mode. Enhanced touch screen event reporting using the unsolicited result code <code>+CTEV: <action>, <x>, <y>, <id>[, <duration>]</code>. This is a special mode where intermediate depressed result codes (<code>+CTEV: 1, <x>, <y>, <id>[, <duration>]</code>) are generated for each new <code><x>, <y></code> 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 <code><tscrm></code> set to 4 for the <code><action></code> parameter. Only the touch screen events not caused by <code>AT+CTSA</code> are indicated by the TA to the TE.</p> <p>Note 8: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <code><bfr></code> setting.</p>

9.11 Phone Activity Status: AT+CPAS

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

9.11.1 Syntax

Command	Possible Response(s)
AT+CPAS	+CPAS: <code><pas></code> +CME ERROR: <code><err></code>
AT+CPAS=?	+CPAS: <i>list of supported <pas></i> s +CME ERROR: <code><err></code>

9.11.2 Description

The 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: AT+CME ERROR for `<err>` values.

9.11.3 Defined Values

pas

Integer.

Caution: Only the 0, 4, and 5 values are currently implemented. All other values are reserved.

Table 137. 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)
4	Call in progress (MT is ready for commands from TA/TE, but a call is in progress)
5	Asleep (MT is unable to process commands from TA/TE because it is in a low functionality state)
6..128	Reserved

9.12 Signal quality: AT+CSQ

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

9.12.1 Syntax

Command	Possible Response(s)
AT+CSQ	+CSQ: <rsssi>, <ber> +CME ERROR: <err>
AT+CSQ=?	+CSQ: (list of supported <rsssi>s), (list of supported <ber>s)

9.12.2 Description

This command returns received signal strength indication <rsssi> and channel bit error rate <ber> from the MT.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

The test command returns values supported as compound values.

9.12.3 Defined Values

rsssi

Integer. Received signal strength indication.

Table 138. rsssi

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).

Table 139. ber

Value	Description
0 .. 7	RXQUAL values found in the table in 3GPP TS 45.008 [20] subclause 8.2.4
99	Not known or not detectable

9.13 Time Zone Reporting: AT+CTZR

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

9.13.1 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>

9.13.2 Description

This set command controls the time zone change event reporting. If 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: AT+CME ERROR for <err> values.

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, +CTZU.

9.13.3 Defined Values

reporting

Integer.

Table 140. reporting

Value	Description
0	Disable time zone change event reporting.
1	Enable time zone change event reporting using the unsolicited result code +CTZV: <tz>.
2	Enable extended time zone and time adjustment reporting using the unsolicited result code +CTZE: <tz>, <dst>, [<time>].

tz

String type value representing the 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 with the range -48 to +56. To maintain a fixed width, numbers in the range -9 to +9 are expressed with a leading zero, for example, "-09", "+00" and "+09".

dst

Integer. Value indicating whether <tz> includes daylight saving time adjustment.

Table 141. dst

Value	Description
0	<tz> includes no adjustment for Daylight Saving Time
1	Includes +1 hour (equals 4 quarters in <tz>) adjustment for Daylight Saving Time
2	<tz> includes +2 hours (equals 8 quarters in <tz>) adjustment for daylight saving time

time

String type value representing the 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.

9.13.4 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 greater than 10 seconds. The MT also provides the time zone upon network registration, if provided by the network.
+CTZV: <tz>	

9.14 Automatic Time Zone Update: AT+CTZU

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

9.14.1 Syntax

Command	Possible Response(s)
AT+CTZU=<onoff>	+CME ERROR: <err>
AT+CTZU?	+CTZU: <onoff> +CME ERROR: <err>
AT+CTZU=?	+CTZU: (list of supported <onoff>s) +CME ERROR: <err>

9.14.2 Description

This command enables and disables the automatic time zone update via NITZ/SB16. 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: AT+CME ERROR for <err> values.

The read command returns the current settings in the MT.

The test command returns supported on- and off-values.

9.14.3 Defined Values

onoff

Integer: 0 or 1. Boolean switch.

Table 142. onoff

Value	Description
0	Disable automatic time zone update via NITZ.
1	Enable automatic time zone update via NITZ..

9.15 Auto-Connect: AT+SQNAUTOCONNECT

9.15.1 Syntax

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

9.15.2 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.

9.15.3 Defined Values

autoconnect

String. Autoconnect Mode.

Table 143. autoconnect

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

forceautoconnect

String. Force autoconnect Mode.

Table 144. forceautoconnect

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

9.15.4 Example

Enable autoconnect:

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

Read the current autoconnect setting:

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

9.16 Retrieve Current GUTI: AT+SQNGUTI

9.16.1 Syntax

Command	Possible Response(s)
AT+SQNGUTI	SQNGUTI : <mmeGrpId>, <mmeCode>, <mTmsi> OK

9.16.2 Description

This command reads the Globally Unique Temporary ID (GUTI) assigned to the UE by the network.

This number is built as follows:

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>

9.16.3 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.

9.17 Support of Cell Monitoring: AT+SQNMONI

9.17.1 Syntax

Command	Possible Response(s)
AT+SQNMONI=<n>	<ul style="list-style-type: none"> When extracting data for the serving cell and the network name is known: +SQNMONI: <netname> RSRP:<rsrp> RSRQ:<rsrq> TAC:<tac> Id:<pci> EARFCN:<earfcn> PWR:<dBm> PAGING:<drx> CID:<cid> BAND:<band> BW:<bw> 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> 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

9.17.2 Description

This command returns information on the serving and neighboring 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: AT+CME ERROR for specific <err> values.

9.17.3 Defined Values

n

Integer type: scope of the information request.

Table 145. 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. Applicable to Monarch-based products only.

netname

String. Name of network operator

cc

Country code

- nc**
Network operator code
- n**
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. Reference Signal Received Power
- cinr**
Float. Carrier to Interference-plus-Noise Ratio.
- rsrq**
Float. Reference Signal Received Quality
- tac**
Tracking Area Code
- earfcn**
E-UTRA Assigned Radio Channel
- cid**
Integer in hex. 28-bit E-UTRAN Cell Identity as advertised in SIB1 (System Information Block Type 1).
- band**
Band number as defined by 3GPP standard TS 36.101.
- bw**
Downlink bandwidth in kHz
- paging**
DRX cycle in number of radio frames (1 frame = 10ms).

9.18 Time Synchronization with NTP: AT+SQNNTP

9.18.1 Syntax

Command	Possible Response(s)
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)]]]]]]

9.18.2 Description

The AT+SQNNTP command synchronizes the local clock with a reference time server using NTP (Network Time Protocol). An application can request NTP synchronization 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), wait for the registration to complete and IP connectivity to be up, otherwise the request returns ERROR. By default,

the NTP client connects to the `pool.ntp.org:123` (port:123) time server. The application can provide up to three alternative time servers. Examples of such servers are: `time.windows.com` or `ntp.obspm.fr`. 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 `AT+CCLK=<time>`, 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 `AT+CCLK?` command.

NTP configuration is persistent (survives device reboots and all power states), and changes are applied immediately.

See also Mobile Termination Error Result Code: `AT+CME ERROR` 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, `+CTZU`.

9.18.3 Defined Values

reporting

Integer: 0, 1 or 2. NTP service control command.

Table 146. cmd

Value	Description
0	On-demand mode. Synchronous execution.
1	Enable automatic time update. The NTP client automatically queries for UTC time whenever required. The command is asynchronous, sending a <code>+SQNNTP</code> notification at each time update completion (success or failure). NOT IMPLEMENTED YET
2	On-demand mode. Command is asynchronous, returning <code>+SQNNTP</code> notification after completion (success or failure).

state

Integer: 0 or 1. NTP automatic time update service activation state.

Table 147. state

Value	Description
0	Automatic time update is disabled
1	Reserved for future use

autosetTime

Integer: 0 or 1. Update policy.

Table 148. 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 means 'use the default server' (pool.ntp.org:123). If the port number is not provided, 123 is used.

Examples of alternative servers: `time.windows.com`, `europe.pool.ntp.org`, `ntp.obspm.fr`.

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 149. status

Value	Description
0	OK
1	Connection timed out
4	DNS error
5	NTP error
6	Unknown network error

time

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). For example, May 6th, 2021, 22:10:00 GMT+2 is written as '21/05/06,22:10:00+08'.

9.18.4 Specific +CME ERROR Error Codes

This command can return specific extended error codes.

Table 150. +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

9.18.5 Recommended Time Synchronization Process

Renesas' 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.).

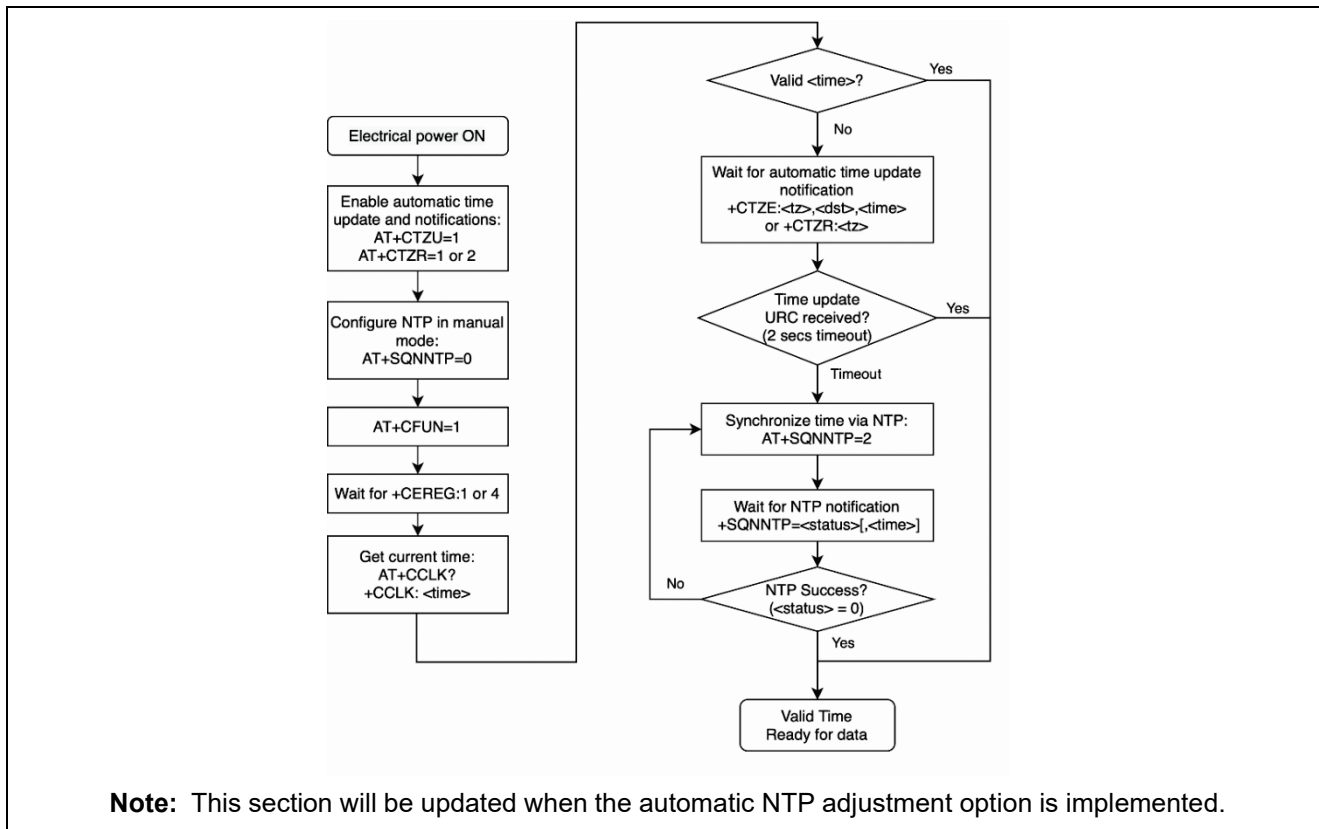


Figure 1. Recommended time synchronization process

9.19 Modem statistics: AT+SQNRXTXSTATS

9.19.1 Syntax

Command	Possible Response(s)
AT+SQNRXTXSTATS=<enable>[, <reset>]	OK ERROR
AT+SQNRXTXSTATS?	AT+SQNRXTXSTATS=<enable>, <rx_time>, <tx_time>, <tx_time23>, <tx_time22>, <tx_time21>, <tx_time20>, <tx_time19>, <tx_time18>, <tx_time17>, <tx_time16>, <tx_time15>, <tx_time12>, <tx_time9>, <tx_time6>, <tx_time3>, <tx_time0> OK
AT+SQNRXTXSTATS=?	+SQNRXTXSTATS: (0-1), (0-1)

9.19.2 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 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 statistics can be read at any time if <enable> is 1, otherwise it 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.

9.19.3 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.

10. Network ServiceCommands

10.1 Forward Network Reject/Error Codes : AT\$ARMEE, \$ARME ERROR

10.1.1 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>

10.1.2 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 command.

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

10.1.3 Defined Values

n

Integer: 0 or 1. Enable/disable the \$ARME ERROR:<type>, <err> URC.

Table 151. 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

10.1.4 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 152. <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

<type>	<err>
'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.

10.2 EPS Network Registration Status: AT+CEREG

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

10.2.1 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))

10.2.2 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: AT+CME ERROR for <err> values.

Note: If the EPS MT in GERAN/UTRAN/E-UTRAN also supports circuit mode services and/or GPRS services, the +CREG command and +CREG: result codes and/or the +CGREG command and +CGREG: result codes apply to the registration status and location information for those services.

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.

10.2.3 Defined Values

n

Integer.

Table 153. 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. Indicates the EPS registration status.

Table 154. 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 (for example, out of E-UTRAN coverage)
5	Registered, roaming
6	Registered for "SMS only", home network (not applicable)
7	Registered for "SMS only", roaming (not applicable)
8	Attached for emergency bearer services only (See Note 2)
9	Registered for "CSFB not preferred", home network (not applicable)
10	Registered for "CSFB not preferred", roaming (not applicable)
80	This code is a proprietary notification. Registered, temporary connection lost. A PLMN loss indication is received from RRC.

Note: 2. 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 (for example, "00C3" equals 195 in decimal).

ci

String: four byte E-UTRAN cell ID in hexadecimal format

Act

Integer: The parameter sets/shows the access technology of the serving cell.

Table 155. 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

Note: 3. 3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.

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. Indicates the type of <reject_cause>.

Table 156. 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 type; contains the cause of the failed registration. The value is of type as defined by <cause_type>.

Active-Time

String type: one 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 (for example, "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: one 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 (for example, "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].

10.3 Subscriber Number: AT+CNUM

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

10.3.1 Syntax

Command	Possible Response(s)
AT+CNUM	+CNUM: [<alpha1>, <number1>, <type1>[, <speed>, <service>[, <itc>]]] [<CR><LF>] +CNUM: [<alpha2>, <number2>, <type2>[, <speed>, <service>[, <itc>]]] [...] +CME ERROR:<err>
AT+CNUM=?	

10.3.2 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: AT+CME ERROR for <err> values.

10.3.3 Defined Values**alphax**

String. Associated with <numberx>; the character set should be the one selected with command Select TE Character Set: AT+CSCS.

numberx

String. Phone number in the format specified by <typex>.

typex

Integer. Type of address octet (see 3GPP TS 24.008 [8] subclause 10.5.4.7)

speed

As defined in subclause 6.7

service

Integer. Service related to the phone number.

Table 157. 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. Information transfer capability.

Table 158. itc

Value	Description
0	3,1 kHz
1	UDI

10.4 Read Operator Names: AT+COPN

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

10.4.1 Syntax

Command	Possible Response(s)
AT+COPN	+COPN: <numeric1>,<alpha1> [<CR><LF>+COPN: <numeric2>,<alpha2> [...]] +CME ERROR: <err>
AT+COPN=?	

10.4.2 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: AT+CME ERROR for <err> values.

10.4.3 Defined Values

numericn

String type: operator id in numeric format (see PLMN Selection: AT+COPS).

alphan

String type: operator id in long alphanumeric format (see PLMN Selection: AT+COPS).

10.5 PLMN Selection: AT+COPS

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

10.5.1 Syntax

Command	Possible Response(s)
AT+COPS[<mode> [, <format> [, <oper> [, <AcT>]]]]	+CME ERROR: <err>

Command	Possible Response(s)
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>

10.5.2 Description

This command attempts to select and register the MT on the operator GSM/UMTS/EPS 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 (+COPS?) also. <mode>=2 forces an attempt to unregister from the network. The selected mode affects to all further network registration (for example, after <mode>=2, MT is unregistered until <mode>=0 or 1 is selected). This command should be abortable when registration/unregistration attempt is made.

See also Mobile Termination Error Result Code: AT+CME ERROR 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 (GSM or USIM) 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).

10.5.3 Defined Values

mode

Integer: 0, 1, 2, 3, or 4.

Table 159. 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 160. format

Value	Description
0	Long format alphanumeric <oper>
1	Short format alphanumeric <oper>
2	Numeric <oper>

oper

String type; <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 to GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer to 3GPP TS 24.008 [8] subclause 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 161. stat

Value	Description
0	Unknown
1	Available
2	Current
3	Forbidden

AcT

Integer. The parameter sets/shows the access technology selected.

Table 162. 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)

- Notes:**
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).

10.6 Selection of Preferred PLMN List: AT+CPLS

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

10.6.1 Syntax

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

10.6.2 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 +CPOL 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: AT+CME ERROR for <err> values.

10.6.3 Defined Values

list

Integer: 0, 1, or 2.

Table 163. 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}

10.7 Preferred PLMN List: AT+CPOL

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

10.7.1 Syntax

Command	Possible Response(s)
AT+CPOL[[<index>] [,<format> [,<oper> [,<GSM_Act>,<GS M_Compact_Act>,<UTRAN_Act>,<E-UTRAN_Act>]]]]	+CME ERROR: <err>
AT+CPOL?	+CPOL: [<index1>,<format>,<oper1> [,<GSM_Act1>,<GSM_Compact_Act1>,<UTRAN_Act1>,<E-UTRAN_Act1>] [<CR><LF>+CPOL: <index2>,<format>,<oper2>

Command	Possible Response(s)
	[,<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>

10.7.2 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 SIM/USIM list of preferred PLMNs, previously selected by the command +CPLS. 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].

- Notes: 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 SIM/USIM has been previously verified.

Read command returns all used entries from the SIM/USIM list of preferred PLMNs, previously selected by the command +CPLS, 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: AT+CME ERROR for <err> values.

10.7.3 Defined Values

indexn

Integer. The order number of operator in the SIM/USIM preferred operator list

format

Integer: 0, 1, or 2.

Table 164. format

Value	Description
0	Long format alphanumeric <oper>
1	Short format alphanumeric <oper>
2	Numeric <oper>

opern

String. <format> indicates if the format is alphanumeric or numeric (see PLMN Selection: AT+COPS)

GSM_Actn

Integer: 0 or 1. GSM access technology

Table 165. GSM_Actn

Value	Description
0	Access technology not selected
1	Access technology selected

GSM_Compact_AcTn

Integer: 0 or 1. GSM compact access technology

Table 166. GSM_Compact_AcTn

Value	Description
0	Access technology not selected
1	Access technology selected

UTRAN_AcTn

Integer: 0 or 1. UTRAN access technology

Table 167. UTRAN_AcTn

Value	Description
0	Access technology not selected
1	Access technology selected

E-UTRAN_AcTn

Integer: 0 or 1. E-UTRAN access technology

Table 168. E-UTRAN_AcTn

Value	Description
0	Access technology not selected
1	Access technology selected

10.8 4G LTE Band Selection: AT+SQNBANDSEL**10.8.1 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

10.8.2 Description

This command enables the user to specify 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 is:

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 regarded product variant, causes the AT command to reject the configuration request and responds with an ERROR message.

The test command reports the list of supported <rat> and <operator> as well as list of the 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.

10.8.3 Defined Values

rat

Integer: 0 or 1. Radio Access Technology

Table 169. rat

Value	Description
0	LTE Category M1
1	LTE Category NB1

operator

String: Operator mode.

Table 170. 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, syntax is "5, 3, 8".

10.9 Conformance Test Mode: AT+SQNCTM

10.9.1 Syntax

Command	Possible Response(s)
AT+SQNCTM=<ctm>	OK
AT+SQNCTM?	+SQNCTM:<ctm> OK
AT+SQNCTM=?	+SQNCTM:("standard", "3gpp-conformance", list of supported operators) OK

10.9.2 Description

This command changes the conformance test mode of the device. The <ctm> mode acting as a configuration command to enable automatic selection mode:

Caution: For the change to be effective, a reboot of the device is required. Reboot is automatic except for 3gpp-conformance mode.

The test command returns the supported conformance test modes.

Note: The values not listed in Table 60 are reserved for internal use and should not be used.

10.9.3 Defined Values

10.9.4 Example

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
```

10.10 Highest priority EARFCN selection: AT+SQNEARFCNSEL

10.10.1 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

10.10.2 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.

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 (that is, "") 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>.

Notes:

- Available <operator> names correspond to the names defined in AT+SQNCTM.
- The "3gpp-conformance" profile cannot be modified: any attempt to do so is rejected and returns ERROR.
- Attempting to modify an invalid <rat> and/or <operator> is rejected and returns ERROR.
- Only 24 EARFCN can be configured. Any additional EARFCN is silently ignored.
- Attempting to configure an <earfcnList> containing EARFCN(s) outside the bands supported by the product fails and returns ERROR.
- Any EARFCN outside the configured band list for the specified pair (<rat>, <operator>) (see AT+SQNBANDSEL) is silently ignored during scanning operations.
- To add a new EARFCN(s), read the current list, append the new EARFCN(s) and write the updated list back.
- The configuration is stored in non-volatile memory and survives device reboots and software upgrades. New configurations are activated at the next re-connections to the network (AT+CFUN=1).
- Refer to operator recommendations to create the list of the highest priority EARFCN.

10.10.3 Defined Values

rat

Integer: 0 or 1.

0: LTE Cat M1

1: LTE Cat NB1

operator

String: Operational mode. "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".

earfcnList

String: comma separated list of the highest priority EARFCN.

10.11 Handover Configuration: AT+SQNHOCFG

10.11.1 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

10.11.2 Description

This command is used to read and configure handover (intra- and inter- frequency) behavior. 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: AT+CME ERROR for <err> values.

10.11.3 Defined Values

rat

Integer: 0 or 1.

0: LTE Cat M1

1: LTE Cat NB1

operator

String: Operational mode. "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".

enable

Integer: 0 or 1. Handover enable.

0: No handover

1: Handover is enabled

10.12 Read the Home PLMN: AT+SQNHPLMN

10.12.1 Syntax

Command	Possible Response(s)
AT+SQNHPLMN?	+SQNHPLMN: <num_oper>, <short_oper>, <long_oper>, OK

10.12.2 Description

This command reads the HPLMN.

10.12.3 Defined Values

num_oper

Numeric format: the GSM Location Area Identification number (refer to 3GPP TS 24.008 [8] subclause 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.

10.12.4 Example

```
AT+SQNHPLMN?
+SQNHPLMN: "00101", "TEST", "Aeroflex"
OK
```

10.13 PCCA STD 101 [17] Select Wireless Network: AT+WS46

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

10.13.1 Syntax

Command	Possible Response(s)
AT+WS46<n>	
AT+WS46?	<n>

Command	Possible Response(s)
AT+WS46=?	//list of supported <n>s

10.13.2 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.

10.13.3 Defined Values

n (read)

Integer. The values in <n> for the read command are mutually exclusive. A single value is always returned.

Table 171. n (Query)

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)

Integer. Refer PCCA STD 101 [17] for other values.

Table 172. n (set)

Value	Description
12	3GPP System
22	Not used. These values are treated as if 12 had been sent. An ERROR may be returned.
25	
28	
29	
30	
31	

11. Packet Domain Related Commands

11.1 UE Modes of Operation for EPS: AT+CEMODE

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

See the current implementation limitation in `mode` parameter description.

11.1.1 Syntax

Command	Possible Response(s)
AT+CEMODE	+CME ERROR: <err>
AT+CEMODE?	+CEMODE: <mode>
AT+CEMODE=?	+CEMODE: (list of supported <mode>s)

11.1.2 Description

This command sets 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 +CMEE command.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

The read command returns the mode of operation set by the TE, regardless of the current serving cell capability and independent of the current serving cell Access Technology.

The test command is used for requesting information on the supported MT mode of operation.

11.1.3 Defined Values

Caution: Only <mode> 0 and 2 are currently implemented.

mode

Integer. Indicates the mode of operation.

Table 173. mode

Value	Description
0	PS mode 2 of operation
1	CS/PS mode 1 of operation
2	CS/PS mode 2 of operation
3	PS mode 1 of operation

Note: The definition for UE modes of operation can be found in 3GPP TS 24.301 [83]

11.2 PDP Context Activate or Deactivate: AT+CGACT

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

11.2.1 Syntax

Command	Possible Response(s)
AT+CGACT?	+CGACT: [<cid>, <state>] [<CR><LF>+CGACT: <cid>, <state> [...]]
AT+CGACT=?	+CGACT: (list of supported <state>s)

11.2.2 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 +CMEE 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: AT+CME ERROR 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 subclause 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.

11.2.3 Defined Values

state

Integer: 0 or 1. Indicates the state of PDP context activation.

Table 174. state

Value	Description
0	deactivated
1	activated

cid

Integer type; specifies a particular PDP context definition (see the Define PDP Context: AT+CGDCONT and Define Secondary PDP Context: AT+CGDSCONT commands).

11.3 PS Attach or Detach: AT+CGATT

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

11.3.1 Syntax

Command	Possible Response(s)
AT+CGATT=<state>	+CME ERROR: <err>
AT+CGATT?	+CGATT: <state>
AT+CGATT=?	+CGATT: (list of supported <state>s)

11.3.2 Description

This command attaches the MT to, or detaches 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 +CMEE command.

See also Mobile Termination Error Result Code: AT+CME ERROR on page 148 for <err> values.

Note: If the initial PDP context is supported, the context with <cid>=0 is automatically defined at startup, see subclause 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.

11.3.3 Defined Values

state

Integer. Indicates the state of PS attachment.

Note: AT+CGATT=1 will put the UE in automatic attach mode only if AT+CFUN=1 and until the next AT+CFUN=0.

Table 175. state

Value	Description
0	Detached
1	Attached

11.4 Define PDP Context Authentication Parameters: AT+CGAUTH

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

11.4.1 Syntax

Command	Possible Response(s)
AT+CGAUTH=<cid> [,<auth_prot> [,<userid> [,<password>]]]	+CME ERROR:<err>
AT+CGAUTH?	[+CGAUTH <:cid>,<auth_prot>,<userid>,<password>] [<CR><LF>+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)

11.4.2 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 and AT+CGDSCONT commands, AT+CGAUTH can be thought of as an extension to these commands.

See also Mobile Termination Error Result Code: AT+CME ERROR can be thought of as an extension to these commands for <err> values.

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

The test command returns values supported as a compound value.

11.4.3 Defined Values

cid

Integer. Specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT commands).

auth_prot

Integer: 0, 1, or 2. Authentication protocol used for this PDP context.

Table 176. 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.

11.5 PDP Context Modify: AT+CGCMOD

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

11.5.1 Syntax

Command	Possible Response(s)
AT+CGCMOD[=<cid> [,<cid> [...]]]	+CME ERROR:<err>
AT+CGCMOD=?	+CGCMOD:(list of <cid>s with active contexts)

11.5.2 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+CME command.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

The network answers a modification request for an EPS bearer resource using the network by 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.

11.5.3 Defined Values

cid

Integer. Specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT commands).

11.6 PDP Context Read Dynamic Parameters: AT+CGCONTRDP

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

11.6.1 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>]]]]]]] [<CR><LF>+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>]]]]]]] [...]
AT+CGCONTRDP=?	+CGCONTRDP : (list of <cid>s associated with active contexts)

11.6.2 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 this 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, for example, if the UE received four IP addresses of DNS servers and two IP addresses of P-CSCF servers, the value corresponding to an unknown IP address is set to an empty or an 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.

11.6.3 Defined Values

cid

Integer. Specifies a particular 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 AT+CGDCONT and AT+CGDSCONT 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.

When +CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of +CGCONTRDP.

gw_addr

String. Gateway Address of the MT. The string is given as dot-separated numeric (0-255) parameters.

When AT+CGPIAF is supported, its settings can influence the format of this parameter.

DNS_prim_addr

String. The IP address of the primary DNS server.

When AT+CGPIAF is supported, its settings can influence the format of this parameter.

DNS_sec_addr

String. IP address of the secondary DNS server.

When AT+CGPIAF is supported, its settings can influence the format of this parameter returned.

P_CSCF_prim_addr

String. IP address of the primary P-CSCF server.

When AT+CGPIAF is supported, its settings can influence the format of this parameter returned.

P_CSCF_sec_addr

String. IP address of the secondary P-CSCF server.

When +CGPIAF is supported, its settings can influence the format of this parameter returned.

IM_CN_Signalling_Flag

Integer: 0 or 1. Tells whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 177. IM_CN_Signalling_Flag

Value	Description
0	PDP context is not for IM CN subsystem-related signaling only
1	PDP context is for IM CN subsystem-related signaling 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 178. 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

11.7 Enter Data State: AT+CGDATA

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

11.7.1 Syntax

Command	Possible Response(s)
AT+CGDATA [=<L2P> [,<cid> [,<cid> [...]]]]	CONNECT ERROR +CME ERROR:<err>
AT+CGDATA=?	+CGDATA: (list of supported <L2Ps>)

11.7.2 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: AT+CME ERROR for <err> values.

Note: If the initial PDP context is supported, the context with <cid>=0 is automatically defined at start-up, see subclause 10.1.0.

Commands following AT+CGDATA command in the AT command line shall not be processed by the MT.

The detailed behavior after the online data state has been entered is dependent on the PDP type. It is described briefly in 3GPP TS 27.060 [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: +CGATT and PDP Context Activate or Deactivate: +CGACT 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 have access to 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.

Command	Possible Response(s)
AT+CGDCONT?	<pre>[+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>]]]]]]]]]] [<CR><LF> +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>]]]]]]]]]] [...]]</pre>
AT+CGDCONT=?	<pre>+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) [<CR><LF>+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) [...]]</pre>

11.8.2 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, for example, 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, +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 subclause 10.1.0. As all other contexts, the parameters for <cid>=0 can be modified with +CGDCONT. If the initial PDP context is supported, AT+CGDCONT=0 resets context number 0 to its particular default settings.

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.

11.8.3 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 the initial PDP context is supported (see subclause 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 +CGDCONT and +CGDSCONT.

PDP_type

String. Specifies the type of packet data protocol

Table 180. 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 AT+CGPADDR command.

When AT+CGPIAF is supported, its settings can influence the format of this parameter returned with the read form of +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 SDCP only) (refer 3GPP TS 44.065 [61])

Table 181. 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 to 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

Table 182. h_comp

Value	Description
0	Off
1	On (manufacturer preferred compression)
2	RFC 1144 [105] (applicable for SDCP 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 183. IPv4AddrAlloc

Value	Description
0	IPv4 Address Allocation through NAS Signaling
1	IPv4 Address Allocated through DHCP

request_type

Integer. Indicates the type of PDP context activation request for the PDP context, see 3GPP TS 24.301 [83] (subclause 6.5.1.2) and 3GPP TS 24.008 [8] (subclause 10.5.6.17). If the initial PDP context is supported (see subclause 10.1.0) it is not allowed to assign <cid>=0 for emergency bearer services. According to 3GPP TS 24.008 [8] (subclause 4.2.4.2.2 and subclause 4.2.5.1.4) and 3GPP TS 24.301 [83] (subclause 5.2.2.3.3 and subclause 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] subclause 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 184. 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. Influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [89] annex B and annex L.

Table 185. 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 Signaling
2	Currently not supported. Preference of P-CSCF address discovery through DHCP

IM_CN_Signalling_Flag_Ind

Integer: 0 or 1. Indicates to the network whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 186. IM_CN_Signalling_Flag_Ind

Value	Description
0	UE indicates that the PDP context is not for IM CN subsystem-related signaling only
1	UE indicates that the PDP context is for IM CN subsystem-related signaling only

NSLPI

Integer. Indicates the NAS signaling priority requested for this PDP context.

NOTE 6: The MT utilizes the provided NSLPI information as specified in 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8].

Table 187. 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 signaling low priority"

securePCO

Integer. Specifies if security protected transmission of PCO is requested or not (applicable for EPS only, see 3GPP TS 23.401 [82] subclause 6.5.1.2).

Table 188. 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] subclause 10.5.6.3.

Table 189. 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 signaling

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] subclause 10.5.6.3).

Table 190. 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] subclause 10.5.6.3.

Table 191. 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 signaling

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] subclause 10.5.6.3.

Table 192. 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

11.9 Define Secondary PDP Context: AT+CGDSCONT

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

11.9.1 Syntax

Command	Possible Response(s)
AT+CGDSCONT=[<cid>,<p_cid> [,<d_comp> [,<h_comp> [,<IM_CN_Signalling_Flag_Ind>]]]]	
AT+CGDSCONT?	[+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp> ,<IM_CN_Signalling_Flag_Ind> [<CR><LF>+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)

11.9.2 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 subclause 10.1.0.

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

The test command returns values supported as a compound value.

11.9.3 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 and AT+CGDSCONT.

p_cid

Integer. Specifies a particular PDP context definition which has been specified by use of the AT+CGDCONT 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 to 3GPP TS 44.065 [61])

Table 193. 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 194. 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. Indicates to the network whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 195. IM_CN_Signalling_Flag_Ind

Value	Description
0	UE indicates that the PDP context is not for IM CN subsystem-related signaling only
1	UE indicates that the PDP context is for IM CN subsystem-related signaling only

11.10 Define EPS Quality Of Service: AT+CGEQOS

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

11.10.1 Syntax

Command	Possible Response(s)
AT+CGEQOS=[<cid> [,<QCI> [,<DL_GBR>,<UL_GBR> [,<DL_MBR>,<UL_MBR]]]]	+CME ERROR: <err>

Command	Possible Response(s)
AT+CGEQOS?	[+CGEQOS: <cid>, <QCI>, [<DL_GBR>, <UL_GBR>] [,<DL_MBR>, <UL_MBR>]] [<CR><LF>+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)

11.10.2 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 UMTS/GPRS Quality of Service.

See also Mobile Termination Error Result Code: AT+CME ERROR 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.

11.10.3 Defined Values

cid

Integer. Specifies a particular EPS Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS (see the AT+CGDCONT and AT+CGDSCONT commands).

QCI

Integer. Specifies a class of EPS QoS (see 3GPP TS 24.301 [83]).

Table 196. 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 type; 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]).

11.11 EPS Quality Of Service Read Dynamic Parameters: AT+CGEQOSRDP

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

11.11.1 Syntax

Command	Possible Response(s)
AT+CGEQOSRDP	[+CGEQOSRDP: <cid>, <QCI> [, <DL_GBR>, <UL_GBR>] [, <DL_MBR>, <UL_MBR>] [, <DL_AMBR>, <UL_AMBR>]] [<CR><LF>+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)

11.11.2 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.

11.11.3 Defined Values

cid

Integer. Specifies a particular Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS (see the AT+CGDCONT and AT+CGDSCONT commands).

QCI

Integer. Specifies a class of EPS QoS (see 3GPP TS 24.301 [83]).

Table 197. 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
Dd	Value range for Operator-specific qcis
28 to 254	

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.

11.12 Packet Domain Event Reporting: AT+CGEREP

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

11.12.1 Syntax

Command	Possible Response(s)
AT+CGEREP=[<mode>] [,<bfr>]]	+CME ERROR: <err>
AT+CGEREP?	+CGEREP: <mode>,<bfr>
AT+CGEREP=?	+CGEREP: (list of supported <mode>s), (list of supported <bfr>s)

11.12.2 Description

This command enables or disables the unsolicited result codes, +CGEV: XXX 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: AT+CME ERROR 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.

11.12.3 Defined Values

mode

Integer: 0, 1, or 2.

Table 198. 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 (for example, 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 (for example, 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 199. 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)

11.12.4 Event Notification URC: AT+CGEV

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.

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 found in command AT+CGCLASS.

— +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 found in command AT+CGCLASS..

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 AT+CGDCONT.

<WLAN_Offload>. An integer (0..3) that 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] subclause 10.5.6.20.

Table 200. WLAN_Offload

Value	Description
0	Offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in lu 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 lu mode.
2	Offloading the traffic of the PDN connection via a WLAN when in lu 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 lu 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 (AT+CGACT), or in result of implicit context activation request associated to attach request (AT+CGATT=1). The format of the parameters <cid> and <cid_other> are found in command AT+CGDCONT. The format of the parameter <WLAN_Offload> is defined above.

<reason>: Integer. 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 201. 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 **AT+CGDSCONT**. 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 202. 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 **AT+CGDSCONT**. The format of the parameters **<event_type>** and **<WLAN_Offload>** are defined above.

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 **AT+CGDCONT**.

— **+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 **AT+CGDCONT**.

— **+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 **AT+CGDCONT**. 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 **AT+CGDCONT**.

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 AT+CGDSCONT. 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 I. The format of the parameters <p_cid> and <cid> are found in command AT+CGDSCONT. 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>].

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 AT+CGDCONT or AT+CGDSCONT. 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 203. 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 AT+CGDCONT or AT+CGDSCONT. The format of the parameters <change_reason>, <event_type>, and <WLAN_Offload> are defined above.

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 AT+CGDCONT.

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 AT+CGDCONT.

Note: This event is not applicable for EPS.

11.13 Show PDP Address(es): AT+CGPADDR

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

11.13.1 Syntax

Command	Possible Response(s)
AT+CGPADDR[=<cid> [,<cid> [...]]]	[+CGPADDR: <cid> [,<PDP_addr_1> [,<PDP_addr_2>]]] [<CR><LF>+CGPADDR: <cid>,<PDP_addr_1> [,<PDP_addr_2>]] [...]]
AT+CGPADDR=?	+CGPADDR: (list of defined <cid>s)

11.13.2 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.

11.13.3 Defined Values

cid

Integer. Specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT 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 and AT+CGDSCONT 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.

When AT+CGPIAF is supported, its settings can influence the format of the IPv6 address in parameter <PDP_addr_1> or <PDP_addr_2> returned with the execute form of AT+CGPADDR.

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>.

11.14 Printing IP Address Format: AT+CGPIAF

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

11.14.1 Syntax

Command	Possible Response(s)
AT+CGPIAF= [<IPv6_Addres sFormat> [,<IPv6_SubnetNotation> [,<IPv6_LeadingZeros> [,<IPv6_CompressZeros>]]]]	
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)

11.14.2 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:

- in AT+CGTFT and AT+CGTFTRDP, the <remote address and subnet mask>;
- in AT+CGDCONT, the <PDP_addr>;
- in AT+CGPADDR, the <PDP_addr_1> and <PDP_addr_2>;
- in AT+CGCONTRDP, the <local address and subnet mask>, <DNS_prim_addr>, <DNS_sec_addr>, <P_CSCF_prim_addr> and <P_CSCF_sec_addr>; and
- in AT+CRG, the <PDP_addr> of unsolicited result code GPRS <PDP_type>, <PDP_addr>[, <L2P>][, <APN>]].

The read command returns the current command parameter settings.

The test command returns values supported as compound values.

11.14.3 Defined Values

IPv6_AddressFormat

Integer: 0 or 1. IPv6 address format. Relevant for all AT command parameters that can hold an IPv6 address.

Table 204. IPv6_AddressFormat

Value	Description
0	Use IPv4-like dot-notation. IP address, and subnetwork mask if applicable, are dot-separated. Example: For <remote address and subnet mask>: "32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0.0.0.255.255.255.255.255.255.240.0.0.0.0.0.0.0.0" 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 subnetwork 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 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 205. 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 are omitted or not. Setting does not apply if <IPv6_AddressFormat> = 0.

Table 206. 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 Authorizes 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 207. IPv6_CompressZeros

Value	Description
0	No zero compression. Example: "2001:DB8:0:CD30:0:0:0:0"
1	Use zero compression. Example: "2001:DB8:0:CD30::"

11.15 Secondary PDP Context Read Dynamic Parameters: AT+CGSCONTRDP

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

11.15.1 Syntax

Command	Possible Response(s)
AT+CGSCONTRDP[=<cid>]	[+CGSCONTRDP: <cid>, <p_cid>, <bearer_id> [,<IM_CN_Signalling_Flag>]] [<CR><LF>+CGSCONTRDP: <cid>, <p_cid>, <bearer_id> [,<IM_CN_Signalling_Flag>] [...]]
AT+CGSCONTRDP=?	+CGSCONTRDP: (list of <cid>s associated with active contexts)

11.15.2 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.

11.15.3 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 AT+CGDSCONT and AT+CGDSCONT commands).

p_cid

Integer. Specifies a particular PDP context definition or default EPS context Identifier which has been specified by use of the AT+CGDSCONT command. The parameter is local to the TE-MT interface (see the AT+CGDSCONT command).

+CGDSCONT command). bearer_id

Integer. Identifies the bearer, EPS Bearer in EPS and NSAPI in UMTS/GPRS.

IM_CN_Signalling_Flag

Integer type; shows whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 208. IM_CN_Signalling_Flag

Value	Description
0	PDP context is not for IM CN subsystem-related signaling only
1	PDP context is for IM CN subsystem-related signaling only

11.16 Traffic Flow Template: AT+CGTFT

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

11.16.1 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>]]]]]]]]]]	+CME ERROR:<err>
AT+CGTFT?	[+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>] [<CR><LF>+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> [...]]
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 (ipv6)>s), (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 / traffic class (ipv6) and mask>s), (list of supported <flow label (ipv6)>s), (list of supported <direction>s) [<CR><LF>+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),

Command	Possible Response(s)
	<i>(list of supported <protocol number (ipv4) / next header (ipv6)>s), (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 / traffic class (ipv6) and mask>s), (list of supported <flow label (ipv6)>s), (list of supported <direction>s) [...]]</i>

11.16.2 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.

This 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 AT+CGDCONT and AT+CGDSCONT commands, the AT+CGTFT 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, AT+CGTFT=*<cid>* 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: AT+CME ERROR 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.

11.16.3 Defined Values

cid

Integer: Specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT commands).

PDP_type

String: Specifies the type of packet data protocol (see the AT+CGDCONT command).

packet filter identifier

Integer 1..16: See also 3GPP TS 23.060 [47]

evaluation precedenceindex

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 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.

When AT+CGPIAF is supported, its settings can influence the format of this parameter returned with the read form of AT+CGTFT.

protocol number (ipv4) / next header (ipv6)

Integer: 0..255.

local port range

String: The string is given as dot-separated numeric (0-65535) parameters on the form "from.to".

remote port range

String: The string is given as dot-separated numeric (0-65535) parameters on 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 on 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: Specifies the transmission direction in which the packet filter shall be applied.

Table 209. direction

Value	Description
0	Pre-Release 7 TFT filter (see 3GPP TS 24.008 [8], table 10.5.162)
1	Uplink
2	Downlink
3	Birectional (Up and Downlink)

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].

11.17 Traffic Flow Template Read Dynamic Parameters: AT+CGTFTRDP

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

11.17.1 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>] [<CR><LF>+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)

11.17.2 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 will be returned.

The test command returns a list of <cid>s associated with active secondary and non-secondary contexts.

11.17.3 Defined Values

cid

Integer type; Specifies a particular secondary or non-secondary PDP context definition or Traffic Flows definition (see AT+CGDCONT and AT+CGDSCONT commands).

packet filter identifier

Integer: 1..16.

evaluation precedence index

Integer: 0..255.

remote address, subnet mask

String type. 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.

When AT+CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of AT+CGTFTRDP.

protocol number (ipv4)/next header (ipv6)

Integer: 0..255.

local port range

String: The string is given as dot-separated numeric (0-65535) parameters on the form "from.to".

remote port range

String: The string is given as dot-separated numeric (0-65535) parameters on 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 on 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, or 3. Specifies the transmission direction in which the Packet Filter shall be applied.

Table 210. 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].

12. Serial Port Control Commands

12.1 Flow Control: AT\Q

12.1.1 Syntax

Command	Possible Response(s)
AT\Q[<n>]	OK +CME ERROR: <err>

12.1.2 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: AT+CME ERROR for <err> values.

12.1.3 Defined Values

n

Integer: 0, 1, 2 or 3.

Table 211. 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 (AT&V).
1	
2	
3	RTS/CTS hardware flow control

12.2 Received Line Signal Detector Behavior: AT&C

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

12.2.1 Syntax

Command	Possible Response(s)
AT&C[<value>]	

12.2.2 Description

This command defines the Circuit 109 (Received line signal detector) behavior.

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 or AT&D2 is set).

12.2.3 Defined Values

Note: The recommended default value is 1.

Table 212. 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 (for example, , ITU-T Recs V.42, V.110, V.120 and V.13).

12.3 Data Terminal Ready Behavior: AT&D

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

12.3.1 Syntax

Command	Possible Response(s)
AT&D[<value>]	OK

12.3.2 Description

This command defines the Circuit 108 (data terminal ready) behavior.

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 recognized, an ERROR result code is issued.

12.3.3 Defined Values

Note: The recommended default value is 1.

Table 213. value

Value	Description
0	DCE ignores circuit 108/2.
1	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.

12.4 Local Flow Control Option: AT&K

12.4.1 Syntax

Command	Possible Response(s)
AT&K<n>	OK +CME ERROR:<err>

12.4.2 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 online 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: AT+CME ERROR for <err> values.

12.4.3 Defined Values

n

Integer type (multiplexer Transparency Mechanism)

Table 214. n

Value	Description
0	&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	&K1: 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.

Value	Description
2	&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	&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	&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.
5	&K5: Transparent XON/XOFF. The data stream is controlled by characters DC1 and DC3. The characters DLE, DC1, and DC3 are made transparent by sending DLE followed by the character XORed (Exclusive ORed) with 0x21. See notes on &K5 transparent flow : control in 'Appendix D: Transparent XON/XOFF Local Flow Control in Hayes Modems.'

12.5 Data Set Ready (DSR) Control: AT&S

12.5.1 Syntax

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

12.5.2 Description

Set command controls the RS232 DSR pin behavior.

If value 1 is selected then DSR is tied High when the device receives from the network the GSM traffic channel indication.

In power saving mode the DSR pin is always low.

If parameter is omitted, the command has the same behavior of AT&S0

12.5.3 Defined Values

value

Integer: 0, 1, 2, or 3.

Table 215. value

Value	Description
0	Always High
1	Follow the GSM traffic indication
2	High when connected
3	High when device is ready to receive commands

12.6 Multiplexing Mode: AT+CMUX

12.6.1 Syntax

Command	Possible Response(s)
AT+CMUX= <transparency>[,<subset> [,<port_speed> [,<N1> [,<T1> [,<N2> [,<T2> [,<T3> [,<k>]]]]]]]	+CME ERROR:<err>
AT+CMUX?	+CMUX:<transparency> [,<subset>], <port_speed>, <N1>, <T1>, <N2>, <T2>, <T3>[,<k>] OK

Command	Possible Response(s)
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

12.6.2 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: AT+CME ERROR 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 auto bauding purposes irrespective of any previous higher speed having 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.

12.6.3 Defined Values

transparency

Integer: 0 or 1. Multiplexer Transparency Mechanism.

Table 216. transparency

Value	Description
0	Basic option
1	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 217. 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 218. 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 default for Basic option and 64 is default for Advanced option (see <transparency>).

T1

Integer: 1..255 (Default: 10). Acknowledgement timer in units of ten milliseconds.

N2

Integer: 0..100 (Default: 3). Maximum number of re-transmissions.

T2

Integer: 2..255 (Default: 30). Response timer for the multiplexer control channel in units of ten 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.

12.7 DTE-DCE Character Framing: AT+ICF

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

12.7.1 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)

12.7.2 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 forces AT+ICF=0 (see Fixed DTE Rate: AT+IPR).

Note that the definition of fixed character format for online data state is for further study.

12.7.3 Defined Values

format

Integer. 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 219. format

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

parity

Integer. Parity bit generation and verification, if present.

Default value is 3.

Table 220. parity

Value	Description
0	Odd
1	Even
2	Mark
3	Space

12.7.4 Examples

- Read syntax

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

for the recommended defaults.

- Test syntax

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

for all defined values.

12.8 DTE-DCE Local Flow Control: AT+IFC

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

12.8.1 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)

12.8.2 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 accepts 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.

12.8.3 Defined Values

DCE_by_DTE

Integer. 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 221. 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)
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 standardization
Other	Reserved for manufacturer-specific use

DTE_by_DCE

Integer. 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 222. 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 standardization
Other	Reserved for manufacturer-specific use

12.8.4 Examples

- Read syntax

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

for the recommended defaults.

- Test syntax

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

for all defined values.

12.9 Fixed DTE Rate: AT+IPR

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

12.9.1 Syntax

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

12.9.2 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.

12.9.3 Defined Values

rate

The value specified shall be the rate in bits per second at which the DTE-DCE interface should operate, for example, "19 200" or "115 200". The rates supported by a particular DCE are manufacturer-specific; however, the +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 (for example, 134.5 bit/s should be specified as 134; 45.45 bit/s should be specified as 45).

Note that automatic detection setting is not supported.

12.9.4 Examples

Read syntax

+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

+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)]

+IPR: (0, 300, 1200, 2400, 4800, 9600) , (19200, 38400, 57600) if the DCE can autodetect up to 9600 bit/s and can support three additional higher fixed rates.

12.10 UART0 Break Line Setting: AT+SQNIBRCFG

12.10.1 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

12.10.2 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 behavior.

Important: The break signal is only available on UART0.

12.10.3 Defined Values

moBreakMode

Integer: 0 or 1. Host handshake mode.

Table 223. 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.

12.10.4 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
```

12.11 RING Line Behavior Configuration: AT+SQNRICFG

12.11.1 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)] [, (1000-5000)]

12.11.2 Description

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

12.11.3 Defined Values

mode

Integer. RING line behavior for signaling URCs, both when the interface is idle and reserved, that is, 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 224. 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 activated RING0 line of the UART0 interface, whatever URC AT channel origin

events

Integer: 0..3. Event.

Table 225. events

Value	Description
0	RING activation triggered by no event
1	RING activation triggered by general URC events
2	RING activation triggered by data events
3	(default): RING activation triggered by general URC events and data.

timeout

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.

12.11.4 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 another configuration and read again:

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

13. SIM Management Commands

13.1 Close Logical Channel: AT+CCHC

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

13.1.1 Syntax

Command	Possible Response(s)
AT+CCHC=<sessionid>	+CCHC +CME ERROR: <err>
AT+CCHC=?	+CME ERROR: <err>

13.1.2 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: AT+CME ERROR for <err> values.

13.1.3 Defined Values

sessionid

Integer. A session Id to be used in order to target a specific application on the smart card (for example, (U)SIM, WIM, ISIM) using logical channels mechanism

13.2 Open Logical Channel: AT+CCHO

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

13.2.1 Syntax

Command	Possible Response(s)
AT+CCHO=<dfname>	<sessionid> +CME ERROR: <err>
AT+CCHO=?	+CME ERROR: <err>

13.2.2 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 or Generic UICC Logical Channel Access: +CGLA 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: AT+CME ERROR for <err> values.

13.2.3 Defined Values

dfname

All selectable applications in the UICC are referenced by a DF name coded with 1 to 16 bytes

sessionid

Integer type value, a session Id to be used in order to target a specific application on the smart card (for example, (U)SIM, WIM, ISIM) using the logical channels mechanism

13.3 Generic UICC Logical Channel Access: AT+CGLA

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

13.3.1 Syntax

Command	Possible Response(s)
AT+CGLA=<sessionid>,<length>,<command>	+CGLA: <length>, <response> +CME ERROR: <err>
AT+CGLA=?	+CME ERROR: <err>

13.3.2 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: AT+CME ERROR 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 AT+CGLA is locked or unlocked. This policy does not forbid the TE to send Authenticate commands in other security contexts (for example, 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 AT+CRLA, 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.

13.3.3 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

Command passed on by the MT to the UICC in the format as described in 3GPP TS 31.101 [65] (hexadecimal character format; refer to Select TE Character Set: AT+CSCS)

response

Response to the command passed on by the UICC to the MT in the format as described in 3GPP TS 31.101 [65] (hexadecimal character format; refer to Select TE Character Set: AT+CSCS)

13.3.4 Example

Lock the SIM interface

```
AT+CGLA=<sessionId>,1,"1"
```

Unlock the SIM interface

```
AT+CGLA=<sessionId>,1,"0"
```

13.4 Facility Lock: AT+CLCK

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

See the current implementation limitation in `fac` parameter description.

13.4.1 Syntax

Command	Possible Response(s)
AT+CLCK=<fac>,<mode> [,<passwd>[,<class>]]	+CME ERROR: <err> When <mode>=2 and command successful: +CLCK: <status>[,<class1> [<CR><LF>+CLCK: <status>,<class2> [...]]
AT+CLCK=?	+CLCK: (list of supported <fac>s)

13.4.2 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>. This command should be abortable when network facilities are set or interrogated.

Call barring facilities are based on GSM/UMTS supplementary services (refer to 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 facility values supported as a compound value.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

13.4.3 Defined Values

fac

String. Facility.

Table 226. fac

Value	Description
"CS"	CNTRL (lock CoNTRoL surface (for example, phone keyboard))
"PS"	PH SIM (lock PHone to SIM/UICC card installed in the currently selected card slot) (MT asks password when other than current SIM/UICC card inserted; MT may remember some previously used cards, thus not requiring password when they are inserted)
"PF"	Lock Phone to the very first inserted SIM/UICC card (also referred in the present document as PH-FSIM) (MT asks password when other than the first SIM/ UICC card is inserted)
"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 issued)
"AO"	BAOC (Bar All Outgoing Calls) (refer to 3GPP TS 22.088 [6] clause 1)
"OI"	BOIC (Bar Outgoing International Calls) (refer to 3GPP TS 22.088 [6] clause 1)
"OX"	BOIC exHC (Bar Outgoing International Calls except to Home Country) (refer to 3GPP TS 22.088 [6] clause 1)
"AI"	BAIC (Bar All Incoming Calls) (refer to 3GPP TS 22.088 [6] clause 2)
"IR"	BIC Roam (Bar Incoming Calls when Roaming outside the home country) (refer to 3GPP TS 22.088 [6] clause 2)
"NT"	Bar incoming calls from numbers Not stored to TA memory
"NM"	Bar incoming calls from numbers Not stored to MT memory
"NS"	Bar incoming calls from numbers Not stored to SIM/UICC memory
"NA"	Bar incoming calls from numbers Not stored in Any memory
"AB"	All Barring services (refer to 3GPP TS 22.030 [19]) (applicable only for <mode>=0)
"AG"	All outGoing barring services (refer to 3GPP TS 22.030 [19]) (applicable only for <mode>=0)
"AC"	All inComing barring services (refer to 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

Value	Description
"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 to 3GPP TS 22.022 [33])
"PU"	network sUbset Personalization (refer to 3GPP TS 22.022 [33])
"PP"	service Provider Personalization (refer to 3GPP TS 22.022 [33])
"PC"	Corporate Personalization (refer to 3GPP TS 22.022 [33])

mode

Integer. Mode.

Table 227. mode

Value	Description
0	Unlock
1	Lock
2	Query status

status

Integer. Status.

Table 228. status

Value	Description
0	Not active
1	Active

passwd

String. Same as password specified for the facility from the MT user interface or with command Change Password AT+CPWD.

classx

Integer. <classx> is a sum of integers each representing a class of information. Default is 7 - voice + data + fax.

Table 229. 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

13.5 Enter PIN: AT+CPIN

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

13.5.1 Syntax

Command	Possible Response(s)
AT+CPIN=<pin>[,<newpin>]	+CME ERROR: <err>
AT+CPIN?	+CPIN: <code> +CME ERROR: <err>
AT+CPIN=?	

13.5.2 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.

Notes: 1. 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: AT+CME ERROR for <err> values.

13.5.3 Defined Values

pin

String. PIN code.

newpin

String. New PIN code.

code

<code> values reserved by the present document:

Table 230. 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 the SIM 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 the network personalization password to be given
PH-NET PUK	MT is waiting for the network personalization 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

Value	Description
PH-SP PUK	MT is waiting for service provider personalization unblocking password to be given
PH-CORP PIN	MT is waiting for the corporate personalization password to be given
PH-CORP PUK	MT is waiting for the corporate personalization unblocking password to be given

13.6 Enter PIN2: AT+CPIN2

13.6.1 Syntax

Command	Possible Response(s)
AT+CPIN2=<pin> [,<newPin> [,<aid>]]	+CME ERROR: <i>err</i>

13.6.2 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.

13.6.3 Defined Values

pin

Value of PIN2 or PUK2

newpin

Value of new PIN2 if SIM contains PUK2

aid

Application ID, if omitted USIM application is used

13.6.4 Example

Enter PIN2 without *aid*:

```
AT+CPIN2=1234
OK
```

Enter PUK2 and update PIN2 without *aid*:

```
AT+CPIN2=12345678,1234
OK
```

13.7 Remaining PIN Retries: AT+CPINR

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

See the current implementation limitation in *sel_code* parameter description.

13.7.1 Syntax

Command	Possible Response(s)
AT+CPINR= [<i>sel_code</i>]	+CME ERROR: <err>
AT+CPINR=?	

13.7.2 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>, 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: AT+CME ERROR for <err> values.

13.7.3 Defined Values

Caution: Restriction for `sel_code` parameter: only "SIM PIN" and "SIM PUK" codes are supported. Matching using the "*" wild card is not supported.

retries

Integer. Number of remaining retries per PIN.

default_retries

Integer. Number of default/initial retries per PIN.

code

Type of PIN. All values are listed under the description of the AT+CPIN command, `<code>` parameter, except `READY`.

ext_code

Extended: Manufacturer specific codes.

sel_code

String. Same values as for the `<code>` and `<ext_code>` parameters. These values are strings and use double quotes.

13.8 Change Password: AT+CPWD

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

See the current implementation limitation in *fac* parameter description.

13.8.1 Syntax

Command	Possible Response(s)
AT+CPWD=<fac>,<oldpwd>,<newpwd>	+CME ERROR: <err>
AT+CPWD=?	+CPWD: list of supported (<fac>,<pwdlength>)s

13.8.2 Description

This command sets a new password for the facility lock function defined by command Facility Lock AT+CLCK.

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: AT+CME ERROR for `<err>` values.

13.8.3 Defined Values

fac

String. Facility. See Facility Lock: AT+CLCK for other values.

Caution: Only the "SC" and "P2" facilities are currently implemented.

Table 231. 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>` shall be the same as password specified for the facility from the MT user interface or with command Change Password +CPWD and `<newpwd>` is the new password; maximum length of password can be determined with `<pwdlength>`.

pwdlength

Integer. Maximum length of the password for the facility

13.9 Restricted UICC Logical Channel Access: AT+CRLA

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

13.9.1 Syntax

Command	Possible Response(s)
AT+CRLA=<sessionid>,<command> [,<fileid>[,<P1>,<P2>,<P3> [,<data>[,<pathid>]]]]	+CRLA:<sw1>,<sw2> [,<response>] +CME ERROR: <err>
AT+CRLA=?	

13.9.2 Description

By using this command instead of the Generic UICC Access AT+CGLA, 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: AT+CME ERROR for <err> values.

13.9.3 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: Command passed on by the MT to the UICC; refer to 3GPP TS 31.101 [65].

NOTE 1: The MT internally executes all commands necessary for selecting the desired file, before performing the actual command.

Table 232. 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 XXXXXXXX.

NOTE 2: 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

Information to be written to the SIM (hexadecimal character format; refer to AT+CSCS)

pathid

String: Contains the path of an elementary file on the UICC in hexadecimal format (for example, "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

Response of a successful completion of the command previously issued (hexadecimal character format; refer to AT+CSCS).

STATUS and GET RESPONSE return data, which gives information about the current elementary data field. This information includes the type of file and its size (refer to 3GPP TS 31.101 [65]). After READ BINARY, READ RECORD or

RETRIEVE DATA command the requested data will be returned.

<response> is not returned after a successful UPDATE BINARY, UPDATE RECORD or SET DATA command.

13.10 Restricted SIM Access: AT+CRSM

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

13.10.1 Syntax

Command	Possible Response(s)
AT+CRSM=<command> [,<fileid> [,<P1>,<P2>,<P3> [,<data>[,<pathid>]]]]	+CRSM: <sw1>,<sw2> [,<response>] +CME ERROR: <err> OK
AT+CRSM=?	

13.10.2 Description

By using this command instead of Generic SIM Access +AT+SIM, 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 failure in the execution of the command in the SIM is reported in <sw1> and <sw2> parameters.

Refer to Mobile Termination Error Result Code: AT+CME ERROR 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.

13.10.3 Defined Values

command

Command passed on by the MT to the SIM. refer to 3GPP TS 51.011 [28].

Table 233. 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

All other values are reserved.

NOTE 1: The MT internally executes all commands necessary for selecting the desired file, before performing the actual command.

fileid

Integer. Identifier of a elementary datafile on SIM. Mandatory for every command except STATUS

NOTE 2: 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 at all.

P1, P2, P3

Integer. These parameters are mandatory for every command, except GET RESPONSE and STATUS. The values are described in 3GPP TS 51.011.

data

Hexadecimal. Information to be written to the SIM. See also Section Select TE Character Set: AT+CSCS.

pathid

String. Path of an elementary file on the SIM/UICC in hexadecimal format as defined in ETSI TS 102 221 [60] (for example, "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 3: 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. Response of a successful completion of the command previously issued. See also Section Select TE Character Set: AT+CSCS. STATUS and GET RESPONSE return information about the current elementary data field. This information includes the type of file and its size (refer to 3GPP TS 51.011 [28]). After READ BINARY, READ RECORD or RETRIEVE DATA command the requested data is returned.

<response> is not returned after a successful UPDATE BINARY, UPDATE RECORD or SET DATA command.

13.11 Generic SIM Access: AT+CSIM

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

13.11.1 Syntax

Command	Possible Response(s)
AT+CSIM= <length>, <command>	+CSIM: <length>, <response> +CME ERROR: <err> OK
AT+CSIM=?	

13.11.2 Description

This command transmits to the MT the <command> it must forward verbatim to the SIM. In the same manner, the SIM <response> is forwarded back by the MT to the TA verbatim.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

This command allows a direct control of the SIM by a distant application on the TE. The TE must take care of processing SIM information within the frame specified by GSM/UMTS.

Note: Compared to the Restricted SIM Access command AT+CRSM, the definition of AT+CSIM allows TE to take 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 (by 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.

13.11.3 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. Command passed on by the MT to the SIM in the format as described in 3GPP TS 51.011 [28]. See also Select TE Character Set: AT+CSCS.

response

Hexadecimal. response to the command passed on by the SIM to the MT in the format as described in 3GPP TS 51.011 [28]. See also Select TE Character Set: AT+CSCS.

13.12 Set Card Slot: AT+CSUS

13.12.1 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

13.12.2 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 authorized only when SIM/UICC is inactive. If write command is issued when a SIM/UICC is active (AT+CFUN=1 or AT+CFUN=4), 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: AT+CME ERROR 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 (`AT+CFUN=1`) or the device needs access to the SIM/UICC (`AT+CFUN=4`).

13.12.3 Defined Values

card_slot

Integer: Slot number n is $SIMn$ when identified on the product datasheet. The default selection depends on the product variant.

Table 234. 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).

13.13 Activate USAT Profile: AT+CUSATA

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

13.13.1 Syntax

Command	Possible Response(s)
<code>+CUSATA[=<activation>]</code>	<code>+CUSATA: <UICC_state></code> <code>[,<additional_profile_support>]</code> <code>+CME ERROR: <err></code>
<code>AT+CUSATA=?</code>	<code>+CUSATA: (list of supported <activation>s)</code>

13.13.2 Description

This 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 upon a `AT+CUSATA =1` or `AT+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].

The test command returns values supported as a compound value.

Refer to Section Mobile Termination Error Result Code: `AT+CME ERROR` for details on `<err>`.

13.13.3 Defined Values

activation

Integer: 0, 1, 2, or 3.

Table 235. activation

Value	Description
0	Return status information only, in information response: <code>AT+CUSATA: <UICC_state> [, <additional_profile_support>]</code> .
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 <code>AT+CUSATD=1</code>).
2	Download MT default profile.
3	Download the combined TE and MT profile (merger of the profiles written by <code>AT+CUSATW</code>) and 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 startup and entered active state.

Table 236. 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 <code>+CUSATD=2</code> was issued before restart. UICC start-up will continue upon <code>+CUSATA=2</code> or <code>+CUSATA=3</code> .
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 237. additional_profile_support

Value	Description
0	No support.
1	Supported.

proactive_command

String in hexadecimal character format. Proactive command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

13.14 Profile Download upon Start-Up: AT+CUSATD

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

13.14.1 Syntax

Command	Possible Response(s)
<code>+CUSATD=[<download> [, <reporting>]]</code>	<code>+CME ERROR: <err></code> OK
<code>AT+CUSATD?</code>	<code>+CUSATD: <download>, <reporting></code>
<code>AT+CUSATD=?</code>	<code>+CUSATD: (list of supported <download>s), (list of supported <reporting>s)</code>

13.14.2 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 behavior upon start-up. However, if the parameters of `AT+CUSATD`

have been set to other than default and then a restart is performed (for example, by AT+CFUN), these values determine the behavior.

This is true for only the next restart after altering AT+CUSATD parameter, since they are always restored to their default at the end of the next UICC start-up (i.e. when the USIM initialization as specified in 3GPP TS 31.102 [98] has been completed).

The command without parameters resets the parameters to their default values.

The command can only be used if the UICC is already in active state (<UICC_state>4, for example, 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+CUSATA=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: AT+CME ERROR for details on <err>.

13.14.3 Defined Values

download

Integer: 0, 1, Or 5. When/if to perform a profile download to UICC and which profile to download. The default value is implementation specific.

Table 238. 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].
5	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 239. reporting

Value	Description
0	Disable +CUSATS, that is, no notification.
1	Enable +CUSATS, that is, 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 240. 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.

13.15 Send USAT Envelope Command: AT+CUSATE

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

13.15.1 Syntax

Command	Possible Response(s)
+CUSATE=<envelope_command>	+CME ERROR: <err>
AT+CUSATT=?	

13.15.2 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 AT+CUSATA command description).

Refer to Mobile Termination Error Result Code: AT+CME ERROR for details on <err>.

13.15.3 Defined Values**envelope_command**

String type in hexadecimal character format. Envelope command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

envelope_response

String type in hexadecimal character format: 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 241. 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], subclause 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>.

13.16 Read USAT Profile: AT+CUSATR

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

13.16.1 Syntax

Command	Possible Response(s)
AT+CUSATR [=<profile_storage>]	[+CUSATR: <profile_storage>,<profile>] [<CR><LF>+CUSATR:<profile_storage>,<profile> [...]] +CME ERROR: <err> OK
AT+CUSATR=?	+CUSATR: (list of supported <profile_storage>s)

13.16.2 Description

This command AT+CUSATR=<profile_storage> returns the profile specified by <profile_storage>.

The command issued without parameter AT+CUSATR returns all profiles.

The test command returns values supported as a compound value.

Refer to Mobile Termination Error Result Code: AT+CME ERROR for details on <err>.

13.16.3 Defined Values

profile_storage

Integer: 0..5.

Table 242. 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.
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 [925%]).

profile

String in hexadecimal character format. 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].

13.17 Send USAT Terminal Response: AT+CUSATT

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

13.17.1 Syntax

Command	Possible Response(s)
+CUSATT=<terminal_response>	+CUSATE:<envelope_response> [,<busy>] [<CR><LF>+CUSATE2:<sw1>,<sw2>] +CME ERROR: <err>
AT+CUSATE=?	

13.17.2 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 Mobile Termination Error Result Code: AT+CME ERROR for details on <err>.

13.17.3 Defined Values

terminal_response

String in hexadecimal character format. Terminal response to a proactive command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

13.18 Write USAT Profile: AT+CUSATW

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

13.18.1 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)

13.18.2 Description

This command AT+CUSATR=<profile_storage> returns the profile specified by <profile_storage>.

The same command issued without parameter AT+CUSATR returns all profiles.

The test command returns values supported as a compound value.

Refer to Mobile Termination Error Result Code: AT+CME ERROR for details on <err>.

13.18.3 Defined Values

profile_storage

Integer: 0, 1, or 2.

Table 243. 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 execution command and in the information response.
5	Refers to a conflict between the TE profile and the list of MT only facilities. This value is not applicable in?the execution command.

profile

String: hexadecimal character format. 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

String: hexadecimal character format. 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].

13.19 Change PIN with <aid>: AT+SCPWD

13.19.1 Syntax

Command	Possible Response(s)
AT+SCPWD=<fac>, <pin>, <newPin>[, <aid>]	+CME ERROR:err

13.19.2 Description

This command allows changing PIN with *aid*.

13.19.3 Defined Values

fac

Facility type. Only the facility "SC" is supported.

pin

Value of PIN code

newpin

Value of new PIN code

aid

Application ID, if omitted USIM application is used

13.19.4 Example

```
AT+SCPWD="SC", 1234,5678,A0000000871004010203040506070809
OK
```

13.20 ICCID Read: AT+SQNCCID

13.20.1 Syntax

Command	Possible Response(s)
AT+SQNCCID	+CME ERROR: <err>
AT+SQNCCID?	+SQNCCID: <iccid>[, <euiccid>] OK +CME ERROR: <err>
AT+SQNCCID=?	+CME ERROR: <err>

13.20.2 Description

This command reads the ICCID (card identification number) on the SIM card.

Caution: Reading the CCID of the SIM card is only possible under CFUN=1 and CFUN=4. Any reading attempt while the modem is not in one of those cases will be unsuccessful and return no error.

The test command returns OK result code.

13.20.3 Defined Values

iccid

String. USIM integrated circuit card ID.

euiccid

String. eUICCID of the SIM card.

13.21 USIM Data Download Status: AT+SQNSIMDD

13.21.1 Syntax

Command	Possible Response(s)
AT+SQNSIMDD=<enable>	OK
AT+SQNSIMDD=?	+SQNSIMDD: (0-1)
AT+SQNSIMDD?	+SQNSIMDD: <enable>, <status>
Unsolicited Notification (URC)	+SQNSIMDD: <status>

13.21.2 Description

The read command should be used to retrieve current USIM data download status. This status is maintained until modem shut down.

The write command should be used to activate +SQNSIMDD USIM data download notification. If activated, an URC will be issued when an USIM data download starts or stops.

Notes:

- **enable**: The configuration persists over reset. The configuration also survives every modem LPM state (suspend state).
- **status**: survives every modem LPM state (suspend state).

13.21.3 Defined Values

enable

Integer: 0 or 1. USIM data download activity notification enable state.

Table 244. enable

Value	Description
0	Notification disabled (default value)
1	Notification enabled

status

Integer: 0, 1 or 2. USIM data download status

Table 245. 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

13.22 SIM State: AT+SQNSIMST

13.22.1 Syntax

Command	Possible Response(s)
AT+SQNSIMST=<enable>	OK
AT+SQNSIMST?	+SQNSIMST: <enable>, <status>
AT+SQNSIMST=?	+SQNSIMST: (0-1)
URC	+SQNSIMST: <status>[, <code>]

13.22.2 Description

This command enables or disables the URC `+SQNSIMST` that returns the SIM state.

The read command returns the current URC configuration.

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 state, though.

See also Mobile Termination Error Result Code: `AT+CME ERROR` for `<err>` values.

13.22.3 Defined Values

enable

Integer: 0 or 1. SIM status change notification enable state.

Table 246. enable

Value	Description
0	(default): Notification disabled
1	Notification enabled

status

Integer: 1..10. SIM card status.

Table 247. 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

13.23 Change STK APN Configuration: AT+SQNSTKAPNE

13.23.1 Syntax

Command	Possible Response(s)
<code>AT+SQNSTKAPNE=<apnname>,<iptype>,<enabled></code>	OK
<code>AT+SQNSTKAPNE?</code>	<code>+SQNSTKAPNE: <apnname>,<iptype>,<enabled></code> OK
<code>AT+SQNSTKAPNE=?</code>	<code>+SQNSTKAPNE: <apnname>, (ip, ipv6, ipv4v6), (0,1)</code> OK

13.23.2 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.

This setting is not persistent across reboots.

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.

13.23.3 Defined Values

iptype

String. IP stack description.

Table 248. iptype

Value	Description
ip	IPv4 only
ipv6	IPv6 only
ipv4v6	IPv4 and IPv6

enabled

Integer: 0 or 1. Status.

Table 249. enabled

Value	Description
0	APN is disabled
1	APN is enabled

13.23.4 Example

Set STK APN:

```
AT+SQNSTKAPNE="stktest","ipv4v6",1
OK
```

Read the current autoconnect setting:

```
AT+SQNSTKAPNE?
+SQNSTKAPNE: stktest,ipv4v6,1 OK
```

14. Short Message Service (SMS) Commands

14.1 Select Service for MO SMS Messages: AT+CGSMS

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

See the current implementation limitation in `service` parameter description.

14.1.1 Syntax

Command	Possible Response(s)
AT+CGSMS=[<i><service></i>]	
AT+CGSMS?	+CGSMS: <i><service></i>
AT+CGSMS=?	+CGSMS: (<i>list of supported <service>s</i>)

14.1.2 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.

14.1.3 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 250. 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)

14.2 Send Command: AT+CMGC

Note: This command is described in 3GPP TS 27.005. See Section *References*.

14.2.1 Syntax

Command	Possible Response(s)
If text mode (+CMGF=1): +CMGC=<fo>,<ct> [,<pid>[,<mn> [,<da>[,<toda>]]]]<CR>text<Ctrl-Z/ESC>	If text mode (+CMGF=1) and delivery OK: +CMGC: <mr>[,<scts>] If delivery fails: +CMS ERROR: <err>
AT+CMGC=?	

14.2.2 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 AT+CMGS, 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 AT+CMGS). 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 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: AT+CMS ERROR for <err> values.

14.3 Delete Message: AT+CMGD

Note: This command is described in 3GPP TS 27.005. See Section *References*.

See the current implementation limitation in *delflag* parameter description.

14.3.1 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)]

14.3.2 Description

This command deletes message from preferred message storage <mem1> 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, 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: AT+CMS ERROR for <err> values.

14.3.3 Defined Values

index

Integer.

delflag

Integer: 0..4. Indicates multiple message deletion request as follows:

Table 251. 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.
4	Delete all messages from preferred message storage including unread messages.

14.4 Message Format: AT+CMGF

Note: This command is described in *3GPP TS 27.005*. See Section *References*.

14.4.1 Syntax

Command	Possible Response(s)
AT+CMGF=[<mode>]	
AT+CMGF?	+CMGF: <mode>
AT+CMGF=?	+CMGF: (list of supported <index>s) [(list of supported <mode>s)]

14.4.2 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.

The test command returns supported modes as a compound value.

See also Message Service Failure Result Code: AT+CMS ERROR for <err> values.

14.4.3 Defined Values

mode

Integer: 0 or 1. Indicates multiple message deletion request as follows:

Table 252. mode

Value	Description
0	PDU mode (default when implemented)
1	Text mode

14.5 List Messages: AT+CMGL

Note: This command is described in 3GPP TS 27.005. See Section References.

14.5.1 Syntax

Command	Possible Response(s)
AT +CMGL=<stat>	<ul style="list-style-type: none"> If in text mode (+CMGF=1), the command is successful and SMS-SUBMITs and/or SMS-DELIVERs: +CMGL: <index>, <stat>, <oa/da>, [<alpha>][, <scts>][, <tooa/toda>, <length>]<CR><LF><data> [<CR><LF>+CMGL: <index>, <stat>, <da/oa>, [<alpha>][, <scts>][, <tooa/toda>, <length>]<CR><LF><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> [<CR><LF>+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> [<CR><LF>+CMGL: <index>, <stat>, <fo>, <ct>[...]] If in text mode (AT+CMGF=1), command successful and CBM storage: +CMGL: <index>, <stat>, <sn>, <mid>, <page>, <pages> <CR><LF><data> [<CR><LF>+CMGL: <index>, <stat>, <sn>, <mid>, <page>, <pages> <CR><LF><data>[...]] Otherwise:+CMS ERROR: <err>
AT+CMGL=?	+CMGL: (list of supported <stat>s)

14.5.2 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. 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 (for example, SMS-DELIVERs, SMS-SUBMITs, SMS-STATUS-REPORTs and SMS-COMMANDs), the response is a mix of the responses of different SM types. The TE application can recognize the response format by examining the third response parameter.

The test command shall give a list of all status values supported by the TA.

See also Message Service Failure Result Code: AT+CMS ERROR for <err> values.

14.5.3 Defined Values

stat

Integer: 0..4.

Table 253. 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 +CMGL command)

14.6 Read Message: AT+CMGR

Note: This command is described in 3GPP TS 27.005. See Section *References*.

14.6.1 Syntax

Command	Possible Response(s)
AT+CMGR=<index>	<ul style="list-style-type: none"> If in text mode (+CMGF=1), the command is successful and SMS-DELIVER: +CMGR: <stat>, <oa>[, <alpha>], <scts> [, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>] <CR><LF><data> 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>] <CR><LF><data> If in text mode (+CMGF=1), the command is successful and SMS-STATUS- REPORT: +CMGR: <stat>, <fo>, <mr>[, <ra>][, <tora>], <scts>, <dt>, <st> If in text mode (+CMGF=1), the command is successful and SMS-COMMAND: +CMGR: <stat>, <fo>, <ct> [, <pid>[, <mn>][, <da>][, <toda>], <length><CR><LF><cdata>] If in text mode (+CMGF=1), the command successful and CBM storage: +CMGR: <stat>, <sn>, <mid>, <dcs>, <page>, <pages> <CR><LF><data> Otherwise: +CMS ERROR: <err>
AT+CMGR=?	

14.6.2 Description

This command returns message with location value <index> from message storage <mem1> to the TE. About text mode parameters in italics, refer to command Show Text Mode Parameters: AT+CSDH. If status of the message is 'received unread', the status in the storage changes to 'received read'. If the reading fails, final result code +CMS ERROR: <err> is returned.

See also Message Service Failure Result Code: AT+CMS ERROR for <err> values.

14.6.3 Defined Values

index

Integer.

14.7 Send Message: AT+CMGS

Note: This command is described in 3GPP TS 27.005. See Section *References*..

14.7.1 Syntax

Command	Possible Response(s)
If in text mode (+CMGF=1): AT+CMGS=<da>[, <toda>]<CR>text<Ctrl-Z/ESC>	<ul style="list-style-type: none"> If in text mode (+CMGF=1) and delivery successful: +CMGS: <mr>[, <scts>] If delivery failed: +CMS ERROR: <err>
AT+CMGS=?	

14.7.2 Description

This command sends 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 +CSMS <service> value is 1 and the network supports) <scts> is returned. The values can be used to identify the message after an 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: AT+CMS ERROR for <err> values.

The entered text (3GPP TS 23.040 [3] TP-Data-Unit) is sent to address <da> and all current settings (refer to Set Text Mode Parameters AT+CSMP and Service Centre Address AT+CSCA) are used to construct the actual PDU in ME/TA.

The TA shall send a four character sequence <CR><LF><greater_than><space> (IRA 13, 10, 62, 32) after the command line is terminated with <CR>. 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`.

The entered text should be formatted as follows:

- If <dc> (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 to command Select TE Character Set `AT+CSCS` 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. (for example, 17 (IRA 49 and 55) will be converted to character (GSM 7 bit default alphabet 23)).
- if <dc> 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 (for example, 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.

14.8 Write Message to Memory: AT+CMGW

Note: This command is described in 3GPP TS 2.005. See Section *References*.

14.8.1 Syntax

Command	Possible Response(s)
If in text mode (+CMGF=1)	+CMGW: <index>
AT+CMGW=[<oa/da>[, <tooa/toda>[, <stat>]]]	+CMS ERROR: <err>
<CR> (text to enter) <Ctrl-Z/ESC>	
AT+CMGW=?	

14.8.2 Description

This command stores message (either SMS-DELIVER or SMS-SUBMIT) to 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 i allows also other status values to be given. The text transmission is done as in command Send Message: +CMGS. If writing fails, 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: AT+CMS ERROR for <err> values.

Note: SMS-COMMANDS and SMS-STATUS-REPORTS cannot be stored in text mode.

14.8.3 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) or string (text mode): Indicates the status of message in memory

Table 254. 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 supported by the associated memory

14.9 More Messages to Send: AT+CMMS

Note: This command is described in 3GPP TS 27.005. See Section References.

14.9.1 Syntax

Command	Possible Response(s)
AT+CMMS=<n>	
AT+CMMS?	+CMMS : <n>

14.9.2 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.

14.9.3 Defined Values

n

Integer.

Table 255. n

Value	Description
0	Disable
1	Keep enabled until the time between the response of the latest message send command (+CMGS, +CMSS, 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)

14.10 Message Service Failure Result Code: AT+CMS ERROR

Note: This command is described in 3GPP TS 27.005. See Section References.

14.10.1 Syntax

Command	Possible Response(s)
	+CMS ERROR: <err>

14.10.2 Description

Final result code +CMS ERROR: <err> indicates an error related to mobile equipment or network. The operation is similar to ERROR result code. None of the following commands in the same command line is executed. Neither ERROR nor OK result code shall be returned. ERROR is returned normally when error is related to syntax or invalid parameters.

14.10.3 Defined Values

err

Integer. The values used by common messaging commands:

Table 256. err

Value	Description
0...127	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
321	Invalid memory index
322	Memory full
330	SMSC address unknown
331	No network service
332	Network timeout
340	No +CNMA acknowledgement expected
500	Unknown error
...511	Other values in range 256...511 are reserved
512	Manufacturer specific

14.11 Send Message from Storage: AT+CMSS

Note: This command is described in 3GPP TS 27.005. See Section *References*.

14.11.1 Syntax

Command	Possible Response(s)
AT+CMSS=<index> [, <da>[, <tda>]]	<ul style="list-style-type: none"> If in text mode (+CMGF=1) and the sending is successful: +CMSS: <mr>[, <scts>] If sending fails: +CMS ERROR: <err>
AT+CMSS=?	

14.11.2 Description

This command sends message with the location value *<index>* from the preferred message storage *<mem2>* to the network (SMS-SUBMIT or SMS-COMMAND). If 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) *<scfs>* 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: AT+CMS ERROR for *<err>* values.

14.11.3 Defined Values

index

Integer.

14.12 Unsolicited Result Code AT+CMTI

Note: This command is described in 3GPP TS 27.005. See Section *References*.

14.12.1 Syntax

Command	Possible Response(s)
	+CMTI: <i><mem></i> , <i><index></i>

14.13 New Message Acknowledgement to ME/TA: AT+CNMA

Note: This command is described in 3GPP TS 27.005. See Section *References*.

See the current implementation limitation in command description.

14.13.1 Syntax

Command	Possible Response(s)
If in PDU mode (+CMGF=0): AT+CNMA[= <i><n></i>],[<i><length></i>] <CR>PDU is given<Ctrl-Z/ESC>	+CMS ERROR: <i><err></i>
If in Text mode (+CMGF=1): AT+CNMA AT+CNMA=?	+CMS ERROR: <i><err></i> If PDU mode (+CMGF=0): +CNMA: (<i>list of supported <n></i> s) If in Text mode (+CMGF=1):OK

14.13.2 Description

PDU Mode

Caution: Only parameter *<n>* is currently supported in PDU mode.

This command confirms reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer to command +CNMI tables 2 and 4). This acknowledgement command is used when +CSMS 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 +CMGS, except that the format of *<ackpdu>* is used instead of *<pdu>* (that is, 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 ME does not get 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 TE by setting both *<mt>* and *<ds>* values of +CNMI to zero.

Text Mode

The command confirms correct reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer to command +CNMI table 3.4.1-3 and table 3.4.1-5). This acknowledgement command (causing ME to send RP-ACK to the network) shall be used when the +CSMS parameter <service> equals 1. TA shall not send another +CMT or +CDS result code to TE before previous one is acknowledged.

If the ME does not get acknowledgement within required time (network timeout), ME should respond as specified in 3GPP TS 24.011 [6] to the network. ME/TA shall automatically disable 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 +CNMI parameter <mode> equals 0 or 2) or the AT interpreter remains in a state where result codes cannot be sent to TE too long (for example, user is entering a message using +CMGS), acknowledgement (RP-ACK) must be sent to the network without waiting for the +CNMA command from TE. Later, when buffered result codes are flushed to the TE, the TE must send the +CNMA acknowledgement for each result code. In this way, ME/TA can determine if message should be placed in non-volatile memory and routing to the TE disabled (+CNMA not received). Refer to AT+CNMI for more details how to use <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: AT+CMS ERROR for <err> values.

14.14 New Message Indications to TE: AT+CNMI

Note: This command is described in 3GPP TS 27.005. See Section References.

See the current implementation limitation in mode and mt parameters description.

14.14.1 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)

14.14.2 Description

This command selects the procedure of notification when new messages arrive from the network and the TE is active, for example, DTR signal is ON. If TE is inactive (for example, 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 AT&D0), reliable message transfer can be assured using +CNMA 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 is enabled. 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: AT+CMS ERROR for <err> values.

The test command gives the settings supported by the TA as compound values.

Note: Command Select Message Service AT+CSMS 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 AT+CNMA).

14.14.3 Defined Values

The following parameters are NOT supported:

- **<mode>**: '3'
- **<bm>**: '1' (broadcast is not supported)

mode

Integer. The buffering mechanism may as well be located in the ME; the setting affects only to unsolicited result codes specified within this command):

Table 257. 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 (for example, 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 (for example, 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 inband technique 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. Rules for storing received SMSs depend on its data coding scheme (refer to 3GPP TS 23.038 [2]), preferred memory storage (+CPMS) 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 258. mt

Value	Description
0	No SMS-DELIVER indications are routed to the TE.
1	If SMS-DELIVER is stored into ME/TA, the indication of the memory location is routed to the TE using unsolicited result code: +CMTI: <mem>,<index>
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: [<i><alpha></i>],<length><CR><LF><pdu> (PDU mode enabled); or +CMT: <oa>, [<i><alpha></i>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data> (text mode enabled. About parameters in italics, refer to command Show Text Mode Parameters in AT+CSDH) 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. Rules for storing received CBMs. These rules depend on its data coding scheme (refer to 3GPP TS 23.038 [2]), the setting of Select CBM Types (AT+CSCB) and this value:

Table 259. 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><CR><LF><pdu> (PDU mode enabled) or +CBM: <sn>, <mid>, <dc>, <page>, <pages><CR><LF><data> (text mode enabled) If ME supports data coding groups which define special routing also for messages other than class 3 (for example, (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.

Table 260. ds

Value	Description
0	No SMS-STATUS-REPORTs are routed to the TE.
1	SMS-STATUS-REPORTs are routed to the TE using unsolicited result code: +CDS: <length><CR><LF><pdu> (PDU mode enabled) or +CDS: <fo>, <mr>, [<ra>], [<tora>], <sects>, <dt>, <st> (text mode enabled)
2	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.

Table 261. 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.

14.15 Preferred Message Storage: AT+CPMS

Note: This command is described in 3GPP TS 27.005. See Section References.

14.15.1 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)

14.15.2 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: AT+CMS ERROR for *<err>* values.

14.16 Restore Settings: AT+CRES

Note: This command is described in 3GPP TS 27.005. See Section *References*.

See the current implementation limitation in the parameter's description.

14.16.1 Syntax

Command	Possible Response(s)
AT+CRES[= <i><profile></i>]	+CMS ERROR: <i><err></i>
AT+CRES=?	+CRES: (<i>list of supported <profile>s</i>)

14.16.2 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, Set Message Parameters AT+CSMP and Select Cell Broadcast Message Types AT+CSCB (if implemented) are restored. Certain settings may not be supported by the storage (for example, (U)SIM SMS parameters) and therefore cannot be restored.

See also Message Service Failure Result Code: AT+CMS ERROR for *<err>* values.

14.16.3 Defined Values

profile

Integer. Value in range 0...255. Manufacturer specific profile number from where settings are to be restored.

14.17 Save Settings: AT+CSAS

Note: This command is described in 3GPP TS 27.005. See Section *References*.

See the current implementation limitation in the parameters description.

14.17.1 Syntax

Command	Possible Response(s)
AT+CSAS[= <i><profile></i>]	+CMS ERROR: <i><err></i>
AT+CSAS=?	+CSAS: (<i>list of supported <profile>s</i>)

14.17.2 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 ServiceCentre Address AT+CSCA, Set Message Parameters AT+CSMP and Select Cell Broadcast Message Types +CSCB (if implemented) are saved. Certain settings may not be supported by the storage (for example, (U)SIM SMS parameters) and therefore are not saved.

See also Message Service Failure Result Code: AT+CMS ERROR for *<err>* values.

The test command shall display the supported profile numbers for reading and writing of settings.

14.17.3 Defined Values

profile

Integer. Value in range 0...255. Manufacturer specific profile number where settings are to be stored.

14.18 Service Centre Address: AT+CSCA

Note: This command is described in 3GPP TS 27.005. See Section *References*.

14.18.1 Syntax

Command	Possible Response(s)
AT+CSCA=<sc>[,<tosca>]	OK
AT+CSCA?	+CSCA : <sc>,<tosca> OK
AT+CSCA=?	OK

14.18.2 Description

This command updates the SMSC address, through which mobile originated SMS are transmitted. In text mode, setting is used by send and write commands. In PDU mode, setting is used by the same commands, but only when the length of the SMSC address coded into <pdu> parameter equals zero.

Important: It is recommended backup the Service Center Address in SMS *profile1* with AT+CSAS=1. It can then be restored by AT+CRES=1.

14.19 Show Text Mode Parameters: AT+CSDH

Note: This command is described in 3GPP TS 27.005. See Section *References*.

14.19.1 Syntax

Command	Possible Response(s)
AT+CSDH[=<show>]	
AT+CSDH?	+CSDH : <show>
AT+CSDH=?	+CSDH : (list of supported <show>s)

14.19.2 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.

14.19.3 Defined Values

show

Integer.

Table 262. show

Value	Description
0	Do not show header values defined in commands AT+CSCA and AT+CSMP(<sc>, <tosca>, <fo>, <vp>, <pid> and <dc>) nor <length>, <today> 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>, <today>, <length> or <cdata>.
1	Show the values in result codes

14.20 Set Text Mode Parameters: AT+CSMP

Note: This command is described in 3GPP TS 27.005. See Section *References*.

14.20.1 Syntax

Command	Possible Response(s)
AT+CSMP=[<fo>,<vp>,<pid>,<dc>]]]]	
AT+CSMP?	+CSMP : <fo>, <vp>, <pid>, <dc>
AT+CSMP=?	

14.20.2 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 for example to <pdu>) with double quotes.

Note: When storing a SMS-DELIVER from the TE to the preferred memory storage in text mode (refer to command Write Message to Memory +CMGW), <vp> field can be used for <scts>.

14.21 Select Message Service: AT+CSMS

Note: This command is described in 3GPP TS 27.005. See Section References.

See the current implementation limitation in the parameters description.

14.21.1 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>?)

14.21.2 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: AT+CMS ERROR for <err> values.

The read command returns supported message types along with the current service setting.

Test command returns a list of all services supported by the TA.

14.21.3 Defined Values

Caution: Restriction: cannot disable <mt>, <mo> and <bm> services.

service

Integer: 0..128.

Table 263. 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)
2...127	Reserved
128	Manufacturer specific

mt, mo, bm

Integer: 0 or 1.

Table 264. mt, mo, bm

Value	Description
0	Type not supported
1	Type supported

14.22 Stored SMS Statistics: AT+SQNSMSCOUNT

14.22.1 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

14.22.2 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 are returned for all possible <stat>.

The command has no impact on the status of messages (UNREAD or READ).

14.22.3 Defined Values

mem

String. Memory from which the messages are read.

Table 265. mem

Value	Description
"ME"	ME message storage
"SM"	(U)SIM message storage
"SR"	Status report storage

stat

String. Status of message in memory

Table 266. stat

Value	Description
"REC UNREAD"	Received unread message
"REC READ"	Received read message
"STO UNSENT"	Stored unsent message
"STO SENT"	Stored sent message
"ALL"	All messages

count

Integer. Number of SMS in storage <mem> with status <stat>.

14.22.4 Example

Example 1

```
AT+SQNSMSCOUNT="ME", "REC READ"
+SQNSMSCOUNT: 1,ME,REC READ OK
```

Example 2

```
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
```

14.23 Delete Long SMS: AT+SQNSMSDELETE

14.23.1 Syntax

Command	Possible Response(s)
AT+SQNSMSDELETE=<index>	OK

Command	Possible Response(s)
	+CME ERROR: <err>

14.23.2 Description

This command deletes the message <index> from the message storage <mem1>. If the message is segmented, all its segments are deleted.

14.23.3 Example

The first command deletes the SMS of index 0. The second command on the same index returns an error.

```
AT+SQNSMSDELETE=1
OK
```

```
AT+SQNSMSDELETE=1 +CMS
ERROR: 321
```

14.24 Get List of Indexes of Received SMS: AT+SQNSMSLIST

14.24.1 Syntax

Command	Possible Response(s)
AT+SQNSMSLIST	+SQNSMSLIST: <index>[,<index>[, ...]]
	+CMS ERROR: <err>

14.24.2 Description

This command returns the indexes of all stored messages. For segmented messages, it returns only one index (of one of its segments).

14.24.3 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
```

14.25 Send Multiline SMS: AT+SQNSMSMSEND

14.25.1 Syntax

Command	Possible Response(s)
AT+SQNSMSMSEND=<to>[,<save>[,<priority> [,<cbkNumber>]]]<CR> Text<Ctrl+Z/ESC>	+SQNSMSMSEND: ID,<internalId> [+SQNSMSMSEND: STORED,<mem>,<storageId>]
AT+SQNSMSMSEND=?	+SQNSMSMSEND: <to> [,<save>[,<priority> [,<cbkNumber>]]] <CR>Text<Ctrl+Z/ESC>

14.25.2 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 AT+SQNSMSEND, except that the text is entered on separate lines after the prompt <CR><LF><greater_than><space> (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.

14.25.3 Defined Values

to

String. Destination address.

save

Integer type

Table 267. save

Value	Description
0	Don't store SMS before sending.
1	Store SMS before sending.

priority

Integer, 3GPP2 only: 0, 1, 2, or 3

Note: This parameter is ignored in the current implementation.

Table 268. priority

Value	Description
0	NORMAL
1	INTERACTIVE
2	URGENT
3	EMERGENCY

cbkNumber

String type, 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.

14.25.4 Defined URCS

For each SMS segment, two URC are notified: the first URC is the status of sending attempt and the second is the status of network response.

```
+SQNSMSSSENDRES: SENT OK | SENT
ERROR,<internalId>,<mr>|<errorCause>
+SQNSMSSSENDRES: ACK OK | ACK
ERROR,<internalId>
[,<errorCause>]
```

With:

<mr>: integer type, TPDU message reference.

<errorCause>: integer type, error cause

14.25.5 Example

Send message:

```
AT+SQNSMSMMLSEND="+11325476980"
> This the first line.
> This is the last line.
+SQNSMSMMLSEND: ID,4
OK
+SQNSMSMMLSEND: SENT OK,4,44
+SQNSMSMMLSEND: 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
```

14.26 Read Long SMS: AT+SQNSMSREAD

14.26.1 Syntax

Command	Possible Response(s)
AT+SQNSMSREAD=<index>	+SQNSMSREAD: <stat>, <send-status>, <oa>, <scts>, <local-ts>, <priority>, <cbk-xnumber><CR><LF><text>

14.26.2 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.

14.26.3 Defined Values

stat

Same usage as AT+CMGR.

send_status

String.

Note: Only "UNUSED" is currently supported.

scts

Integer. Service center time stamp.

local_ts

String.

Note: Only value "00/00/00,00:00:00+00" is currently supported.

oa

String. Originating address.

priority

Integer. Message priority.

Note: Only value "0" is currently supported.

cbk_number

String.

Note: Only value "" is currently supported.

14.26.4 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
```


14.27 Send Long SMS: AT+SQNSMSSEND

14.27.1 Syntax

Command	Possible Response(s)
AT+SQNSMSSEND=<to>, <text> [, <save> [, <priority> [, <cbk-number>]]]	+SQNSMSSEND:ID,<internalId> [<CR><LF>+SQNSMSSEND:STORED,<mem>,<storageId>] OK

Note: Quotes are not supported.

14.27.2 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.

14.27.3 Defined Values

to

String. Destination number for the SMS message.

text

String. Text of the SMS message.

save

Integer: 1 or 0. Optional parameter.

Table 269. save

Value	Description
0	(default value) Do not save the SMS message.
1	Save the SMS message.

priority

Integer: 0, 1, or 3.

Note: This parameter is ignored in the current implementation.

Table 270. priority

Value	Description
0	Normal
1	Interactive
2	Urgent
3	Emergency

cbk number

String. 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.

Note: This parameter is ignored in the current implementation.

14.27.4 Defined URC

For each SMS segment, two URCs are notified. The first URC is the status of the sending attempt. The second URC is the status of the network response.

```
+SQNSMSSSEND: SENT OK|SENT ERROR,<internalId>,<mr>|
  <errorCause>
+SQNSMSSSEND: SENT OK,0,132
+SQNSMSSSEND: ACK OK|ACK ERROR,<internalId>
  [,<errorCause>
+SQNSMSSSEND: ACK OK,0
```

With:

`mr`: integer type, TPDU message reference.

`errorCause`: integer type, error cause

14.27.5 Examples

Send message

```
AT+SQNSMSSSEND="123456789","This is the SMS content"
```

Send message and save

```
AT+SQNSMSSSEND="123456789","This is the SMS content",1
```

Send message without saving and with callback number 11111

```
AT+SQNSMSSSEND="123456789","This is the SMS content",0,, "11111"
```

Full example with Error

```
AT
+SQNSMSSSEND="1234","01234567890123456789012345678901234567890"
+SQNSMSSSEND: ID,6
+SQNSMSSSEND: ID,7OK
+SQNSMSSSEND: SENT ERROR,6,500
+SQNSMSSSEND: SENT ERROR,7,500
```

Full example with OK+ACK

```
AT
+SQNSMSSSEND="1234","01234567890123456789012345678901234567890"
+SQNSMSSSEND: ID,6
+SQNSMSSSEND: ID,7OK
+SQNSMSSSEND: SENT OK,6,1
+SQNSMSSSEND: SENT OK,7,2
+SQNSMSSSEND: ACK OK,6 or +SQNSMSSSEND: ACK ERROR,6,1
+SQNSMSSSEND: ACK OK,7 or +SQNSMSSSEND: ACK ERROR,7,1
```

15. System Features Commands

15.1 Hard Reset: AT^RESET

15.1.1 Syntax

Command	Possible Response(s)
AT^RESET	Device is reset

15.1.2 Description

This command performs a hardware reset.

In order to optimize power consumption, the behavior of this command differs slightly from a power-down/power-up cycle or a `RESETN` signal activation. Notably, 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.

15.2 Unsolicited Commands +SHUTDOWN, +SYSSTART

15.2.1 Syntax

Command	Possible Response(s)
	+SYSSTART
	+SHUTDOWN

15.2.2 Description

The `+SYSSTART` URC indicates that the ME has started (or restarted after a `^RESET`) and is ready to operate.

The `+SHUTDOWN` URC indicates that the ME has completed the reset procedure and will restart.

15.3 Device Management Configuration: AT+SQNDMCFG

15.3.1 Syntax

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

15.3.2 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`).

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.

15.3.3 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)

15.4 UART Interface Power Saving Configuration: AT+SQNIPSCFG

15.4.1 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>]

15.4.2 Description

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

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 behavior. 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 (HW flow control supported and activated on UART interface). The module does not sleep as long as at least one RTS line is low.

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, for example, 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.
- In <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: AT+CME ERROR for <err> values.

15.4.3 Defined Values

mode

Integer: UART power saving mode.

Table 271. 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	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. 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).

Default configuration is 5000 ms.

15.5 Power Saving Configuration (Host Latency): AT+SQNPSCFG

15.5.1 Syntax

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

15.5.2 Description

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

The read command displays the active power saving configuration. The configuration is non-volatile (persistent over device reboot)

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: AT+CME ERROR for <err> values.

15.5.3 Defined Values

latency

Integer: 0 .. 10000. Maximum authorized wake-up latency in milliseconds

The module decides what deepest low power mode it go to and still exit within the required time.

Configuring a max latency below suspend wake-up time (about 4 seconds) will typically prevent the module to enter suspend mode.

Default configuration is 5000 ms.

15.6 PXL Configuration: AT+SQNPXLCFG

15.6.1 Syntax

Command	Possible Response(s)
AT +SQNPXLCFG=[<enable>]	OK
AT+SQNPXLCFG?	+SQNPXLCFG: <enable>OK
AT+SQNPXLCFG=?	+SQNPXLCFG: (0-1) OK

15.6.2 Description

This command should be used to activate or deactivate

CAUTION: The change must be followed by a device's reboot. The configuration is lost during software upgrade or factory reset.

15.6.3 Defined Values

enable

Integer: 0 or 1. PXL application state

Table 272. enable

Value	Description
0	PXL application disabled
1	Default value. PXL application enabled

15.7 Device Reset to Factory State: AT+SQNFACTORYRESET

15.7.1 Syntax

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

15.7.2 Description

This command performs a factory reset. This factory reset rewinds all non volatile parameters of the module back to the last restoration point. This includes any configuration change done with AT+SQNHWCFG, but also any persistent setting changed via any other AT command. 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.

Note: To create a restoration point, see Save Module Configuration: AT+SQNFACTORYSAVE.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

15.8 Read Data in NVM: AT+SQNSNVR

15.8.1 Syntax

Command	Possible Response(s)
AT+SQNSNVR="privatekey"[,<index>]	+SQNSNVR: <index>, "-----BEGIN RSA PRIVATE KEY <CR><LF> <8 first bytes> [...] <8 last bytes>" "-----END RSA PRIVATE KEY-----" [<CR><LF>+SQNSNVR: <index>, "-----BEGIN RSA PRIVATE KEY <CR><LF> <8 first bytes> [...] <8 last bytes>" "-----END RSA PRIVATE KEY " [...]] OK
AT +SQNSNVR="certificate", <index>,<size>[...]] <CR><LF><data>	+SQNSNVR: <type>...<type>... [<CR><LF>+SQNSNVR: <type>...
AT+SQNSNVR="json"[,<index>]	[...]]
AT+SQNSNVR="strid"[,<index>]	OK
AT+SQNSNVR?	ERROR +CME ERROR: <err>
AT+SQNSNVR=?	+SQNSNVR: "certificate", (list of supported <index>) +SQNSNVR: "privatekey", (list of supported <index>),(list of supported <mode>s) +SQNSNVR: "json", (list of supported <index>) +SQNSNVR: "strid", (list of supported <index>) OK

15.8.2 Description

Note: The commands AT+SQNSNVR and AT+SQNSNVW read and write data (certificates, etc.) from/to the non-volatile (NV) memory or from/to the Flash File System. Data stored in non-volatile memory is not affected by device reboots and software upgrades.

This command allows to read data (certificate, private key) stored in the non-volatile (NV) memory or the Flash File System.

Usage and syntax vary depending on the type of stored data.

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

This command dumps all certificates stored in the system.

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 available certificates are displayed, one per line.

- AT+SQNSNVR="privatekey"

This command dumps all the private keys stored in the system. Only the first 8 bytes and the last 8 bytes of the private key are displayed, separated by [. . .] characters.

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

This command dumps all JSON files stored in the system..

15.8.3 Defined Values

type

String: Type of data.

"certificate": Certificate data.

"privatekey": Private key data.

"json": Json data.

index

Integer:0..19. Certificate index.

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: Certificate thumbprint (the hash value).

15.8.4 Example

Read certificate at index 5

```
AT+SQNSNVR="certificate",5
+SQNSNVR:
"certificate",5,<issuer>,<serial-number>,<subject>,<valid- from>,<valid-
to>,<signature-algorithm>,<signature>,<thumbprint-algorithm>,<thumbprint>
OK
```

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=VeriSignTrust
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","36/07/1623:59:59","sha1RSA","0000 (...) 0000","sha1",
"b054ec81256dc47f1f0360e38fe30d6ccba35424"
```



```
+SQNSNVR: "certificate",1,"/OU=Amazon Web Services O=Amazon.comInc. 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-----"
```

15.9 Write Data in NVM: AT+SQNSNVW

15.9.1 Syntax

Command	Possible Response(s)
AT+SQNSNVW=<type>,...	OK
AT +SQNSNVW="certificate", <index>, <size> <CR><LF><data>	
AT +SQNSNVW="privatekey", <index>, <size> <CR><LF><data>	
AT+SQNSNVW="strid", <index>, <size> <CR><LF><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

15.9.2 Description

Note: The commands AT+SQNSNVR and AT+SQNSNVW read and write data (certificates, etc.) from/to the non-volatile (NV) memory or from/to the Flash File System. 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+SQNFACTORYRESET) clears all data written in NVRAM!

This command writes/deletes data (Certificate, etc.) to/from the non-volatile (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 certificate in the non-volatile memory. Once the operation is completed, public certificates are immediately available for all client secured IP connection (AT+SQNSUPGRADE, 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 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. Private keys are used by the AT+SQNSJWTENCODE command. Maximum <size> for private keys is 2 kB.

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

Write a string value to the non-volatile memory. Maximum <size> for strings is 1 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
```

15.9.3 Defined Values

type

String: Type of data.

"certificate": Certificate data.

"privatekey": Private key.

index

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

size

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

15.9.4 Example

Certificate upload at index 5:

```
AT+SQNSNVW="certificate",5,1346
-----BEGIN CERTIFICATE-----
MIIDXTCCAkwgAwIBAgIJAJC1 [...] j3tCx2IUxVqRs5m1SbvA==
-----END CERTIFICATE-----
OK
```

Remove certificate @ index 5:

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

Upload client private key with keyid 2:

```
$ AT+SQNSNVW="privatekey",2,1675
> -----BEGIN RSA PRIVATE KEY-----
...
-----END RSA PRIVATE KEY-----
OK
```

15.10 Device Shutdown: AT+SQNSSHDN

15.10.1 Syntax

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

15.10.2 Description

This command causes the device to detach from the network and shutdown. Before completing its shutdown, it returns an OK acknowledge. This command terminates any active or pending activity. The device will not answer any further command.

See also Mobile Termination Error Result Code: AT+CME ERROR for <err> values.

15.10.3 URC +SQNSSHDN

The +SQNSSHDN URC is issued on the AT port when the power down process has completed. This indicates that the power supply of the device can be safely removed.

15.11 Temperature Monitoring: AT+SQNTMON

15.11.1 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>

15.11.2 Description

This command activate/deactivate and configure temperature monitoring function.

Temperature range is split into 5 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 via the internal temperature sensor according to the following rules:

Every time the measured temperature switches to a new operation zone, the +SQNTMONS notification is issued

To avoid fluctuations between operating zones, a hysteresis of +/-2°C is applied to the raw temperature (non-configurable hysteresis value)

When the module operates in low or high temperature range, the module is still in good working condition.

When module enters in extreme temperature zones (low extreme or high extreme), then an URC will be issued to notify the dangerous working condition.

After 3 seconds, if the module is still in extreme zone and `<mode>` set to 2, the device sends a new URC (`+SQNTMONS:2,10,<temperature>`), then triggers an emergency shut-down procedure to avoid damage.

The `+SQNTMONS` URC is also sent after enabling the feature indication (by means of `<mode>` set 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: `AT+CME ERROR` for `<err>` values.

15.11.3 Defined Values

mode

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

Table 273. mode

Value	Description
0	Default value. Temperature monitoring disabled
1	Temperature monitoring activated with <code>+SQNTMONS</code> URC activated
2	Temperature monitoring activated with <code>+SQNTMONS</code> 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 274. 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 °C.

15.11.4 Example

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

15.12 Battery Voltage Monitoring: AT+SQNVMON

15.12.1 Syntax

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

15.12.2 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 using the internal voltage sensor every <period> seconds.

The voltage monitoring behaves according to the following rules:

- If the measured voltage goes below <threshold>, then the +SQNVMONS notification is issued
- After 3 seconds, if module is still below the threshold and <mode> is set to 2 or 4, the device will issue a new URC (+SQNVMONS:<mode>,10,<voltage>), then trigger an emergency shutdown procedure.

The +SQNVMONS URC is also issued after enabling the feature indication (by means of <mode> set to a value different than 0).

Note: Low power mode considerations:

- If <mode> is 3 or 4, voltage monitoring works when the module is active as well as when it is in deep sleep. 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 goes below the defined threshold, the module will wake up to issue the URC. It is therefore advised to configure the threshold at a level below which the LTE modem really needs to be awoken from deep sleep.

15.12.3 Defined Values

mode

Integer: 0..4. Voltage monitoring mode.

Table 275. 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 3s 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 3s after the first +SQNVMONS URC is sent

threshold

Integer: 22..55. Low voltage threshold in hundreds of millivolts. The default value is 25 (2.5V).

status

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

Table 276. status

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

voltage

Integer 22..55. Current VBAT voltage in hundreds of millivolts.

period

Integer. Periodicity at which VBAT is measured. Default is 30 s.

15.13 Wake Lock Management: AT+SQNWL

15.13.1 Syntax

Command	Possible Response(s)
AT+SQNWL=<app>[,<wl_mask>]	+CME ERROR:<err> +SQNWL:<app>,<wl_mask> OK
AT+SQNWL?	+SQNWL:<app1>,<mask1> [<CR><LF> ... <CR><LF>+SQNWL:<appN>,<maskN>[...]] OK
AT+SQNWL=?	+SQNWL:" ", (0-3) OK

15.13.2 Description

This command manages resources wake locks to indicate that a client application running on the Host CPU needs 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 <app> setting a wake lock to 1 should explicitly clear it when the resource is not needed any more.

15.13.3 Defined Values

app

String: Client application name.

wl_mask

Bitmask as integer: 0..3: Resources to keep available. Bits set to 1 to keep the resource available and prevent sleep mode

Table 277. 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.

16. Appendix: Abbreviations

Table 278. List of Abbreviations

Abbreviation	Description
A-PDU	Application Protocol Data Unit
DVI	Digital Voice Interface
GPIO	General Purpose Input output
I25%C	Inter-Integrated Circuit
I25%S	Integrated Interchip Sound
IMSI	International Mobile Subscriber Identification
MO	Mobile Originated
MT	Mobile Termination
PCM	Pulse Code Modulation
SCL	I2C Serial Clock Line
SDA	I2C Serial Data Line
SIM	Subscriber identity module
SMS	Short Message Service
TA	Terminal adapter
TDM	Time Division Multiplexing
TE	Terminal Equipment
UE	User Equipment
UICC	Universal Integrated Circuit Card (SIM)

17. Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Oct.17.22	—	First release document

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