ADRASTEA-I AT COMMANDS MANUAL

2615011136000

VERSION 1.0

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Revision history

Manual version	FW version	HW version	Notes	Date
1.0	1.0	1.0	• Initial release of the manual	April 2022

Abbreviations

Abbreviation	Name
3GPP	3rd Generation Partnership Project
ASCI	Advanced Speech Call Items
APN	Access Point Name
BCD	Binary Coded Decimal
DH	Deep Hibernation
EJTAG	Embedded Joint Test Action Group
GLONASS	Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GPIO	General Purpose Input Output
I2C	Inter-Integrated Circuit
IoT	Internet of Things
IMEI	International Mobile station Equipment Identity
IMEISV	International Mobile station Equipment Identity and Software Version number
LTE	Long Term Evolution
MCU	Micro controller Unit
MSIO	Master In Slave Out
ME	Mobile Equipment
MT	Mobile Termination
MTU	Maximum Transfer Unit
PSM	Power Save Mode
RAM	Random Access Memory
RLP	Radio Link Protocol
SIM	Subscriber Identity Module
SVN	Software Version Number
SPI	Serial Peripheral Interface
TA	Terminal Adaptor
TE	Terminal Equipment
UART	Universal Asynchronous Receiver/Transmitter
UE	User Equipment
UICC	Universal Integrated Circuit Card
USIM	Universal Subscriber Identity Module

Contents

1 Introduction

This document provides information about the AT command set supported by the Adrastea-I. Adrastea-I module is a compact LTE-M/NB-IoT Cellular module with integrated GNSS, integrated ARM Cortex-M4 and 1MB Flash memory for customer developed applications.

Based on Sony Altair ALT1250 chipset, Adrastea-I module provide AT-Command based multi-band configurability enabling international multi-regional coverage in LTE Cat M1 / NB1 radio access technologies.

Adrastea-I includes a fully integrated global navigation satellite system solution that supports GPS and GLONASS positioning systems.

The ARM Cortex-M4 processor is exclusively for user application software, and it offers 1 MB of flash and 256 kB of RAM dedicated to this use.

Compact 13.4mm x 14.6mm x 1.85mm design allows the module to fit in small-size applications.

The module can be operated through one of two available cellular communication technologies:

- LTE-Cat.M or
- LTE-Cat.NB-IoT.

Adrastea-I evaluation kit and "Adrastea Commander" tool allow getting started with the module and testing its functionalities. Evaluation board can be connected to an USB port of a PC. The evaluation board also represents our reference design. For further information, please refer to the evaluation board manual.

The module comes with declaration of conformity (CE), is compliant to RoHS, REACH and Deutsche Telekom certified.

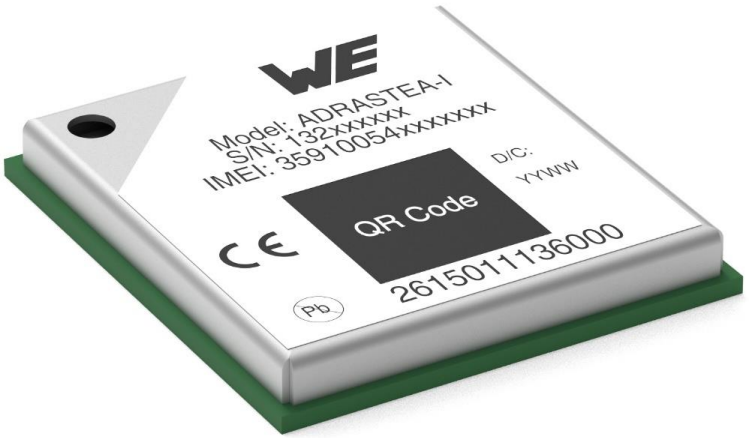

Figure 1: Adrastea-I

1.1 Adrastea-I Key Features

Feature	Description
Physical Dimenstions	13.4mm x 14.6mm x 1.85mm
Supported Networks	- LTE-Cat.M - LTE-Cat.NB-IoT
LTE Supported Bands	**LTE-Cat.M:**B2/B3/B4/B5/B8/B12/B20/B25/B26/B28 **LTE-Cat.NB-IoT:** B3/B5/B8/B20/B28
Module Interfaces	- USIM - UART - I2C Master - SPI Master - GPIO - ADC - JTAG
Integrated GNSS	Adrastea-I includes a fully integrated global navigation satellite system solution that supports below positioning systems: - GPS - GLONASS
Integrated User MCU	User MCU is exclusively for user application software: - ARM Cortex-M4 - 1 MB Flash Memory - 256 kB RAM
Output Power class	Power Class 3 (23 dBm)
Maximum Data Rate	**LTE-Cat.M:** Downlink: 300 Kbps,Uplink: 375 Kbps
	LTE-Cat.NB-IoT: Downlink: 27.2 Kbps, Uplink 62.5 Kbps
3GPP Standard Compliance	3GPP Release 13 compliant, Upgradable to Rel 14
Firmware Upgrade	- Firmware upgrade over USB interface - Firmware upgrade over air
Supported Protocols	- IPv4, IPv6 - TPC/UDP SOCKET - HTTP/HTTPS - TLS/DTLS - LWM2M Client - MQTT
AT Commands	3GPP TS 27.007 and 3GPP TS 27.005 (3GPP Release-13) AT commands, as well as Wurth Elektronik enhanced AT commands
Operating Voltage	- VDD: From 2.3 V to 4.3 V - VDD_FEM: From 3.1 V to 4.3 V
Temperature Range	Operation temperature: -40℃ to +85℃

Table 1: Module Key Features

1.2 AT command Syntax and Types

The AT commands are sent to the Adrastea-I module with the following generic syntax:

AT<+ or %><at_command_name> = <param1>,[<param2>]<CR><LF>

Following syntactical definitions apply for AT command syntax.

- AT: AT is is the command line prefix for AT commands.
- + or %: All standard AT commands starts with +. All wurth Elektronik enhanced AT commands begin with a percent sign %.
- <at_command_name>: It represents the name of the AT command.
- <param1>: Name enclosed in <angle brackets> is a syntactical element. Brackets themselves do not appear in the command line.
  - When AT command have more than 1 parameter then comma (,) is used as delimiter to separate each parameter.
  - A string type parameter should be enclosed between quotation marks "" i.e."STRING".
  - For number type parameter positive and negative counting numbers, as well as zero are allowed.

<param2> : Name enclosed in [square brackets] represents optional parameter of an AT command. Brackets themselves do not appear in the command line. When a parameter is not given, the value will be set to the default value provided in the command description.

  - If the optional parameter is at the end of AT command and this parameter is omitted then this parameter skipped entirely.
  - In case of multiple optional parameters, if a parameter is omitted then „ (two delimiters with no whitespace) are mandatory for omitted parameter.

- AT or at both is OK but other combinations ("aT" or "At" or "Ta") are not supported.
- Additional whitespaces in AT command is not allowed. Additional whitespaces will return ERROR by the module.
- <CR><LF>: Mandatory Command line termination characters <CR><LF>. To increase the readability these characters are not displayed on serial port console.
- When writing or sending an SMS, Ctrl-Z (SUB, 0x1A) or ESC (0x1B) terminates the command.

1.2.1 Test Command:

A test command provides the list of the values allowed by each parameter of the AT command.

Test Command Format:

```
AT+ <Command> =?
```

and

```
AT%<Command> =?
```

Where:
AT is the command line prefix.
"+ or %" is the prefix for extended commands.
<Command> is the body of a basic command.
=? represents a test command for checking possible subparameter values.

Test Command Example:

```
AT+CEREG=?
+CEREG: (0,1,2,3,4,5)

OK
```

1.2.2 Read Command:

A read command provides the current setting of the command parameters. It is used to find out the current command configuration.

Read Command Format:

```
AT+ <Command>?
```

and

```
AT%<Command>?
```

Where:
AT is the command line prefix.
"+ or %" is the prefix for extended commands.
<Command> is the body of a basic command.
? represents a read command.

Read Command Example:

```
AT+CEREG?
+CEREG: 2,5,"CB48","01CD6007",9

OK
```

1.2.3 Set Command:

A set command configures the preferred settings for the specified AT command.

Set Command Format:

```
AT+<Command>=1
```

and

```
AT%<Command>=1
```

Where:
AT is the command line prefix.
"+ or %" is the prefix for extended commands.
<Command> is the body of a basic command.
1 is a subparameter (multiple subparameters are separated by commas).

Set Command Example:

```
AT+CEREG=2
OK
```

1.2.4 Execute Command:

Execute command is to print information text or execute a specific action for the command.

Execute Command Format:

```
AT+<Command>
```

and

```
AT%<Command>
```

Where:
AT is the command line prefix.
"+ or %" is the prefix for extended commands.
<Command> is the body of a basic command.

Execute Command Example:

```
AT%CSQ
%CSQ: 13,99,30

OK
```

1.2.5 Unsolicited Result Code Command:

Unsolicited result codes indicates about status of operation.
Unsolicited result codes also indicates occurrence of an event not directly associated with issuance of an AT command.

Unsolicited Result Code Command Example:

```
%NOTIFYEV:"RRCSTATE",2

%NOTIFYEV: "SIB1"

%NOTIFYEV: "SIB1"

%NOTIFYEV:"RRCSTATE",0
```

1.3 Quick Lookup Table: AT Command Syntax and Types

Command Type	Command Format	Explanation
Test Command	AT+ <Command> =? AT% <Command> =?	A test command provides the list of the values allowed by each parameter of the AT command. **Where:** AT is the command line prefix. "+ or %" is the prefix for extended commands. <Command> is the body of a basic command. =? represents a test command for checking possible subparameter values. **Example:** AT+CEREG=?
Read Command	AT+<Command>? AT% <Command>?	A read command provides the current setting of the command parameters. It is used to find out the current command configuration. **Where:** AT is the command line prefix. "+ or %" is the prefix for extended commands. <Command> is the body of a basic command. ? represents a read command. **Example:** AT+CEREG?
Set Command	AT+<Command>=<...> AT% <Command> = <...>	A set command configures the preferred settings for the specified AT command. **Where:** AT is the command line prefix. "+ or %" is the prefix for extended commands. <Command> is the body of a basic command. 1 is a subparameter (multiple subparameters are separated by commas). **Example:** AT+CEREG=2
Execute Command	AT+<Command> AT% <Command>	Execute command is to print information text or execute a specific action for the command. **Example:** AT+CGSN
Unsolicited result code	%NOTIFYEV: "SIB1"	Unsolicited result codes indicates about status of operation. **Example:** %NOTIFYEV: "SIB1"

Table 2: AT Command Syntax and Types

2 General AT Commands

These commands are for the identification of the module.

2.1 +CGMI: Request Manufacturer Identification

The +CGMI command requests manufacturer identification.

Command	Command Type	Response
AT+CGMI	Execute	<manufacturer> or +CME ERROR: <err>
AT+CGMI?	Read	<manufacturer> OK
AT+CGMI=?	Test	OK

Table 3: AT+CGMI

Description:

Execution 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, the text will consist of a single line containing the name of the manufacturer, but manufacturers may choose to provide more information if desired.

Defined values:

<manufacturer>: The identification of manufacturer. Total number of characters, including line terminators , in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<CR> or OK<CR>

Example:

2.1.1 AT+CGMI: Execute Command

```
AT+CGMI

Wurth Elektronik eiSos

OK
```

2.1.2 AT+CGMI: Read Command

```
AT+CGMI?

Wurth Elektronik eiSos

OK
```

2.1.3 AT+CGMI: Test Command

```
AT+CGMI=?


OK
```

2.2 +CGMM: Request Model Identification

The +CGMM command requests identification model determined by manufacturer.

Command	Command Type	Response
AT+CGMM	Execute	<model> or +CME ERROR: <err>
AT+CGMM?	Read	<model> OK
AT+CGMM=?	Test	OK

Table 4: AT+CGMM

Description:

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

Defined values:

<model>:The identification model determined by manufacturer. Total number of characters, including line terminators , in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<CR> or OK<CR>.

Example:

2.2.1 AT+CGMM: Execute Command

```
AT+CGMM
```

```
WIRL-CLTI-ADRASTEA-I

OK
```

2.2.2 AT+CGMM: Read Command

```
AT+CGMM?

WIRL-CLTI-ADRASTEA-I

OK
```

2.2.3 AT+CGMM: Test Command

```
AT+CGMM=?


OK
```

2.3 +CGMR: Request Revision Identification

The +CGMM command requests the version of the product and other information determined by manufacturer.

Command	Command Type	Response
AT+CGMR	Execute	<revision> or +CME ERROR: <err>
AT+CGMR?	Read	<revision> OK
AT+CGMR=?	Test	OK

Table 5: AT+CGMR

Description:

Execution command causes the TA to return one or more lines of information text <revision>, determined by the MT manufacturer, which is intended to permit the user of the TA to identify the version, revision level or date, or other pertinent information of the MT to which it is connected to. Typically, the text will consist of a single line containing the version of the product, but manufacturers may choose to provide more information if desired.

Defined values:

<revision>:The version of the product and other information determined by manufacturer.Total number of characters, including line terminators , in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<CR> or OK<CR>.

Example:

2.3.1 AT+CGMR: Execute Command

```
AT+CGMR

ADRASTEA-I_06.006

OK
```

2.3.2 AT+CGMR: Read Command

```
AT+CGMR?

ADRASTEA-I_06.006

OK
```

2.3.3 AT+CGMR: Test Command

```
AT+CGMR=?


OK
```

2.4 +CGSN: Request Product Serial Number Identification

Execution command returns product serial number identification like IMEI, IMEISV, SVN.

Command	Command Type	Response
AT+CGSN=<n>	Execute	AT+CGSN=1 +CGSN: "<IMEI>" OK AT+CGSN=2 +CGSN: "<IMEISV>" OK AT+CGSN=3 +CGSN: "<SVN>" OK or +CME ERROR: <err>
AT+CGMI?	Read	+CME ERROR
AT+CGSN=?	Test	+CGSN: (0-3) OK

Table 6: AT+CGSN

Description:

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

Defined values:

<n>:integer type. Indicating the serial number type that has been requested.

Value	Description
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)

Table 7: +CGSN_Description

Example:

2.4.1 AT+CGSN: Execute Command

Below AT+CGSN=1 shall print IMEI of the module.

```
AT+CGSN=1

+CGSN:"359100540001992"

OK
```

Below AT+CGSN=2 shall print IMEISV of the module.

```
AT+CGSN=2

+CGSN:"3591005400019906"

OK
```

Below AT+CGSN=3 shall print SVN of the module.

```
AT+CGSN=3

+CGSN:"06"

OK
```

2.4.2 AT+CGSN: Read Command

```
AT+CGSN?

ERROR
```

2.4.3 AT+CGSN: Test Command

```
AT+CGSN=?

+CGSN: (0−3)

OK
```

2.5 +GSN: Request Product Serial Number Identification

Command	Command Type	Response
AT+GSN	Execute	<Adrastea-I serial Number> OK
AT+GSN?	Read	<Adrastea-I serial Number> OK
AT+GSN=?	Test	OK

Table 8: AT+GSN

Description:

Execution command causes the TA to return SN(Product Serial Number) information to identify the MT that the TE is connected to..

Defined values:

<Adrastea-Iserial Number>: Product Serial Number, Text shall not contain the sequence 0<CR> or OK<CR>.

Example:

2.5.1 AT+GSN: Execute Command

```
AT+GSN

132000199

OK
```

2.5.2 AT+GSN: Read Command

```
AT+GSN?

132000199

OK
```

2.5.3 AT+GSN: Test Command

```
AT+GSN=?


OK
```

2.6 +CIMI: Request International Mobile Subscriber Identity

Command	Command Type	Response
AT+CIMI	Execute	<IMSI> OK
AT+CIMI?	Read	ERROR
AT+CIMI=?	Test	OK

Table 9: AT+CIMI

Description:

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

Defined values:

<imsi>: string (without double quotes). International Mobile Subscriber Identity.

Example:

2.6.1 AT+CIMI: Execute Command

```
AT+CIMI

001010123456063

OK
```

2.6.2 AT+CIMI: Read Command

```
AT+CIMI?

ERROR
```

2.6.3 AT+CIMI: Test Command

```
AT+CIMI=?

OK
```

2.7 +CSCS: Select TE Character Set

Command	Command Type	Response
AT+CSCS=<chset>	Set	OK
AT+CSCS?	Read	+CSCS: <chset> OK
AT+CSCS=?	Test	+CSCS: ("UCS2","8859-1","IRA","PCCP437") OK

Table 10: AT+CSCS

Description:

Set command informs TA which character set is used by the TE. TA is then able to convert character strings correctly between TE and MT character sets.

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

Test command returns values supported as a compound value.

Defined values:

<chset>: string.

Value	Description
"UCS2"	16-bit universal multiple-octet coded character set. UCS2 character strings are converted to hexadecimal numbers from 0000 to FFFF. e.g. "004100620063" equals three 16-bit characters with decimal values 65, 98 and 99.
"8859-n"	ISO 8859 Latin n (1-6) character set.
"IRA"	International reference alphabet.
"HEX"	Character strings consist only of hexadecimal numbers from 00 to FF. e.g. "032FE6" equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set shall be done.
"PCCP437"	PC character set Code.

Table 11: +CSCS_Description

Example:

2.7.1 AT+CSCS: Set Command

```
AT+CSCS="8859−1"
OK
```

2.7.2 AT+CSCS: Read Command

```
AT+CSCS?
+CSCS: "8859−1"

OK
```

2.7.3 AT+CSCS: Test Command

```
AT+CSCS=?
+CSCS: ("UCS2","8859−1","IRA","HEX","PCCP437")

OK
```

2.8 +GCAP: Capabilities list

Command	Command Type	Response
AT+GCAP	Execute	+GCAP: +CLTE-M1 OK
AT+GCAP?	Read	ERROR
AT+GCAP=?	Test	ERROR

Table 12: AT+GCAP

Description:
This command gets the complete list of capabilities.
Example:

2.8.1 AT+GCAP: Execute Command

```
AT+GCAP

+GCAP: +CNB−1

OK
```

2.8.2 AT+GCAP: Read Command

```
AT+GCAP?

ERROR
```

2.8.3 AT+GCAP: Test Command

```
AT+GCAP=?

ERROR
```

2.9 +CFUN: Set phone functionality

Command	Command Type	Response
AT+CFUN=<fun>[,<rst>]	Set	OK
AT+CFUN?	Read	+CFUN: <fun>
AT+CFUN=?	Test	+CFUN: (list of supported <fun>s),(list of supported <rst>s)

Table 13: AT+CFUN

Description:

Set command selects the level of functionality <fun> in the module. Level "full functionality" has the highest power consumption. "Minimum functionality" has the lowest power consumption.

Defined values:

<fun>: integer.

Value	Description
0	minimum functionality
1	full functionality
2	Disable (turn off) MT transmit RF circuits only
3	Disable (turn off) MT receive RF circuits only
4	Disable phone both transmit and receive RF circuits

Table 14: +CFUN_FUN_Description

<rst>: integer.

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> power level

Table 15: +CFUN_RST_Description

Example:

2.9.1 AT+CFUN: Set Command

```
AT+CFUN=4

OK
```

2.9.2 AT+CFUN: Read Command

```
AT+CFUN?
+CFUN: 1

OK
```

2.9.3 AT+CFUN: Test Command

```
AT+CFUN=?
+CFUN: (0−1,4),(0−1)

OK
```

2.10 ATZ: Reset Device

Command	Command Type	Response
ATZ	Execute	OK

Table 16: ATZ

Description:

Reset device but doesn't return values to factory default.

Example:

2.10.1 ATZ: Execute Command

```
ATZ

OK
```

2.11 ATI: Display Product Identification Information

Command	Command Type	Response
ATI	Execute	Manufacturer: Model: Revision: OK

Table 17: ATI

Description:
Display Product Identification Information.
Example:

2.11.1 ATI: Execute Command

```
ATI

Manufacturer: Wurth Elektronik eiSos
Model: WIRL-CLTI-ADRASTEA-I
Revision: ADRASTEA-I_06.006

OK
```

2.12 AT&F0: Settings to Factory Default Values

Command	Command Type	Response
AT&F0	Execute	OK

Table 18: ATF0

Description:
TA sets all parameters to their defaults as specified by the manufacturer.
Example:

2.12.1 AT&F0: Execute Command

```
AT&F0

OK
```

2.13 ATV: Result Code Format Mode

Command	Command Type	Response
ATV[<value>]	Execute	OK

Table 19: ATV

Description:
DCE response format.
Defined values:
<value>: integer.

Value	Description
0	Displays result codes in numeric form.
1	Displays result codes in verbose form.

Table 20: ATV_Description

Example:

2.13.1 ATV: Execute Command

```
ATV0
OK
```

3 Network Service Related AT Commands

This chapter describes LTE network related commands.

3.1 +COPN: Read Operator Names

Command	Command Type	Response
AT+COPN	Execute	+COPN:<numeric1>,<alpha1> +COPN:<numeric2>,<alpha2> [...]] or +CME ERROR: <err>
AT+COPN?	Read	ERROR
AT+COPN=?	Test	OK

Table 21: AT+COPN

Description:

Execute command returns the list of operator names from the MT. Each operator code <numericn> that has an alphanumeric equivalent <alphan> in the MT memory shall be returned.

Defined values:

<numeric_n>: string. Operator in numeric format (see +COPS).

<alpha_n>: string. Operator in string format (see +COPS).

Example:

3.1.1 +COPN: Execute Command

```
AT+COPN
 .....
+COPN: "23003", "Vodafone␣CZ"
+COPN: "23001", "T−Mobile␣CZ"
+COPN: "23002", "O2␣−␣CZ"
+COPN: "26203", "o2␣−␣de"
+COPN: "26207", "o2␣−␣de"
+COPN: "26202", "Vodafone.de"
+COPN: "26201", "Telekom.de"
 ......
OK
```

3.1.2 +COPN: Test Command

```
AT+COPN=?

OK
```

3.2 +COPS: PLMN Selection

Command	Command Type	Response
AT+COPS=[<mode>[,<format>[,<operator>[,<AcT>]]]]	Set	OK or +CME ERROR: <err>
AT+COPS?	Read	+COPS:<mode>[,<format>,<operator>[,<AcT>]]
AT+COPS=?	Test	+COPS: [<stat>,long alphanumeric <operator> name,short alphanumeric <operator> name,numeric <operator>[,<AcT>])]

Table 22: AT+COPS

Description:

3.2.1 +COPS: Set Command

The +COPS command selects a PLMN automatically or manually, and reads and searches the current mobile network.
Set command forces an attempt to select and register the LTE network operator using the SIM/USIM card installed in the currently selected card slot.

<mode> is used to select whether the selection is done automatically or manually.

This command should be abortable when registration/deregistration attempt is made.

Syntax:

AT+COPS=[<mode>[,<format>[,<operator>[,<AcT>]]]]

Example:
The following command example selects the automatic network selection:

```
AT+COPS=0
OK
```

The following command manually selects network 26201:

```
AT+COPS=1,2,"26201"
OK
```

3.2.2 +COPS: Read Command

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.

Syntax:

AT+COPS?

Response Syntax:

+COPS:<mode>[,<format>,<operator>[,<AcT>]]

Example:

3.2.3 +COPS: Read Command

```
AT+COPS?
+COPS: 0,0,"Telekom.de",9

OK
```

3.2.4 +COPS: Test Command

Test command returns a set of five parameters, each representing an operator present in the network. Details of 5 parameters are as below:

1. A set consists of an integer indicating the availability of the operator <stat>.
2. long alphanumeric format of the name of the operator.
3. short alphanumeric format of the name of the operator.
4. numeric format representation of the operator.
5. Access technology.

Syntax:

AT+COPS=?

Response Syntax:

+COPS: [<stat>,long alphanumeric <operator>,short alphanumeric <operator>,numeric <operator>[,<AcT>])]
Example:

```
AT+COPS=?
+COPS: (1,"Telekom.de","TDG","26201",9),,(0−3),(0−2)

OK
```

Defined values:

<mode>: integer.

Value	Description
0	automatic (<operator> field is ignored).
1	manual (<operator> field shall be present, and <AcT> optionally).
2	deregister 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.

Table 23: +COPS_Mode_Description

<format>: integer.

Value	Description
0	long format alphanumeric <operator>.
1	short format alphanumeric <operator>.
2	numeric <oper>.

Table 24: +COPS_Format_Description

<operator>: string.
<format>:integer. Indicates if the format is alphanumeric or numeric.

Value	Description
0	long format alphanumeric <operator>
1	short format alphanumeric <operator>
2	numeric <operator>

Table 25: +COPS_Format_Description

<stat>: integer.

Value	Description
0	Unknown.
1	Available.
2	Current.
3	Forbidden.

Table 26: +COPS_Stat_Description

<Act>: integer. The parameter sets/shows the access technology selected.

Value	Description
0	GSM.
1	GSM Compact.
2	UTRAN.
3	GSM with EGPRS.
4	UTRAN with HSDPA.
5	UTRAN with HSUPA.
6	UTRAN with HSDPA and HSUPA.
7	E-UTRAN.
9	E-UTRAN (NB-S1 Mode).

Table 27: +COPS_Act_Description

3.3 +CSQ: Signal quality

Command	Command Type	Response
AT+CSQ	Execute	+CSQ: <rssi>,<ber> OK
AT+CSQ?	Read	ERROR: <err>
AT+CSQ=?	Test	+CSQ: (0-31,99), (0-7,99) OK

Table 28: AT+CSQ

Description:

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

Defined values:

<rssi>: integer. Received signal strength indication.

Value	Description
0	-113 dBm or less
1	-111 dBm
2...30	-109 .. -53 dBm (Increase of 2dBm for each increasing value)
31	-51 dBm or greater
99	not known or not detectable

Table 29: +CSQ_rssi_Description

<ber>: Integer. Channel bit error rate (in percent).

Value	Description
0...7	as RXQUAL values in the table in 3GPP TS 45.008 Release-13 subclause 8.2.4
99	not known or not detectable

Table 30: +CSQ_Ber_Description

3.4 +CESQ: Extended Signal Quality

Command	Command Type	Response
AT+CESQ	Execute	+CESQ: <rxlev>,<ber>,<rscp>,<ecno>,<rsrq>,<rsrp> +CME ERROR: <err>
AT+CESQ=?	Test	+CESQ: (list of supported <rxlev>), ,(list of supported <ber>),(list of supported <rscp>),(list of supported <ecno>), (list of supported <rsrq>),(list of supported <rsrp>)

Table 31: AT+CESQ

Description:

Execution command returns received signal quality parameters. If the current serving cell is not a 2G cell, <rxlev> and <ber> are set to value 99. If the current serving cell is not a 3G FDD or 3G 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 LTE cell, <rsrq> and <rsrp> are set to 255

Test command returns values supported as compound values.

Defined values:

<rxlev>: integer. For LTE set to value 99 (not known or not detectable).
<ber>: integer. For LTE set to value 99 (not known or not detectable).
<rscp>: integer. For LTE set to 255 (not known or not detectable).
<ecno>: integer. For LTE set to 255 (not known or not detectable).
<rsrq>: integer. Reference signal received quality.

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

Table 32: +CESQ_rsrq_Description

<rsrp>: integer. Reference signal received power.

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

Table 33: +CESQ_rsrp_Description

3.5 +CPSMS: Power Saving Mode Setting

Command	Command Type	Response
AT+CPSMS=[<mode>[, <Requested_Periodic-RAU>[, <Requested_GPRSREADYtimer>[, <Requested_Periodic-TAU>[, <Requested_Active-Time>]]]]]	Set	OK
AT+CPSMS?	Read	+CPSMS:<mode>,[<Requested_Periodic-RAU>], [<Requested_GPRS-READYtimer>], <Requested_Periodic-TAU>], [<Requested_Active-Time>]
AT+CPSMS=?	Test	+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)

Table 34: AT+CPSMS

Description:

The set command controls the setting 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 TAU value in LTE and the requested Active Time value. See the unsolicited result codes provided by commands +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= (with all parameters omitted). In this form, the parameter <mode> will be set to 0, the use of PSM will be disabled and data for all parameters in command +CPSMS will be removed or, if available, set to the manufacturer specific default values.

The read command returns the current parameter values.

The test command returns the requested extended periodic TAU value in LTE and the requested Active Time value as compound values.

Defined values:

<mode>: integer.

Value	Description
0	Disable PSM.
1	Enable PSM.

Table 35: +CPSMS_Mode_Description

<Requested_Periodic-RAU>:string. Ignored for LTE.

<Requested_GPRS-READY-timer>: string. Ignored for LTE.

<Requested_Periodic-TAU>: string. One byte in an 8 bit format. Requested extended periodic TAU value (T3412) to be allocated to the UE in LTE.This paramter is Optional. When this parameter is omitted the default value, is manufacturer specific.

The requested extended periodic TAU value is coded as one byte coded as bit format (e.g. "01000111" equals 70 hours).

Bits 5 to 1 represent the binary coded timer value.
Bits 8 to 6 define the timer value unit as follows:

value	Description
0 0 0	value is incremented in multiples of 10 minutes.
0 0 1	value is incremented in multiples of 1 hour.
0 1 0	value is incremented in multiples of 10 hours.
0 1 1	value is incremented in multiples of 2 seconds.
1 0 0	value is incremented in multiples of 30 seconds.
1 0 1	value is incremented in multiples of 1 minute.
1 1 0	value is incremented in multiples of 320 hours.
1 1 1	value indicates that the timer is deactivated.

Table 36: CPSMS_T3412_Timer_value

<Requested_Active-Time>: string. One byte in an 8 bit format. Requested Active Time value (T3324) to be allocated to the UE.This paramter is Optional. When this parameter is omitted the default value, is manufacturer specific.

The requested Active Time value is coded as one byte coded as bit format (e.g. "00100100" equals 4 minutes).

Bits 5 to 1: Represent the binary coded timer value. Bits 6 to 8: Defines the timer value unit for the GPRS timer as follows:

value	Description
0 0 0	value is incremented in multiples of 2 seconds.
0 0 1	value is incremented in multiples of 1 minute.
0 1 0	value is incremented in multiples of decihours.
1 1 1	value indicates that the timer is deactivated.

Table 37: CPSMS_Active_Timer_value

Example:
Following command enables PSM and sets timer T3412 value to 60s and T3324 to 10s.

```
AT+CPSMS=1,,,"10100001","00000101"

OK
```

Following command disable PSM.

```
AT+CPSMS=0

OK
```

3.6 +CEDRXRDP: eDRX Read Dynamic Parameters

Command	Command Type	Response
AT+CPWD	Execute	+CEDRXRDP: <AcT-type>[,<Requested_eDRX_value>[, value>[,<NW-provided_eDRX_value>[, <Paging_time_window>]]]
AT+CEDRXRDP=?	Test	OK

Table 38: AT+CEDRXRDP

Description:

The execution command returns <AcT-type>, <Requested_eDRX_value>, <NW-provided_eDRX_value> and <Paging_time_window>.

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

Defined values:

<AcT-type>: integer. Indicates the type of access technology. This is used to specify the relationship between the type of access technology and the requested eDRX value.

Value	Description
0	Access technology is not using eDRX
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)

Table 39: +CEDRXRDP_Act_Type_Description

<Requested_eDRX_value>: string. Half a byte in a 4 bit format.

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 Release-13).

<NW-provided_eDRX_value>:string. Half a byte in a 4 bit format.

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 Release-13).

value	E-UTRAN eDRX cycle length duration
0 0 0 0	5.12 seconds (Refer to Note1)
0 0 0 1	10.24 seconds (Refer to Note1)
0 0 1 0	20.48 seconds
0 0 1 1	40.96 seconds
0 1 0 0	61.44 seconds (Refer to Note1)
0 1 0 1	81.92 seconds
0 1 1 0	102.4 seconds (Refer to Note1)
0 1 1 1	122.88 seconds (Refer to Note1)
1 0 0 0	143.36 seconds (Refer to Note1)
1 0 0 1	163.84 seconds
1 0 1 0	327.68 seconds
1 0 1 1	655,36 seconds
1 1 0 0	1310.72 seconds
1 1 0 1	2621.44 seconds
1 1 1 0	5242.88 seconds (Refer to Note2)
1 1 1 1	10485.76 seconds (Refer to Note)

Table 40: NW_Provided_eDRX_Value

Note1: The value is applicable only in WB-S1 mode. If received in NB-S1 mode it is interpreted as 0010 by this version of the protocol.

Note2: The value is applicable only in NB-S1 mode. If received in WB-S1 mode it is interpreted as 1101 by this version of the protocol.

<Paging_time_window>: string. Half a byte in a 4 bit format.
Below Table is applicable for LTE-M:

value	Paging Time Window length	Unit
0 0 0 0	1.28	seconds
0 0 0 1	2.56	seconds
0 0 1 0	3.84	seconds
0 0 1 1	5.12	seconds
0 1 0 0	6.4	seconds
0 1 0 1	7.68	seconds
0 1 1 0	8.96	seconds
0 1 1 1	10.24	seconds
1 0 0 0	11.52	seconds
1 0 0 1	12.8	seconds
1 0 1 0	14.08	seconds
1 0 1 1	15.36	seconds
1 1 0 0	16,64	seconds
1 1 0 1	17.92	seconds
1 1 1 0	19.20	seconds
1 1 1 1	20.48	seconds

Table 41: LTEM_PTW_Value

Below Table is applicable for NB-IoT:

value	Paging Time Window length	Unit
0 0 0 0	2.56	seconds
0 0 0 1	5.12	seconds
0 0 1 0	7.68	seconds
0 0 1 1	10.24	seconds
0 1 0 0	12.8	seconds
0 1 0 1	15.36	seconds
0 1 1 0	17.92	seconds
0 1 1 1	20.48	seconds
1 0 0 0	23.04	seconds
1 0 0 1	25.6	seconds
1 0 1 0	28.16	seconds
1 0 1 1	30.72	seconds
1 1 0 0	33.28	seconds
1 1 0 1	35.84	seconds
1 1 1 0	38.4	seconds
1 1 1 1	40.96	seconds

Table 42: NB-IoT_PTW_Value

3.7 +CEDRXS: eDRX Setting

Command	Command Type	Response
AT+CEDRXS=[<mode>,[,<AcT-type>[,<Requested_eDRX_value>]]]	Set	OK
AT+CEDRXS?	Read	+CEDRXS:<AcT-type>, <Requested_eDRX_value>
AT+CEDRXS=?	Test	+CEDRXS: (list of supported <mode>), (list of supported <AcT-type>), (list of supported <Requested_eDRX_value>)

Table 43: AT+CEDRXS

Description:

The set 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.

The set command also controls the presentation of an unsolicited result code +CEDRXP:<AcTtype>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value> [,<Paging_time_window>]]]

A special form of the command can be given as +CEDRXS=3. In this form, eDRX will be disabled and data for all parameters in the command +CEDRXS will be removed or, if available, set to the manufacturer specific default values.

The read command returns the current settings for each defined value of <AcT-type>.

The test command returns the supported <mode> and the value ranges for the access technology and the requested eDRX value as compound values.

Defined values:

<mode>: integer. Indicates to disable or enable the use of eDRX in the UE.

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.

Table 44: +CEDRXS_Act_Description

<AcT-type>: integer. Indicates the type of access technology.

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)

Table 45: +CEDRXS_Act_Type_Description

<Requested_eDRX_value>: string. Half a byte in a 4 bit format.
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 Release-13).

value	E-UTRAN eDRX cycle length duration
0 0 0 0	5.12 seconds (Refer to Note1)
0 0 0 1	10.24 seconds (Refer to Note1)
0 0 1 0	20.48 seconds
0 0 1 1	40.96 seconds
0 1 0 0	61.44 seconds (Refer to Note1)
0 1 0 1	81.92 seconds
0 1 1 0	102.4 seconds (Refer to Note1)
0 1 1 1	122.88 seconds (Refer to Note1)
1 0 0 0	143.36 seconds (Refer to Note1)
1 0 0 1	163.84 seconds
1 0 1 0	327.68 seconds
1 0 1 1	655,36 seconds
1 1 0 0	1310.72 seconds
1 1 0 1	2621.44 seconds
1 1 1 0	5242.88 seconds (Refer to Note2)
1 1 1 1	10485.76 seconds (Refer to Note)

Table 46: Requested_eDRX_Value

Note1: The value is applicable only in WB-S1 mode. If received in NB-S1 mode it is interpreted as 0010 by this version of the protocol.
Note2: The value is applicable only in NB-S1 mode. If received in WB-S1 mode it is interpreted as 1101 by this version of the protocol.

<NW-provided_eDRX_value>: string. Half a byte in a 4 bit format.

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 Release-13).
Refer to Table: 40

<Paging_time_window>: string type; half a byte in a 4 bit format;

For LTE-M Values refer to Table:41.
For NB-IoT Values refer to Table:42.

Example:
Following command enables eDRX and sets requested value to 20.48 seconds.

```
AT+CEDRXS=1,4,"0010"

OK
```

3.8 +CRCES: Reading Coverage Enhancement Status

Command	Command Type	Response
AT+CRCES	Execute	+CRCES: <AcT>,<CE_level>,<CC> OK
AT+CRCES?	Read	ERROR
AT+CRCES=?	Test	OK

Table 47: AT+CRCES

Description:

Read command returns the coverage enhancement status of the MT. The terminal can consider the coverage enhancement status prior to deciding to transmit data. Depending on the coverage enhancement status the terminal can refrain from transmitting data.

The coverage enhancement status is only provided by the MT if the access technology of the serving cell is EUTRAN, or E-UTRAN (NB-S1 mode). For all other access technology of the serving cell is different, <Act>=0 is indicated.

Defined values:

<Act>: integer. Access technology of the serving cell;

Value	Description
0	Serving cell has no coverage enhancement
1	E-UTRAN
2	EC-GSM-IoT (A/Gb mode)
3	E-UTRAN (NB-S1 mode) (see NOTE 1)

Table 48: +CRCES_Act_Description

NOTE 1:: 3GPP TS 36.331 Release-13 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).

<CE_level>:integer. Coverage Enhancement (CE) level of the MT in the serving cell. Applicable only if <Act>=1 (E-UTRAN) or <Act>=3 (E-UTRAN (NB-S1 mode)). Coverage Enhancement levels are defined and specified in 3GPP TS 36.331 Release-13.

Value	Description
0	No Coverage Enhancement in the serving cell
1	Coverage Enhancement level 0
2	Coverage Enhancement level 1
3	Coverage Enhancement level 2
4	Coverage Enhancement level 3

Table 49: +CRCES_CE_Level_Description

<CC>:integer. Coverage Class (CC) of the MT in the serving cell. For LTE it is set to 0.

Value	Description
0	No Coverage Class in the serving cell
1	Coverage Class 1
2	Coverage Class 2
3	Coverage Class 3
4	Coverage Class 4
5	Coverage Class 5

Table 50: +CRCES_CC_Description

3.9 +CSODCP: Sending of Originating data via the control plane

Command	Command Type	Response
AT+CSODCP=<cid>, <cpdata_length>,<cpdata> [,<RAI>[,<type_of_user_data>]]	Set	OK or ERROR
AT+CSODCP=?	Test	+CSODCP: (1),(1500),(0,1,2),(0,1) OK

Table 51: AT+CSODCP

Description:

The set command is used by the TE to transmit data over control plane to network via MT. Context identifier <cid> isused to link the data to particular context.

This command optionally indicates that the application on the MT expects that the exchange of data:

- Will be completed with this uplink data transfer.
  or
- Will be completed with the next received downlink data.

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

This command causes transmission of an ESM DATA TRANSPORT message, as defined in 3GPP TS 24.301 Release-13.

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

Defined values:

<cid>: integer. A numeric parameter which specifies a particular EPS bearer context definition.

< cpdata_length>: integer. Indicates the number of octets of the <cpdata> information element. When there is no data to transmit, the value shall be set to zero.

<cpdata>: string. Contains the user data container contents (refer 3GPP TS 24.301 Release-13 subclause 9.9.4.24). When there is no data to transmit, the <cpdata> shall be an empty string ("").

<RAI>: integer. Indicates the value of the release assistance indication, refer 3GPP TS 24.301 subclause 9.9.4.25 Release-13.

Value	Description
0	No information available
1	The MT expects that exchange of datawill be completed with the transmission of the ESM DATA TRANSPORT message.
2	The MT expects that exchange of data will be completed with the receipt of an ESM DATA TRANSPORT message

Table 52: +CSODCP_RAI_Description

<type_of_user_data>:integer. Indicates whether the user data that is transmitted is regular or exceptional.

Value	Description
0	Regular data.
1	Exception data.

Table 53: +CSODCP_Type_of_data_Description

3.10 +CRTDCP: Reporting of terminating data via the control plane

Command	Command Type	Response
AT+CRTDCP=[<reporting>]	Set	OK or ERROR
AT+CRTDCP?	Read	+CRTDCP: <reporting>
AT+CRTDCP=?	Test	+CRTDCP: (list of supported <reporting>), (range of supported <cid>), (maximum number of octets of user data indicated by <cpdata_length>)

Table 54: AT+CRTDCP

Description:

The set command is used to enable and disable reporting of data from the network to the MT that is transmitted via the control plane in downlink direction. If reporting is enabled, the MT returns the unsolicited result code when data is received from the network. +CRTDCP: <cid>,<cpdata_length>,<cpdata>

Read command returns the current settings.

Test command returns supported values as compound values.

Defined values:

<reporting>: integer. Controlling reporting of mobile terminated control plane data events.

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

Table 55: +CRTDCP_Reporting_Description

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

<cpdata_length>:integer. Indicates the number of octets of the <cpdata> information element. When there is no data to transmit, the value shall be set to zero.

<cpdata>:string. Contains the user data container contents.

4 (U)SIM Related AT Commands

4.1 +CIMI: Request International Mobile Subscriber Identity

Command	Command Type	Response
AT+CIMI	Execute	<IMSI> OK
AT+CIMI?	Read	ERROR
AT+CIMI=?	Test	OK

Table 56: AT+CIMI

Description:

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

Defined values:

<imsi>: string (without double quotes). International Mobile Subscriber Identity.

Example:

4.1.1 AT+CIMI: Execute Command

```
AT+CIMI

001010123456063

OK
```

4.1.2 AT+CIMI: Read Command

```
AT+CIMI?

ERROR
```

4.1.3 AT+CIMI: Test Command

```
AT+CIMI=?

OK
```

4.2 +CLCK: Facility lock

Command	Command Type	Response
AT+CLCK=<fac>,<mode> [,<password>]	Set	+CME ERROR: <err> when <mode>=2 and command successful: +CLCK: <status>
AT+CLCK?	Read	ERROR
AT+CLCK=?	Test	+CLCK: ("SC","PN","PU","PS") OK

Table 57: AT+CLCK

Description:

Set 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 line for 'not active' case (<status>=0) will be returned only if service is not active for any <class>.

This command should be abortable when network facilities are set or interrogated.

Test command returns facility values supported as a compound value.
Defined values:

<fac>: string. facility.

Value	Description
"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)
"PN"	Network Personalization
"PU"	Network subset Personalization
"PS"	PH SIM (lock PHone to SIM/UICC card installed in the currently selected card slot)

Table 58: +CLCK_fac_Description

<mode>: integer.

Value	Description
0	Unlock
1	Lock
2	Query status

Table 59: +CLCK_Mode_Description

<password>: string.

<status>: integer.

Value	Description
0	Not Active
1	Active

Table 60: +CLCK_Status_Description

4.3 +CNUM: Subscriber number

Command	Command Type	Response
AT+CNUM	Execute	+CNUM:[<alpha1>],<number1>,<type1>[,<speed>,<service>[,<itc>]][+CNUM:[<alpha2>], <number2>,<type2>[,<speed>,<service>[,<itc>]][...]]
AT+CNUM?	Read	ERROR
AT+CNUM=?	Test	OK

Table 61: AT+CNUM

Description:

Execute command returns the MSISDNs related to the subscriber (this information can be stored in the SIM/UICC or in the MT). If subscriber has different MSISDN for different services, each MSISDN is returned on a separate line.

Defined values:

<alpha_n>:string. Optional alphanumeric string associated with <number_n>. used character set should be the one selected with command Select TE Character Set +CSCS.

<number_n>:string. Phone number of format specified by <type_n>.

<type_n>:integer. Type of address octet in integer format.

<speed>:integer. type as defined in (refer 3GPP TS 24.008 Release-13 subclause 6.7).

<service>:integer. Service related to the phone number.

Value	Description
0	asynchronous modem
1	synchronous modem
2	PAD Access (asynchronous)
3	Packet Access (synchronous)
4	Voice
5	fax

Table 62: +CNUM_Service_Description

all other values below 128 are reserved.

<itc>:integer. 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.

Value	Description
0	3.1 kHz
1	UDI

Table 63: +CNUM_ITC_Description

4.4 +CPIN: Enter Pin

Command	Command Type	Response
AT+CPIN= <pin>[,<newpin>]	Set	OK or +CME ERROR: <err>
AT+CPIN?	Read	+CPIN: <code>
AT+CPIN=?	Test	OK

Table 64: AT+CPIN

Description:

The Set 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 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.

Read command returns an alphanumeric string indicating whether some password is required or not.

Defined values:

<pin>: string. PIN code.

<newpin>: string. New PIN code.

<code>: Values reserved by the present document.

Value	Description
READY	MT is not pending for any password
SIM PIN	MT is waiting SIM PIN to be given
SIM PUK	MT is waiting SIM PUK to be given
PH-SIM PIN	MT is waiting phone to SIM card password to be given
PH-FSIM PIN	MT is waiting phone-to-very first SIM card password to be given
PH-FSIM PUK	MT is waiting phone-to-very first SIM card unblocking password to be given
SIM PIN2	MT is waiting 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 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 network personalization password to be given
PH-NET PUK	MT is waiting network personalization unblocking password to be given
PH-NETSUB PIN	MT is waiting network subset personalization password to be given
PH-NETSUB PUK	MT is waiting network subset personalization unblocking password to be given
PH-SP PIN	MT is waiting service provider personalization password to be given
PH-SP PUK	MT is waiting service provider personalization unblocking password to be given
PH-CORP PIN	MT is waiting corporate personalization password to be given
PH-CORP PUK	MT is waiting corporate personalization unblocking password to be given

Table 65: +CPIN_code_Description

Example:

4.4.1 AT+CPIN: Set Command

Following command enters PIN 2615

```
AT+CPIN="2615"
OK
```

4.5 +CPWD: Change Password

Command	Command Type	Response
AT+CPWD=<fac>, <old password>[,<new password>]	Set	OK When inputs are wrong: ERROR or +CME ERROR:<err>
AT+CPWD?	Read	ERROR
AT+CPWD=?	Test	+CPWD:("SC",8),("P2",8),("PN",16),("PU",16),("PS",16) OK

Table 66: AT+CPWD

Description:

Set command sets a new password for the facility lock function defined by the command Facility Lock +CLCK.

The test command returns a list of pairs which present the available facilities and the maximum length of their password.

Defined values:

<fac>: string. facility.

Value	Description
"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)
"P2"	SIM PIN2
"PN"	Network Personalization.
"PU"	Network subset Personalization.
"PS"	PH SIM (lock PHone to SIM/UICC card installed in the currently selected card slot)

Table 67: +CPWD_fac_Description

<old password>: string.

<new password>: string.

Example:

4.5.1 AT+CPWD: Set Command

Following command changes PIN from 2615 to 4321

```
AT+CPWD="SC","2615","4321"
OK
```

4.6 +CRSM: Restricted SIM access

Command	Command Type	Response
AT+CRSM=<command>[,<fileid>[,<P1>,<P2>,<P3>[,<data>[,<pathid>]]]]	Set	+CRSM: <sw1>,<sw2>[,<response>]
AT+CRSM=?	Test	OK

Table 68: AT+CRSM

Description:

Set command transmits to the MT the SIM <command> and its required parameters. If a SIM 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. 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.

Coordination of command requests to SIM and the ones issued by GSM/UMTS application inside the MT is implementation dependent. However the TE should be aware of the precedence of the GSM/UMTS application commands to the TE commands.

Defined values:

<command>: integer.

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

Table 69: +CRSM_command_Description

NOTE 1: The MT internally executes all commands necessary for selecting the desired file, before performing the actual command.

<fileid>:integer. This is the 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. Optional files may not be present at all.

<P1>,<P2>,<P3>: integer. Parameters passed on by the MT to the SIM. These parameters are mandatory forevery command, except GET RESPONSE and STATUS. The

values are described in 3GPP TS 51.011.

<data>: Information which shall be written to the SIM (hexadecimal character format, refer +CSCS 2.7).

<pathid>: string. Contains the path of an elementary file on the SIM/UICC in hexadecimal format (e.g. "7F205F70" in SIM and UICC case). The <pathid> shall only be used in the mode "select by path from MF".

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.

<sw1>,<sw2>:integer. Information from the SIM about the execution of the actual command. These parameters are delivered to the TE in both cases, on successful or failed execution of the command.

<response>:Response of a successful completion of the command previously issued (hexadecimal character format; refer +CSCS 2.7). STATUS and GET RESPONSE return data, which gives information about the current elementary datafield.This information includes the type of file and its size. 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.

4.7 %CCID: Request ICCID

Command	Command Type	Response
AT%CCID	Execute	%CCID: <iccid> OK or ERROR
AT%CCID?	Read	ERROR
AT%CCID=?	Test	OK

Table 70: AT+CRSM

Description:

This execution command reads the ICCID (Card Identification Number) from the SIMś EFICCID. It is a unique identification number for the SIM. The ERROR is returned by an execution command if the SIM is not inserted.

Defined values:

<iccid>: integer string of 19 or 20 decimal digits, which reflects the SIMś ICCID value.

The ICCID format is: MMCC IINN NNNN NNNN NN C x

Value	Description
MM	Constant (ISO 7812 Major Industry Identifier)
CC	Country Code
II	Issuer Identifier
N12	Account ID (SIM number)
C	Checksum calculated from the other 19 digits using the Luhn algorithm
x	An extra 20th digit, which may be returned by SIM, but not officially part of the ICCID

Table 71: +CCID_iccid_Description

5 Adrastea-I Proprietary AT Commands

5.1 AT%CSQ: Signal quality

Command	Command Type	Response
AT%CSQ	Execute	%CSQ: <rssi>,<ber>,<rsrq-signal quality> OK
AT%CSQ?	Read	ERROR
AT%CSQ=?	Test	%CSQ:(0-31,99),(0-7,99),(0-34,99) OK

Table 72: AT%CSQ

Description:
Execution command returns the:

- <rssi> Received Signal Strength Indication.
- <ber> Channel bit error rate.
- <rsrq> signal quality

TB (Transport Blocks) error rate is used for the BER parameter
Read command is not supported
Test command returns the allowed values.
Defined values:

<rssi>: integer.

Value	Description
0	-113 dBm or less
1	-111 dBm
2...30	-109... -53 dBm
31	-51 dBm or greater
99	Not known, or not detectable

Table 73: CSQ_RSSI_Description

<ber>: integer. Present in percent.

Value	Description
0...7	As RXQUAL values
99	Not known, or not detectable.

Table 74: CSQ_Ber_Description

<rssq-signal-quality>: integer.

Value	Description
0	Less than -19.5 dB
1	-19.5 ... less than -19 dB
2	-19 ... less than -18.5 dB
34	-3 dB and greater
99	Not known, or not detectable

Table 75: CSQ_RSSQ_Description

5.1.1 AT%CSQ: Execute Command

Example:

```
AT%CSQ
%CSQ: 13,99,30

OK
```

5.1.2 AT%CSQ: Read Command

Example:

```
AT%CSQ?
ERROR
```

5.1.3 AT%CSQ: Test Command

Example:

```
AT%CSQ=?
%CSQ: (0−31,99),(0−7,99),(0−34,99)

OK
```

5.2 AT%CMATT: PS Attach or Detach

Command	Command Type	Response
AT%CMATT=<state>	Set	OK or +CME ERROR: <err>
AT%CMATT?	Read	%CMATT: <state>
AT%CMATT=?	Test	%CMATT: (0-1) OK

Table 76: AT%CMATT

Description:
This command is sent from the external Host which instructs the LTE module to detach or attach the LTE network.

Defined values:
<state>: integer.

Value	Description
0	Detach
1	Attach

Table 77: %CMATT_State_Description

5.2.1 AT%CMATT: Set Command

Example:
Following Command is used for Detach from the network.

```
AT%CMATT=0
OK
```

Following Command is used for Attach to the network.

```
AT%CMATT=1
OK
```

5.2.2 AT%CMATT: Read Command

Example:

```
AT%CMATT?
%CMATT: 1

OK
```

5.2.3 AT%CMATT: Test Command

Example:

```
AT%CMATT=?
%CMATT: (0−1)

OK
```

5.3 AT%CPININFO: Remaining Number of PIN and PUK attempts

Command	Command Type	Response
AT%CPININFO	Execute	%CPININFO: <PIN attempts left>, <PUK attempts left>, <PIN2 attempts left>, <PUK2 attempts left> OK
AT%CPININFO?	Read	ERROR
AT%CPININFO=?	Test	OK

Table 78: AT%CPININFO

Description:

This command returns the remaining number of PIN and PUK attempts.

Defined values:

<PIN attempts left>: integer. Number of failed attempts to enter PIN before it is blocked.

<PUK attempts left>: integer. Number of failed attempts to enter PUK before PUK is permanently blocked.

<PIN2 attempts left>:integer. Number of failed attempts to enter PIN2 before it is blocked.

<PUK2 attempts left>:integer. Number of failed attempts to enter PUK2 before PUK2 is permanently blocked.

Example:

5.3.1 AT%CPININFO: Execute Command

```
AT%CPININFO
%CPININFO: 3,10,3,10

OK
```

5.3.2 AT%CPININFO: Read Command

Example:

```
AT%CPININFO?
ERROR
```

5.3.3 AT%CPININFO: Test Command

Example:

```
AT%CPININFO=?
OK
```

5.4 AT%STATUS: Current Status of the Specified Device subsystem

Command	Command Type	Response
AT%STATUS= "<subsystem>"	Set	For all subsystems except of AMBR: %STATUS: <subsystem>: <status> [,<status_info>] OK
AT%STATUS?	Read	ERROR
AT%STATUS=?	Test	%STATUS: (list of supported <subsystem>)

Table 79: AT%STATUS

Description:
This execution command retrieves the current status of the specified UE subsystem. Read command is not supported.

Defined values:
<subsystem>: string.

Value
"INIT"
"USIM"
"RRC"
"SEC"
"ROAM"
"AMBR" (Not applicable for NB-IoT)
"IPS"
"CSPS"
"WDIS"
"UICC"
"TEMPM" (temperature monitor)
"DSIMA"
"PSM"
"EMM"
"ATT"
"BOOT"
"REGCMD"

Table 80: %STATUS_Sub_System_Description

For <subsystem> "INIT": This subsystem is used for RF Calibration progress, customer can ignore it.

<status>, integer.

Value	Description
0	UE initial process ongoing (calibration in progress)
1	UE initial process has finished (calibration complete)
2	UE initial process has finished (calibration complete) but with critical errors. (SYS_CRITICAL)

Table 81: %STATUS_State_Description

For <subsystem> "USIM" :
<status>:

Status
USIM: REAL USIM, LTE
USIM: REAL USIM, non-LTE
USIM: USIM SIMULATOR
USIM: NO USIM
USIM: INACTIVE USIM - USIM is inactive (that is, deactivated), or it is still in the initialization process
USIM: PERSONALIZATION ERROR
USIM: REMOTE USIM
USIM: PERMANENT LOCK ERROR

Table 82: %STATUS_USIM_State_Description

For <subsystem> "IPS" :
<status>:

Value	Description
0	UE IP stack works correctly
1	UE IP stack failure

Table 83: %STATUS_IPS_State_Description

For <subsystem> "AMBR" :
<status>:

Status
EPS bearer id
APN-AMBR downlink
APN-AMBR uplink
No APN-AMBR is defined

Table 84: %STATUS_AMBR_State_Description

For <subsystem> "RRC" :
<status>:

Status
RRC: IDLE
RRC: CONNECTED
RRC: UNKNOWN: Used for all other states (init, standby, flight mode, etc.)

Table 85: %STATUS_RRC_State_Description

For <subsystem> "SEC" :
<status>:

Value	Description
0	No authentication request sent yet
1	Authentication success, stored context
2	Authentication success, new context
3	Authentication failure, MAC failure
4	Authentication failure, Synch failure
5	Authentication failure, non-EPS authentication unacceptable
6	Authentication failure, error unspecified
7	Authentication Reject

Table 86: %STATUS_SEC_State_Description

For <subsystem> "ROAM" :
<status>:

Value	Description
0	Not roaming (UE is not camped at all or UE is camped on HPLMN/EHPLMN)
1	UE is camped on VPLMN

Table 87: %STATUS_ROAM_State_Description

For <subsystem> "CSPS" :
<status>:

Value	Description
0	not registered or EPS_ONLY (PS) mode
1	EPS_COMBINED (CS/PS) mode

Table 88: %STATUS_CSPS_State_Description

For <subsystem> "WDIS" :
<status>:

Value	Description
0	enable signal detected
1	disable signal detected

Table 89: %STATUS_WDIS_State_Description

For <subsystem> "UICC" :
<status>:

Value	Description
0	SIM is not inserted
1	SIM inserted, init is in progress
2	SIM init passed, waiting for PIN unlock
3	Personalization failed, waiting for run-time depersonalization
4	Activation completed. Reported when "Ready" state is reported by "AT+CPIN?"
5	Activation completed. RAM cache also ready except for conditional caches of ISIM files (for IMS)

Table 90: %STATUS_UICC_State_Description

For <subsystem> "TEMPM" :
<status>:

Value	Description
0	Normal UE operation
1	Heating protection applied

Table 91: %STATUS_TEMPM_State_Description

For <subsystem> "DSIMA" :
<status>:

Value	Description
0	SIM not selected
1	SIM1 selected
2	SIM2 selected

Table 92: %STATUS_DSIMA_State_Description

For <subsystem> "PSM" :
<status>:

Value	Description
0	PSM is not active
1	PSM is active

Table 93: %STATUS_PSM_State_Description

For <subsystem> "EMM" :
<status>:

Value	Description
1	EMM_NULL
2	EMM_DEREGISTERED_NORMAL_SERVICE
3	EMM_DEREGISTERED_ATTEMPTING_TO_ATTACH
4	EMM_DEREGISTERED_PLMN_SEARCH
5	EMM_DEREGISTERED_NO_IMSI
6	EMM_DEREGISTERED_ATTACH_NEEDED
7	EMM_DEREGISTERED_NO_CELL_AVAILABLE
8	EMM_DEREGISTERED_ATTACH_ACCEPT_RECEIVED
9	EMM_DEREGISTERED_REGISTRATION_INITIATED
10	EMM_DEREGISTERED_LIMITED_SERVICE
11	EMM_REGISTERED_LIMITED_SERVICE
12	EMM_REGISTERED_NORMAL_SERVICE
13	EMM_REGISTERED_ATTEMPTING_TO_UPDATE
14	EMM_REGISTERED_PLMN_SEARCH
15	EMM_REGISTERED_UPDATE_NEEDED
16	EMM_REGISTERED_NO_CELL_AVAILABLE
17	EMM_REGISTERED_ATTEMPTING_TO_UPDATE_MM
18	EMM_REGISTERED_IMSI_DETACH_INITIATED
19	EMM_REGISTERED_NO_CELL_AVAILABLE_PSM_ACTIVE
20	EMM_REGISTERED_DEREGISTERATION_INITIATED
21	EMM_REGISTERED_TRACKING_AREA_UPDATING_INITIATED
22	EMM_REGISTERED_SERVICE_REQUEST_INITIATED

Table 94: %STATUS_EMM_State_Description

<status_info>, for "ATT" :

Value	Description
0	Detached
1	Normal Attach
2	Attach without PDN
3	Emergency Attach

Table 95: %STATUS_ATT_Status_Info_Description

<status_info>, for "BOOT":

Value	Description
0	Full Power on wakeup
1	sleep mode wakeup

Table 96: %STATUS_BOOT_Status_Info_Description

< status_info>, for "REGCMD" :

Value	Description
0	No Registration commanded
1	Registration commanded

Table 97: %STATUS_REGCMD_Status_Info_Description

Example:

5.4.1 AT%STATUS: Execute Command

Following Command shows the state of RRC.

```
AT%STATUS="RRC"
RRC: IDLE

OK
```

Following Command shows the state of EMM.

```
AT%STATUS="EMM"
EMM: 12

OK
```

5.4.2 AT%STATUS: Read Command

Example:

```
AT%STATUS?
ERROR
```

5.4.3 AT%STATUS: Test Command

Example:

```
AT%STATUS=?
%STATUS: ("INIT", "USIM", "IPS", "AMBR", "RRC", "PSM", "SEC", "ROAM", "CSPS", "
    WDIS", "UICC", "DSIMA", "TEMPM", "EMM", "ATT", "BOOT")
OK
```

5.5 AT%RATACT: Switch to Selected RAT without full reboot

Command	Command Type	Response
AT%RATACT= <rat>[,<storage>[,<source>]]	Set	OK or ERROR
AT%RATACT?	Read	%RATACT: <rat>,<rat_mode>,<source>
AT%RATACT=?	Test	%RATACT: (list of supported <rat>s),(list of supported <storage>s)

Table 98: AT%RATACT

Description:

Execution command switches to selected RAT without full reboot. Any attempt to switch to the RAT already in use will be silently ignored and return OK.

If multiple mode is enabled in configuration file, the call of this AT with <rat>="DEFAULT" returns device to RAT automatic selection mode.

Note : The default mode for module is CAT-M1 single mode.

Defined values:
<rat>: string. RAT to be activated by execution command or currently used RAT for read command.

Value	Description
"DEFAULT"	Activate Default RAT/configured mode
"CATM"	Activate CAT-M RAT
"NBIOT"	Activate NB-IOT RAT
"C2D"	Not support
"N2D"	Not support
"GSM"	Not support
"G2D"	Not support

Table 99: %RATACT_RAT_Description

<storage>: integer. Flag indicates if settings are persistent over a power-cycle (stored into non-volatile memory).

Value	Description
0	Not Persistent (default if parameter omitted)
1	Persistent

Table 100: %RATACT_Storage_Description

<source>: integer. Flag used for RAT switch requests arbitration.

Value	Description
0	None/Clear
1	Host (default)

Table 101: %RATACT_Source_Description

<rat_mode>: integer. RAT mode of RM state machine.

Value	Description
0	Single RAT
1	Multiple RAT

Table 102: %RATACT_RAT_Mode_Description

Example:

5.5.1 AT%RATACT: Set Command

Following AT command will change module mode to NB-IoT.

```
AT%RATACT="NBIOT",1
OK
```

Following AT command will change module mode to LTE-Cat.M.

```
AT%RATACT="CATM",1
OK
```

5.5.2 AT%RATACT: Read Command

Example:

```
AT%RATACT?
%RATACT: "NBIOT",1,0
OK
```

5.5.3 AT%RATACT: Test Command

Example:

```
AT%RATACT=?
%RATACT: ("DEFAULT","CATM","NBIOT","C2D","N2D"),(0−1),(0−2)
OK
```

5.6 AT%MEAS: Measurement for Serving Cell

Command	Command Type	Response
AT%MEAS= "<measurement_type>"	Set	**For RS_SINR:** %MEAS: RS_SINR=<measurement value> **For Power Headroom:** %MEAS: PHR=<measurement value>, PHR Level=<measurement value> **For Srxlev:** %MEAS: SRXLEV=<measurement value> **For all NBS RSRP, RSRQ and RSSI:** %MEAS: EARFCN=<EARFCN>,CellID=<cell ID>,<measurement_type>=<measurementvalue> [%MEAS: EARFCN=<EARFCN>,CellID=<cell ID>,<measurement type>=<measurement value>] [...] **For all neighboring NBS simultaneous RSRP and RSRQ reporting:** %MEAS:EARFCN=<EARFCN>,CellID=<cellID>, RSRP=<measurement value>, RSRQ=<measurement value> [%MEAS:EARFCN=<EARFCN>,CellID=<cellID>, <RSRP>=<measurement value>, RSRQ=<measurement value>] [...] **For NBS RSRP in compressed format:** %MEAS:NBS RSRP:<EARFCN>,<cell ID>, <measurement value>[,<EARFCN>, <cellID>,<measurement value>[...]] **For E-CID (AT%MEAS="95") in compressed format:** %MEAS:ECID:<gcid>,<TimeDifIndex>,<ta>, <MCC>,<MNC>,<TAC>,<EARFCN>,<cellID>, <SFN>,<RSRP>,<RSRQ> [,<EARFCN>,<cell ID>,<SFN>,<RSRP>,<RSRQ> [...]] **The Network Time corresponding to the SFN of the serving cell (AT%MEAS="93") in compressed format:** %MEAS:NWTIME:<networkTTI>, <networkUtcTime>
AT%MEAS?	Read	ERROR
AT%MEAS=?	Test	%MEAS: <list of supported measurements>

Table 103: AT%MEAS

Description:

The averaged narrow-band measurement executed for serving eNB as defined in the spec for the RSRP and RSRQ "Reported" measurement value.

Note: The SINR is not reported over-the-air. It is "reported" value contains the combined value of all antennas measurements.

Signal Quality measurement type (8) simultaneously returns the last serving cell measurements of RSRP, RSRQ, SINR, and RSSI. This AT command is response contains only the "reported" values.

The per antenna measurement value RXyTXz (y,z=0/1) is the result of last non-averaged wide-band measurement used for debugging purposes. This applies for RSRP only.

Only the single "reported" value is supported for neighbor eNB measurements.

Antenna relative phase measurement type (9) returns the relative phase between the UE RX antennas for each eNB TX antenna. This command also returns the related RSSI measurement as per the UE RX antennas.

Read command is not supported.

Defined values:
<measurement type>: string.

Value	Description
"0"	RSRP
"1"	RSRQ
"2"	SINR
"3"	RSSI
"4"	TX Power - Not applicable for NB-IoT in RRC IDLE mode
"5"	Temperature
"6"	Pathloss
"7"	CQI - Not applicable for NB-IoT
"8"	Signal Quality (RSRP & RSRQ & SINR & RSSI)
"9"	Antenna relative phase (Not applicable for NB-IoT)
"10"	RSRP reported value only
"11"	RSRQ reported value only
"12"	SINR reported value only
"13"	RS_SNR (reference signal Signal-to-Noise Ratio).
"14"	RS_SINR (reference signal Signal-to-Interference-plus-Noise Ratio)
"15"	Power Headroom - Only supported for NB-IoT
"16"	Srxlev as defined in 3GPP 36.304
"17..."	Upto "92" Reserved
"93"	Network Time alignment with SFN
"95"	Measurements for E-CID
"96"	RSRP for all detected NBSs (same as 98) in compressed format: In single line Each eNB measurement data (<EARFCN>,<cell ID>,<measurement value>) is separated by additional space
"97"	RSRP and RSRQ for all detected NBS
"98"	RSRP for all detected NBS
"99"	RSRQ for all detected NBS
"100"	RSSI for all detected NBS

Table 104: %MEAS_Measurement_Type_Description

<EARFCN>: integer. Decimal EARFC value.

<gcid>: integer. The Global cell ID hexadecimal value.

<TimeDifIndex>: RxTxTimeDiff decimal index (as defined in 9.1.9.2 of 3GPP 36.133 Release-13) of the measured cell. The value shall be reported by the MAC based on the RxTxTimeDiff reported by the PHY. Be aware that the RxTxTimeDiff used by the PHY is different from the value received by the MAC CE, and has a better Ts granularity and accuracy.

<ta>: integer. Currently used Timing Advance value (NTA) of the measured cell. The NTA value is represented by index values of TA = 0, 1, 2, ..., 1282, where the amount of the time alignment is given by NTA = TA 16 per [3GPP 36.213].

<mcc>: integer. A three-digit value indicating the mobile country code as defined in ITU-T

<mnc>: integer. A three-digit or two-digit value indicating the mobile network code as defined in ITU-T.

<TAC>: hexadecimal. Two byte tracking area code in hexadecimal format.

<SFN>: integer. The decimal system frame number (SFN) of the measured cell during which the measurement has been performed. Since there is averaging over multiple SFNs, it is advised to supply the latest SFN. If this value is not available at the time of the query, the command returns N/A (without quotes).

<cell ID>: integer. Decimal Physical Cell ID value<measurement value>

<measurement value>: integer. The measurement results are returned in native for each measurement unit:

- dBm: For RSRP, RSSI
- dB : For RSRQ, SINR, Pathloss
- 0.1 dBm for TX Power (for example, 2.5 dBm = 25)
- Degrees (℃) for Temperature
- Degrees (phase) & 256*dBM (RSSI) units for Antenna relative phase
- 0.1 dB for RS_SNR, RS_SINR, PHR (for example, 2.5 dB = 25)

Measurement Range:

- -140 <= RSRP <= 0
- -60 <= RSRQ <=0
- -128 <= SINR <= 40
- -26 <= TX Power <= 40
- -128 <= Temperature <= 128
- 0 <= CQI <= 15
- -12.0 <= RS_SNR, RS_SINR <= 40.0
- -23.0 <= PHR <= 40.0

If the RSRP/RSRQ measurement value for an antenna is not supported, the command returns "N/S" (Not Supported) indication for this specific antenna in the returned string.

Note: The reported range is wider than the range defined for Measurement Reporting in 3GPP spec. It is intended to report weak and abnormal measurements, especially for neighboring cells, for jamming detection.

<networkTTI>: integer. The subframe counter of the serving cell corresponds to the network UTC time. The subframe counter is a decimal running from 0 to 10239 (that is, rollover at 10240) also known as the TTI (Transmission Time Interval) counter.

<networkUtcTime>: integer. This field specifies the network UTC time which corresponds to the specified TTI counter. The UTC time is a decimal counter in 1msec units counted since 00:00:00 on 1 January, 1900.

5.6.1 AT%MEAS: Set Command

Following AT command will show the RSRP Measurement.

```
AT%MEAS="0"
%MEAS: RSRP: Reported = −96, Rx0Tx0 = −96, Rx0Tx1 = −116

OK
```

Following AT command will show the RSRQ Measurement.

```
AT%MEAS="1"
%MEAS: RSRQ: Reported = −9, Rx0Tx0 = −9, Rx0Tx1 = −30

OK
```

Following AT command will show the Srxlev Measurement.

```
AT%MEAS="16"
%MEAS: SRXLEV=43

OK
```

5.6.2 AT%MEAS: Read Command

Example:

```
AT%MEAS?
ERROR
```

5.6.3 AT%MEAS: Test Command

Example:

```
AT%MEAS=?
%MEAS: 0−RSRP, 1−RSRQ, 2−SINR, 3−RSSI, 4−TXPOWER, 5−TEMPERATURE,
    6−Pathloss, 7−CQI, 8−Signal Quality, 9−Antenna relative phase,10−RSRP
    reported value only, 11−RSRQ reported value only, 12−SINR reported value only,
    13−RS_SNR, 14−RS_SINR, 15−Power Headroom, 93−Network Time alignment
    with SFN, 95−Measurements for E−CID, 96−RSRP for all detected NBS, 97−
    RSRP & RSRQ for all detected NBS, 98−RSRP for all detected NBS, 99−RSRQ
    for all detected NBS, 100−RSSI for all detected NBS

OK
```

5.7 AT%NWOPER: Set/Query NW Operator Mode of the Modem.

Command	Command Type	Response
AT%NWOPER= <oper_name>	Set	OK or ERROR
AT%NWOPER?	Read	%NWOPER: <oper_name>[,<mode>]
AT%NWOPER=?	Test	%NWOPER: (list of supported <oper_name>)

Table 105: AT%NWOPER

Description:
This command is used to set/query NW operator mode of the modem. This mode setting is used to support NW Operator specific requirements defined on top of 3GPP requirements. The <oper_name>="DEFAULT" means default 3GPP compliant behavior of the modem.

The list of operators is not limited, use test command (AT%NWOPER=?) to retrieve the list of currently supported operators. Any attempt to set unknown operator name will return ERROR.

Read command separates operator name and operator selection mode:

- <oper_name> - current NW Operator settled or selected by MCC-MNC of IMSI if "AUTO" mode was commanded
- <mode> - indicates that "AUTO" mode is currently configured

Defined values:
<oper_name>: string. The name of operator to select modem mode of operations. The name is Altair-proprietary string.

Value	Description
"DEFAULT"	Default 3GPP compliant mode
"AUTO"	NW Operator mode is selected in accordance with IMSI value of currently used SIM
"VZW"	Verizon Wireless
"ATT"	AT&T

Table 106: %NWOPER_Oper_Name_Description

Example:

5.7.1 AT%NWOPER: Set Command

Following command will set uBoot delay to 10 seconds.

```
AT%NWOPER="T-MOBILE"
OK
```

5.7.2 AT%NWOPER: Read Command

Example:

```
AT%NWOPER?
%NWOPER: "DEFAULT","AUTO"


OK
```

5.7.3 AT%NWOPER: Test Command

Example:

```
AT%NWOPER=?
%NWOPER: ("AUTO","DEFAULT","VZW","CMCC","RJIL","KDDI","ATT","USCC","
    DOCOMO","SOFTBANK","LGU+","KT","T-MOBILE","SKT","CTC","VODAFONE","
    TELSTRA","TRUPHONE","CHT")


OK
```

5.8 AT%PDNSET: Set run-time PDN Parameters For Data PDNs

Command	Command Type	Response
AT%PDNSET= <ext_sessionID>, <apnname>,<ip_type>, <ppp_auth>,<user>, <passw>,<host_name>, <IPv4AddrAlloc>, <pcscf_discovery>,<NSLPI>	Set	OK or ERROR
AT%PDNSET?	Read	%PDNSET:<ext_essionID>,<apnname>, <ip_type>,<ppp_auth>,<user>,<passw> ,<host_name>,<IPv4AddrAlloc>, <pcscf_discovery>,<NSLPI> %PDNSET:<ext_sessionID>,<apnname>, <ip_type>,<ppp_auth>,<user>,<passw>, <host_name>,<IPv4AddrAlloc>, <pcscf_discovery>,<NSLPI>
AT%PDNSET=?	Test	OK

Table 107: AT%PDNSET

Description:

The command is intended to set run-time PDN parameters for data PDNs exposed to host.

In addition, the APN name and IP type provided in the command will override default PDN settings from embedded APN table stored into UE NV. The PPP security parameters are run-time only and are not stored into non-volatile memory.

The command will be effective immediately, which means that if parameters are different from those already in use, the PDN will be deactivated, updated locally and on server (via LTE messages) and then reactivated.

Missed PPP security parameters remove previous PPP security setting completely.

Command is intended to substitute previous %PPPAUTH command, which is not synced with other PDN parameters definition.

Note:
In both command and response, a parameter which is not specified will be written as ",,"
Last parameters of the command which are not specified may not include the ",," notation.

Defined values:
<ext_sessionID>: integer. The numeric value of the session identifier which is configured and used by an external application, or by the host, and defined in the NP config file.
<apnname>: string. Indicates the APN name configured for PDN.
<ip_type>: string. Specifies the type of packet data protocol.

Value	Description
"IP"	Internet Protocol
"IPV6"	Internet Protocol, version 6
"IPV4V6"	Virtual <PDP_type> introduced to handle dual IP stack UE capability.

Table 108: %PDNSET_IP_TYPE_Description

<ppp_auth>: string. PPP authentication type.

- "NONE"
- "PAP"
- "CHAP"

<user>: string. Username used for authentication.
<passw>: string. Password used for authentication.
<host_name>: string. Optional, The name of the Authentication server.
<pcscf_discovery>. integer. Decimal value.

Value	Description
0	Disable
1	Enable

Table 109: %PDNSET_pcscf_discovery_Description

<IPv4AddrAlloc>: integer. Controls how the host requests the IPv4 address information (same as defined in AT+CGDCONT)

Value	Description
0	IPv4 address allocation through NAS signaling
1	IPv4 address allocated through DHCP

Table 110: %PDNSET_IPv4AddrAlloc_discovery_Description

<NSLPI>: integer. Indicates the NAS signaling priority requested for this PDP context as defined in AT+CGDCONT.

Value	Description
0	indicates that this PDP context is to be activated with the value for the low priority indicator configured.
1	indicates that this PDP context is is to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority".

Table 111: %PDNSET_NSLPI_discovery_Description

Example:

5.8.1 AT%PDNSET: Set Command

Following command will set for <ext_sessionID=1>, <apnname> to "apnexample" and <ip_type> to "IPV4V6".

```
AT%PDNSET=1,"apnexample","IPV4V6"
OK
```

Following command will remove APN setting for <ext_sessionID=1>.

```
AT%PDNSET=1,"null","IPV4V6"
OK
```

5.8.2 AT%PDNSET: Read Command

Example:

```
AT%PDNSET?
%PDNSET: 1,apn.MNC.MCC.GPRS,IPV4V6,,,,,0,0,0

OK
```

5.8.3 AT%PDNSET: Test Command

Example:

```
AT%PDNSET=?
%PDNSET: <ext_session_id>,<apnname>,<ip_type>,<ppp_auth>,<user>,<passw>,<
    auth_host>,<IPv4AddrAlloc>,<pcscf_discovery>,<NSLPI>

OK
```

5.9 AT%SETBDELAY: Modifies the uBoot delay

Command	Command Type	Response
AT%SETBDELAY= <tout>	Set	OK or ERROR
AT%SETBDELAY?	Read	%SETBDELAY: <tout>
AT%SETBDELAY=?	Test	OK

Table 112: AT%SETBDELAY

Description:
The command is intended for debug purposes. It modifies the uBoot delay applied in next cold boot. Once modified, new timeout value will be used as new default timeout in all following cold boots. Read command is not supported

Defined values:
<tout>: integer. Delay timeout value in sec.
0-99 sec
Example:

5.9.1 AT%SETBDELAY: Set Command

Following command will set uBoot delay to 10 seconds.

```
AT%SETBDELAY=10
OK
```

5.9.2 AT%SETBDELAY: Read Command

Example:

```
AT%SETBDELAY?
%SETBDELAY: 0
OK
```

5.9.3 AT%SETBDELAY: Test Command

Example:

```
AT%SETBDELAY=?
OK
```

5.10 AT%SCAN: Return the RSSI Scan Results

Command	Command Type	Response
AT%SCAN= [<cmd>[,<mode>]]	Set	**For <cmd>="QUERY"** **For <mode>=0 (short) or omitted** %SCAN:<res>[,<EARFCN>,<PCI>,<RSRP>, <RSRQ>[,<EARFCN>,<PCI>,<RSRP>,<RSRQ>]...] **For <mode>=1 (long)** %SCAN:<res>[,<band>,<earfcn>,<pci>,<eci>,<mcc>, <mnc>,<RSRP>,<RSRQ>[,<eci>,<mcc>,<mnc>,<bw>, <tac>,<cstat>,<emg>,<oper1> [,<oper2>[...]]] [%SCAN:<band>,<earfcn>,<pci>,<eci>,<mcc>, <mnc>,<RSRP>,<RSRQ>[,<eci>,<mcc>,<mnc>,<bw>, <tac>,<cstat>,<emg>,<oper1> [,<oper2>[...]]]...]] OK
AT%SCAN?	Read	%SCAN: for each cell: (<bw>, <eci>, <EARFCN>, <Physical_cell_ID>, <PLMN_ID>, <RSRP>)
AT%SCAN=?	Test	OK

Table 113: AT%SCAN

Description:

This command returns the RSSI scan results. These results are displayed only for successfully acquired SIB1 cells.

Execute and Test commands are not supported.

Defined values:

<cmd>: string. Command.

Value	Description
"QUERY"	Ask for last scan results

Table 114: %SCAN_Cmd_Description

<mode>: integer. Result representation mode.

Value	Description
0	Short format
1	Long format

Table 115: %SCAN_Mode_Description

<bw>: integer. Bandwidth configuration.

Value	Description
0	1.4 MHz (Not support in NB-IOT)
1	3 MHz (Not support in NB-IOT)
2	5 MHz (Not support in NB-IOT)
3	10 MHz (Not support in NB-IOT)
4	15 MHz (Not support in NB-IOT)
5	20 MHz (Not support in NB-IOT)

Table 116: %SCAN_BW_Description

<eci>: integer. As per 3GPP encoding for cell ID.
<EARFCN>:integer. As per 3GPP encoding for EARFCN.
<Physical cel l ID> or <PCI>: integer. PHY acquired cell ID.
<PLMN ID>. integer. As per 3GPP encoding for PLMN ID.
<RSRP>: RSRP measurements in dBm.
<res>: integer. scan result.

Value	Description
0	Scan succeeded. Cell measurements will also be provided
1	Scan failed: Low power, no cell found
2	Scan failed: Cell(s) found, but failed to acquire MIB/SIB1. Cell measurements will also be provided.

Table 117: %SCAN_Res_Description

Next params are as per 3GPP definition:

<band>,<earfcn>,<pci>,<eci>,<mcc>,<mnc>,<RSRP>,<RSRQ>,<bw>,<tac>
<operN>: string. Similar to <operator> parameter of +COPS in decimal numeric format.
Example:

5.10.1 AT%SCAN: Set Command

Following command will show RSSI scan results in Short format mode.

```
AT%SCAN="QUERY",0
%SCAN: 0,3740,350,−93,−7

OK
```

5.10.2 AT%SCAN: Read Command

Example:

```
AT%SCAN?
Cell #1
DL BandWidth = 6
```

```
Global Cell ID   = 01CD6007
DL EARFCN        = 3740
Physical Cell ID          = 350
PLMN ID          = 26201
RSRP             = -77

OK
```

5.10.3 AT%SCAN: Test Command

Example:

```
AT%SCAN=?
OK
```

5.11 AT%DNSRSLV: To Resolve a Specific Domain Name.

Command	Command Type	Response
AT%DNSRSLV= <SessionID>, <domain_name>[,<addr_ip_type>]	Set	%DNSRSLV:<ip_type>,<ip_addr> [%DNSRSLV: <ip_type>,<ip_addr>[...]] OK
AT%DNSRSLV?	Read	ERROR
AT%DNSRSLV=?	Test	OK

Table 118: AT%DNSRSLV

Description:

This command provides a request from the device to resolve a specific domain name. The IP address formatting for this command is as described in the AT%SOCKETCMD command.

Defined values:

< SessionID>, integer, A numerical numeric value defined in the NP configuration file which points to the PDN on which the IP address should be resolved. "Session ID" is defined in AT%CGINFO.

<Domain_name>: string. Domain name to resolve. Maximum string size is 256 Bytes

<addr_ip_type>: integer. optional parameter defining the IP address type to resolve.

Value	Description
0	IPv4
1	IPv6
2	IPv4v6 (default)

Table 119: %DNSRSLV_ADDR_IP_TYPE_Description

<ip_type>, integer ; optional parameter defining the IP address type to resolve.

Value	Description
0	IPv4
1	IPv6

Table 120: %DNSRSLV_IP_TYPE_Description

<ip_addr>: string. IPv4 or IPv6 resolved address.
Example:

5.11.1 AT%DNSRSLV: Set Command

Following command will show RSSI scan results in Short format mode.

```
AT%DNSRSLV=1,"www.google.com"
%DNSRSLV:0,"142.250.185.164"
%DNSRSLV:1,"2A00:1450:4001:811::2004"

OK
```

5.11.2 AT%DNSRSLV: Read Command

```
AT%DNSRSLV?
ERROR
```

5.11.3 AT%DNSRSLV: Test Command

Example:

```
AT%DNSRSLV=?
%DNSRSLV:<session_id>,<hostname>[,<addr_ip_type>]

OK
```

5.12 AT%NOTIFYEV: Notify The Events

Command	Command Type	Response
AT%NOTIFYEV=<ev_type>,<mode> [,<ev_type>,<mode>[,<ev_type>,<mode>...]]	Set	OK OR ERROR
AT%NOTIFYEV?	Read	ERROR
AT%NOTIFYEV=?	Test	%NOTIFYEV: (list of supported < ev_type>), (list of supported < mode>)
Unsolicited	unsolicited	%NOTIFYEV:<ev_type>[,<param1> [,<param2>]...]

Table 121: AT%NOTIFYEV

Description:

This command is used to notify the host about important events that have occurred in the LTE device. The reporting may be enabled/disabled per event type. Multiple events may be enabled/disabled by the same command call. This is a compound command which means that the <paramN> parameters are <ev_type> specific. Reporting for all event types is disabled by default at wakeup time

Note: The "LTIME" indication for time change in the "FW" is based on "time-priority" as follows:

- CCLK (highest priority: User set)
- SIB16 (Since it is more accurate than EMM)
- EMM information (Lowest priority)

Defined values:
<ev_type>: string.

Value	Description
"LTIME"	Time change in FW. Could be a result of an SIB16 change, updated EMM-information (NITZ), or a user change with the +CCLK command or %CCLK command.
"SIMREFRESH"	SIM refresh occurred. The event is sent, in addition to the AT%SIMREFRESH response. It is used to notify Altair or OEM internal NP applications or/and external host (such as Android) about SIM refresh event.
"WDIS"	W_DISABLE signal state chang
"SIMD"	SIM inserted/removed state chang
"ROAM"	current PLMN camping/connection state was changed between HPLMN/EHPLMN and VPLMN
"CSPS"	Enables notification on switches between PS and CS/PS modes in the modem
"SIMSTATE"	Reports that the UICC entered a new state during start-up or that the UICC ended startup and entered active state.
"MANSTUCK"	Reports repetitive attach attempt rejections for user selected PLMN in Manual mode.
"RRCSTATE"	Reports any RRC layer state change.
"EMMSTATE"	Reports about any NAS EMM layer state change.
"SIB1"	Reports any SIB1 arrival and processing in MAC
"SIB2"	Reports any SIB2 arrival and processing in MAC
"ALL"	Enables/disables all event types. This event type cannot be sent in unsolicited reporting.

Table 122: %NOTIFYEV_EV_TYPE_Description

<mode>: integer. Status of unsolicited result response presentation ;

Value	Description
0	Disable(default)
1	Enable

Table 123: %NOTIFYEV_Mode_Description

<param1>:
For "LTIME": <time> as encoded in the +CCLK response as (yy/mm/dd,hh:mm:ss).

For "SIMREFRESH": <isRestart> as encoded in the %SIMREFRESH command.

For "WDIS": W_DISABLE line changed status.

Value	Description
0	False (enable signal detected)
1	True (disable signal detected)

Table 124: %NOTIFYEV_Param_Description

For "SIMD": changed status.

Value	Description
0	Removal signal detected
1	Insertion signal detect

Table 125: %NOTIFYEV_SIMD_Description

For "ROAM": changed status.

Value	Description
0	Moved to Home PLMN (HPLMN/EHPLMN)
1	Moved to roaming PLMN (VPLMN)

Table 126: %NOTIFYEV_ROAM_Description

For "CSPS":

Value	Description
0	Moved to PS mode
1	Moved to CS/PS mode

Table 127: %NOTIFYEV_CSPS_Description

For "SIMSTATE":

Value	Description
0	SIM deactivated
1	SIM init passed, wait for PIN unlock
2	Personalization failed, wait for run-time depersonalization
3	Activation completed. Event is sent once "Ready" state reported by "AT+CPIN?" is achieved. Event is always sent at any SIM activation completion

Table 128: %NOTIFYEV_SIMSTATE_Description

For "RRCSTATE":

Value	Description
0	RRC Idle
1	RRC Connected
2	RRC Unknown. Applicable for all LTE-disabled device states (init, standby, flight mode, etc.)

Table 129: %NOTIFYEV_RRC_STATE_Description

For "EMMSTATE":

Value	Description
1	EMM_NULL
2	EMM_DEREGISTERED_NORMAL_SERVICE
3	EMM_DEREGISTERED_ATTEMPTING_TO_ATTACH
4	EMM_DEREGISTERED_PLMN_SEARCH
5	EMM_DEREGISTERED_NO_IMSI
6	EMM_DEREGISTERED_ATTACH_NEEDED
7	EMM_DEREGISTERED_NO_CELL_AVAILABLE
8	EMM_DEREGISTERED_ATTACH_ACCEPT_RECEIVED
9	EMM_DEREGISTERED_REGISTRATION_INITIATED
10	EMM_DEREGISTERED_LIMITED_SERVICE
11	EMM_REGISTERED_LIMITED_SERVICE
12	EMM_REGISTERED_NORMAL_SERVICE
13	EMM_REGISTERED_ATTEMPTING_TO_UPDATE
14	EMM_REGISTERED_PLMN_SEARCH
15	EMM_REGISTERED_UPDATE_NEEDED
16	EMM_REGISTERED_NO_CELL_AVAILABLE
17	EMM_REGISTERED_ATTEMPTING_TO_UPDATE_MM
18	EMM_REGISTERED_IMSI_DETACH_INITIATED
19	EMM_REGISTERED_NO_CELL_AVAILABLE_PSM_ACTIVE
20	EMM_REGISTERED_DEREGISTERATION_INITIATED
21	EMM_REGISTERED_TRACKING_AREA_UPDATING_INITIATED
22	EMM_REGISTERED_SERVICE_REQUEST_INITIATED

Table 130: %NOTIFYEV_EMM_State_Description

<param2>: for "SIMREFRESH": <RefreshType> as encoded

Value	Description
0	NAA Initialization and Full File Change Notification
1	File Change Notification
2	NAA Initialization and File Change Notification
3	NAA Initialization
4	UICC Reset
5	NAA Application Reset
6	NAA Session Reset
7	Steering of Roaming

Table 131: %NOTIFYEV_SIMREFRESH_Description

For "LTIME": <dst> as encoded in the %CCLK command response defined in the current document.
Example:

5.12.1 AT%NOTIFYEV: Set Command

Following command will Enable ALL events.

```
AT%NOTIFYEV="ALL",1
OK
```

5.12.2 AT%NOTIFYEV: Read Command

```
AT%NOTIFYEV?
ERROR
```

5.12.3 AT%NOTIFYEV: Test Command

Example:

```
AT%NOTIFYEV=?
%NOTIFYEV: (LTIME, SIMREFRESH, WDIS, SIMD, ROAM, CSPS, SIMSTATE,
    MANSTUCK, RRCSTATE, SIB1, SIB2, ALL),(0,1)

OK
```

5.12.4 %NOTIFYEV: Unsolicited Responses

```
%NOTIFYEV:"RRCSTATE",2

%NOTIFYEV: "SIB1"

%NOTIFYEV: "SIB1"

%NOTIFYEV:"RRCSTATE",0
```

5.13 AT%PINGCMD: Execute PING services

Command	Command Type	Response
AT%PINGCMD=<ip_type>,<dst_ip>[,<count> [,<packetsize>,<timeout>]]	Set	OK OR ERROR
AT%PINGCMD?	Read	ERROR
AT%PINGCMD=?	Test	OK

Table 132: AT%PINGCMD

Description:
This command is used for executing PING services. The IP address formatting for using this command is as described in the AT%SOCKETCMD command.

Defined values:
<id>: integer. The identifier of each individual reply of the ping request (this can be 1 to <count>).

<IP type>: integer.

Value	Description
0	IPv4
1	IPv6

Table 133: %PINGCMD_IP_TYPE_Description

<dst_ip>: string. Destination (remote machine) IPv4 or IPv6 address.

<packetsize>: decimal. specifies the number of data bytes to be sent. The default is 56, which translates into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data. Maximum size in IPv4 is 9936 Bytes. Maximum size in IPv6 is 9908 Bytes.

<count>: decimal. The number of ping request retries (default is 1).

<timeout>: decimal. Time to wait for a response, in seconds.

<ttl>: decimal. The time to leave within the PING reply. TTL specifies how long to hold or use the packet, or any of its included data before expiring and discarding it.

<rtt>: decimal. The round trip PING time.

Example:

5.13.1 AT%PINGCMD: Set Command

```
AT%PINGCMD=0,"8.8.8.8"
%PINGCMD:1,"8.8.8.8",441,110

OK
```

5.13.2 AT%PINGCMD: Read Command

```
AT%PINGCMD?
ERROR
```

5.13.3 AT%PINGCMD: Test Command

Example:

```
AT%PINGCMD=?
%PINGCMD:<ip_type>,<dst_ip>[,<count>[,<pktsize>[,<timeout>]]]

OK
```

5.14 AT%CERTCMD: To Read/Write/Delete/list User Certificates to/from NV.

Command	Command Type	Response
AT%CERTCMD=<cmd>[,<filename>[,<type>,<CR><LF><data>]]	Set	OK OR ERROR
AT%CERTCMD?	Read	ERROR
AT%CERTCMD=?	Test	%CERTCMD: (list of supported <cmd>), (list of supported <type>)

Table 134: AT%CERTCMD

Description:

Set command is used to read/write/delete/list user certificates to/from NV.

The PEM pseudo-text format specifics is that this format contains newlines (<LF>) in the <data> body. This causes some AT command processing troubles even if the <data> string context is enclosed in quotes. To overcome these troubles, the AT%CERTCMD="WRITE" command shall contain <CR><LF> additional newline separator just before PEM data enclosed in quotes.

Defined values:

<cmd>. string.

Value	Description
"READ"	Read the certificates pointed by <filename>. [Private key cannot be read, command returns ERROR.]
"WRITE"	Write the credentials with its <filename> to the NV storage
"DELETE"	Delete the credential pointed by the <filename> from the NV storage
"DIR"	Get the list of credential file names pointed by <filename>.

Table 135: %CERTCMD_CMD_Description

<filename>: string.

The name of the file to be transferred, deleted or listed. Use " " for this parameter to retrieve trusted root certificates folder content. If omitted, the list of files from user root certificate folder (written by AT%CERTCMD="WRITE") is shown. Next size limitation are applicable to the size of this parameter.

The name of the file itself is limited to 29 bytes
The name of the relative path (including file name) is limited to 64 bytes

Note: if <type>=3 (PSK), the filename shall have .psk extension. Any attempt to store PSK into file with different extension will be rejected with ERROR. All other TLS/DTLS objects (<type>=0/1/2) shall not use this extension

<type>: integer.

Value	Description
0	Certificate
1	Private key
2	PSK ID
3	PSK Key

Table 136: %CERTCMD_Type_Description

<data>: string.

certificate/private key in PEM format. Usage of quotes is mandatory. The data content in PEM format is transferred in pseudo-text format with <LF> (0x10) service symbols inside and will be shown with newlines.

Hexadecimal type for PSK ID/PSK. Usage of quotes is mandatory. The data size is limited by: Up to 128 bytes for PSK ID 8-64 bytes for PSK

Example:

5.14.1 Upload CA certificate

Upload CA certificate named "AmazonRootCA3ECC256.pem"

```
AT%CERTCMD="WRITE","AmazonRootCA3ECC256.pem",0,"-----BEGIN␣
    CERTIFICATE-----
 ....
----END␣CERTIFICATE-----"
OK
```

5.14.2 Upload client private key

Upload client private key named "97fbc28291-private.pem.key" while encrypting the key

```
AT%CERTCMD="WRITE","97fbc28291−private.pem.key",1, "−−−−−BEGIN␣RSA␣
    PRIVATE␣KEY−−−−−
  .......
−−−−END␣RSA␣PRIVATE␣KEY−−−−−"
OK
```

5.14.3 Read Client Certificate

Read Client Certificate named b7c1bd8c7c-certificate.pem.crt

```
AT%CERTCMD="READ","b7c1bd8c7c−certificate.pem.crt"
%CERTCMD: "−−−−−BEGIN␣CERTIFICATE−−−−−
  .........
−−−−END␣CERTIFICATE−−−−−"
OK
```

5.14.4 Get the list of credential folder files:

Get the list of credential folder files:

```
AT%CERTCMD="DIR"
%CERTCMD: "AmazonRootCA3ECC256.pem","b7c1bd8c7c−private.pem.key", "
    b7c1bd8c7c−certificate.pem.crt"

OK
```

5.14.5 Upload PSK ID:

Upload PSK ID value "123456789" into file:

```
AT%CERTCMD="WRITE","testPskID.bin",2, "3132333435363738 39"
OK
```

5.14.6 Upload PSK Passphrase "mySharedKey" into file:

Upload PSK Passphrase "mySharedKey" into file:

```
AT%CERTCMD="WRITE","testPSK.psk",3, "6d795368617265644b6579"
OK
```

5.14.7 Read PSK ID file:

Read PSK ID file named testPskId.bin:

```
AT%CERTCMD="READ","testPskId.bin"
%CERTCFG: "3132333343536373839"
OK
```

5.14.8 Read PSK file:

Read PSK file named testPsk.psk:

```
AT%CERTCMD="READ","testPsk.psk"
```

5.15 AT%CERTCFG: To Add/Delete Certificate (TLS) Profiles

Command	Command Type	Response
AT%CERTCFG=<op>,<profile_id>[, [<ca_file>][,[<ca_path>][,<dev_cert>, <dev_key>][,<psk_id>,<psk_key>]]]]	Set	OK OR ERROR
AT%CERTCFG?	Read	[%CERTCFG: <profile_id>[,<profile_id>...]] OK
AT%CERTCFG=?	Test	%CERTCFG: (list of supported <op>s)

Table 137: AT%CERTCFG

Description: Set command is used to to add/delete certificate (TLS) profiles into TLS certificate profiles config file.
Device contains 2 certificate storage locations:

- Root Trusted folder, which contains only root CAs
- User Trusted folder, which contains root CAs and device credentials (certificate and private key) installed by user or provisioned over the air.

The parameters encoded in AT commands and composed then into single TLS profile stored into configuration file.This config file content will be composed from per-profile sections like:

```
" profile _id": {
      ' cafile ' : " ca_file ",
      'capath': "ca_path",
      'cert ' : "dev_cert",
      'key': "dev_key",
      "pskid": "psk_id",
      "pskkey": "psk_key"
}
```

Where <profile_id>, <ca_file>, <ca_path>, <dev_cert> and <dev_key> are taken from the input parameter list.

Any <ca_file>, <ca_path>, <dev_cert> and <dev_key> are optional and may be omitted.The <dev_cert> and <dev_key> shall be always added together or omitted together too.

If some parameters are omitted, they will be also omitted in config file.

When per-profile section is created by this AT command, TLS security layer using this profile will apply next rules.

If root CA file name is known and <ca_file> parameter is set, then try to find <ca_file> in both storage locations in next order.

- Root Trusted folder
- User Trusted folder

If <ca_file> is defined, but not found or if root CA file name is unknown and <ca_file> parameter is omitted, apply <ca_path> parameter, if present.

- If <ca_path> = " ", then use Root Trusted folder to verify server certificate
- If <ca_path> = ".", then use User Trusted folder to verify server certificate

Always use User Trusted folder to find device <dev_cert> and <dev_key> pair.

This is the AT Command responsibility, which is going to use TLS profile (i.e. AT%SOCKETCMD, AT%ATSIOTCMD, etc.) to verify if the profile is properly defined and contain all needed credential for mutual, server or device authentication.

The Default profile ID=0 cannot be defined by this AT and does not present in TLS config file.
It may be used by TLS-consumer ATs (such as AT%SOCKETCMD, AT%ATSIOTCMD, etc.). This default profile implies only server authentication using root CA stored into Root Trusted folder.

Defined values:
<op>: string. Operation to be applied to TLS profile in config file.

Add operation applied to existed profile will return ERROR.

Value	Description
"ADD"	Add new profile
"DELETE"	Delete profile

Table 138: %CERTCFG_Op_Description

<profile_id>: integer. Numeric value to identify set of credentials used together for some TLS connection(s). (Range: 1-255)

The profile_id=0 is prohibited and reserved for root trusted certs already stored into default root trusted folder.

<ca_file>: string. The name of the root certificate file, if it is known.

<ca_path>: string. The path of the user-added or trusted root certificates.

Use " " (home directory) to create <ca_path> config file parameter for default root trusted folder.

Use "." to create <ca_path> config file parameter for user root certificate folder (which content is populated by AT%CERTCMD="WRITE").

<dev_cert>: string. The name of the user-added device cert file.

<dev_key>: string. The name of the user-added device private key file.

<psk_id>: string. The name of the user-added PSK ID.

<psk_key>: string. The name of the user-added PSK.

PSK filename shall have .psk extension.
Any attempt to create profile with PSK filename with different extension will be rejected with ERROR.

Example:

5.15.1 Create New Config File Section:

```
AT%CERTCFG="ADD",1,"AmazonRootCA3ECC256.pem",,"b7c1bd8c7c-certificate.pem.
    crt","b7c1bd8c7c-private.pem.key"
OK

Created section:
"1": {
'cafile': "AmazonRootCA3ECC256.pem",
'cert': "b7c1bd8c7c-certificate.pem.crt",
'key': "b7c1bd8c7c-private.pem.key",
}
```

5.15.2 Create New PSK Config File Section:

```
AT%CERTCFG="ADD",2,,,,,"testPskId.bin","testPsk.psk"
OK

Created section:
"2": {
"pskid": "testPskId.bin",
"pskkey": "testPsk.psk"
}
```

5.16 AT%CPSMS: Enable/Disable PSM Status Change Notification

Command	Command Type	Response
AT%CPSMS=<cmd>[,<param1>[...]]	Set	OK OR ERROR
AT%CPSMS?	Read	%CPSMS: <state>,<act> OK
AT%CPSMS=?	Test	%CPSMS: (list of supported <cmd>s) OK
Unsolicited	unsolicited	%CPSMSU: <event>

Table 139: AT%CPSMS

Description:
AT command controls non-standard PSM operations and provides enabling/disabling for PSM status change notification.

The execution AT%CPSMS=2 (start camping) triggers cell reconnection procedure, which will be normally stopped by camping on suitable cell.

Modem is considered as get stuck in PSM mode during whole camping attempt and when the camping has been finished.

Read command returns PSM activity status <act>=1.

The AT%CPSMS=2 is accepted only in PSM mode. Otherwise the ERROR will be returned.

The AT%CPSMS=3 (interrupt camping) is accepted only if camping attempt was previously triggered by AT%CPSMS=2. Otherwise the ERROR will be returned.

Read command returns together: PSM feature enabled state (may be also retrieved by AT+CPSMS?) Current PSM activated status (may be also retrieved by AT%STATUS="PSM").

Defined values:
<cmd>: integer. Mode of unsolicited result response presentation.

Value	Description
0	Disable %CPSMSU URC (default)
1	Enable %CPSMSU URC
2	Trigger attempt to camp on cell while in PSM.
3	Interrupt "camping on cell" attempt

Table 140: %CPSMS_Cmd_Description

For <cmd>=2 (start "camping on cell" attempt)
<param1>: integer.

Value	Description
1 - 1200	Optional camping attempt timeout in sec. Default:120 sec

Table 141: %CPSMS_param1_Description

<state>: integer. State of PSM feature.

Value	Description
0	disable
1	Enable

Table 142: %CPSMS_state_Description

<act>: integer. PSM activity status.

Value	Description
0	Inactive
1	Active

Table 143: %CPSMS_Act_Description

<event>: integer.

Value	Description
0	Exit PSM
1	Enter PSM
3	Successfully camped on cell while in PSM
4	Camping attempt interrupted by timeout

Table 144: %CPSMS_Event_Description

6 AT Commands for Packet Domain

6.1 +CEREG: EPS Network Registration Status

The +CEREG command subscribes unsolicited network status notifications.

Command	Command Type	Response
AT+CEREG=<n>	Set	OK
AT+CEREG?	Read	**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=?	Test	+CEREG: (list of supported <n>))

Table 145: AT+CEREG

Description:

The set command controls the presentation of an unsolicited result code +CEREG: <stat> when <n>=1 and there is a change in the MT's network registration status in LTE, or unsolicited result code +CEREG:.

<stat>[,[<tac>],[<ci>],[<AcT>]] when <n>=2 and there is a change of the network cell in LTE. 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.

The read command returns the status of result code presentation and an integer <stat> which shows 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 MT is registered in the network. The parameters[,<cause_type>,<reject_cause>], if available, are returned when <n>=3.

Test command returns values supported as a compound value.

Defined values:

<n>: integer.

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>],[<Perio dic-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>]]]]

Table 146: +CEREG_N_Description

<stat>: integer.

Value	Description
0	not registered, MT is not currently searching an operator to register
1	registered, home network
2	not registered, but MT is currently trying to attach or searching to register
3	registration denied
4	unknown (e.g. 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 1)
9	registered for "CSFB not preferred", home network (not applicable)
10	registered for "CSFB not preferred", roaming (not applicable)

Table 147: +CEREG_Stat_Description

NOTE 1: 3GPP TS 24.008 and 3GPP TS 24.301 Release-13 specify the condition when the MS is considered as attached for emergency bearer services.

<tac>: string. Two byte tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal).

<ci>: string. Four byte E-UTRAN cell ID in hexadecimal format.

<Act>: integer. The parameter sets/shows the access technology of the serving cell.

Value	Description
0	GSM (not applicable)
1	GSM Compact (not applicable)
2	UTRAN (not applicable)
3	GSM w/EGPRS (not applicable)
4	UTRAN w/HSDPA (not applicable)
5	UTRAN w/HSUPA (not applicable)
6	UTRAN w/HSDPA and HSUPA (not applicable)
7	E-UTRAN

Table 148: +CEREG_ActDescription

<cause_type>: integer. Indicates the type of<reject_cause>.

Value	Description
0	Indicates that <reject_cause> contains an EMM cause value.
1	Indicates that <reject_cause> contains a manufacturer-specific cause.

Table 149: +CEREG_Cause_Type_Description

<reject_cause>: integer. Contains the cause of the failed registration. The value is of type as defined by <cause_type>.

<Active-Time>: string. One byte in an 8 bit format. Indicates the Active Time value (T3324) allocated to the UE in LTE.

The Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes).

Bits 5 to 1: Represent the binary coded timer value. Bits 6 to 8: Defines the timer value unit for the GPRS timer as follows:

value	Description
0 0 0	value is incremented in multiples of 2 seconds.
0 0 1	value is incremented in multiples of 1 minute.
0 1 0	value is incremented in multiples of decihours.
1 1 1	value indicates that the timer is deactivated.

Table 150: +CEREG_Active_Timer_value

<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 (e.g. "01000111" equals 70 hours).

Bits 5 to 1 represent the binary coded timer value.
Bits 8 to 6 define the timer value unit as follows:

value	Description
0 0 0	value is incremented in multiples of 10 minutes.
0 0 1	value is incremented in multiples of 1 hour.
0 1 0	value is incremented in multiples of 10 hours.
0 1 1	value is incremented in multiples of 2 seconds.
1 0 0	value is incremented in multiples of 30 seconds.
1 0 1	value is incremented in multiples of 1 minute.
1 1 0	value is incremented in multiples of 320 hours.
1 1 1	value indicates that the timer is deactivated.

Table 151: CEREG_T3412_Timer_value

Example:

6.1.1 AT+CEREG: Set Command

The following command set notifications with level 2:

```
AT+CEREG=2
OK
```

6.1.2 AT+CEREG: Read Command

Example:

```
AT+CEREG?
+CEREG: 2,5,"CB48","01CD6007",9

OK
```

6.1.3 AT+CEREG: Test Command

Example:

```
AT+CEREG=?
+CEREG: (0,1,2,3,4,5)

OK
```

6.2 +CGEREP: Packet domain event reporting

Command	Command Type	Response
AT+CGEREP=[<mode>[,<bfr>]]	Set	OK
AT+CGEREP?	Read	+CGEREP: <mode>,<bfr> OK
AT+CGEREP=?	Test	+CGEREP: (list of supported <mode>),(list of supported<bfr>) OK

Table 152: AT+CGEREP

Description: Command enables or disables sending of 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, Read command returns the current mode and buffer settings.
Test command returns the modes and buffer settings supported by the MT as compound values.

Defined values:

<mode>: integer.

Value	Description
0	Buffer unsolicited result codes in the MT; if MT result code buffer is full, the oldest ones can be discarded. No codes are forwarded to the TE.
1	discard unsolicited result codes when MT-TE link is reserved (e.g. in on-line data mode); otherwise forward them directly to the TE
2	buffer unsolicited result codes in the MT when MT-TE link is reserved (e.g. in on-line data mode) and flush them to the TE when MT-TE link becomes available; otherwise forward them directly to the TE.

Table 153: +CGEREP_Mode_Description

<bfr>: integer.

Value	Description
0	MT buffer of unsolicited result codes defined within this command is cleared when <mode> 1 or 2 is entered.
1	MT buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1 or 2 is entered (OK response shall be given before flushing the codes)

Table 154: +CGEREP_bfr_Description

Example:

6.2.1 AT+CGEREP: Set Command

The following command subscribes CGEV notifications:

```
AT+CGEREP=1
OK
```

6.2.2 AT+CGEREP: Read Command

Example:

```
AT+CGEREP?
+CGEREP: 1,0

OK
```

6.2.3 AT+CGEREP: Test Command

Example:

```
AT+CGEREP=?
+CGEREP: (0−2),(0−1)

OK
```

6.3 +CGDCONT: Define PDP Context

This command defines Packet Data Protocol (PDP) Context.

Command	Command Type	Response
AT+CGDCONT= [<cid> [,<PDP_type>[,<APN> [,<PDP_addr>[,<d_comp> [,<h_comp>[,<IPv4AddrAlloc> [,<request_type> [,<PCSCF_discovery> [,<IM_CN_Signalling_Flag_Ind> [,<NSLPI>[,<securePCO> [,<IPv4_MTU_discovery>][, <Local_Addr_Ind>]]]]]]]]]]]	Set	OK or ERROR
AT+CGDCONT?	Read	[+CGDCONT:<cid>,<PDP_type>,<APN>, <PDP_addr>,<d_comp>,<h_comp> [,<IPv4AddrAlloc>[,<request_type> [,<PCSCF_discovery> [,<IM_CN_Signalling_Flag_Ind>[,<NSLPI> [,<securePCO>[,<IPv4_MTU_discovery> [,<Local_Addr_Ind>]]]]]]]][+CGDCONT:<cid>,<PDP_type>,<APN>, <PDP_addr>,<d_comp>,<h_comp> [,<IPv4AddrAlloc>,<request_type> [,<PCSCF_discovery> [,<IM_CN_Signalling_Flag_Ind>[,<NSLPI> [,<securePCO>[,<IPv4_MTU_discovery> [,<Local_Addr_Ind>]]]]]]]
AT+CGDCONT=?	Test	+CGDCONT: (range of supportet<cid>)),<PDP_type>,,, (list of supported <d_comp>), (list of supported <h_comp>),(list of supported <IPv4AddrAlloc>)...

Table 155: AT+CGDCONT

Description:
The set command specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter.

Modem may automatically set the PDN context. Command shall be used with caution.

Defined values:

<cid>: integer. Specifies a particular PDP context definition.
<PDP_type>: string. Specifies the type of packet data protocol.

- IP
- IPV6
- IPV4V6

<APN>: string. A logical name that is used to select the gateway or the external packet data network.
<PDP_addr>: Parameter omitted.
<d_comp>: Data compression is not supported. Parameters omitted.
<h_comp>: Header compression is not supported. Parameters omitted.
<IPv4AddrAlloc>: integer.

- 0: IPv4 address allocation through NAS signalling
- 1: IPv4 address allocated through DHCP

<request type>: Parameters omitted
<P-CSCF_discovery>: Parameters omitted
<IM_CN_Signalling_Flag_Ind>: Parameters omitted
<NSLPI>: integer. Indicates the NAS signalling priority requested for this PDP context.

- 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 is to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority".

<securePCO>: integer. Specifies if security protected transmission of PCO is requested or not.

- 0: Security protected transmission of PCO is not requested.
- 1: Security protected transmission of PCO is requested.

<IPv4_MTU_discovery>: Parameters omitted.
<Local_Addr_Ind>: Parameters omitted.

Example:

6.3.1 AT+CGDCONT: Set Command

The following command set notifications with level 2:

```
AT+CGDCONT=2,"IP","iot.1nce.net"
OK
```

6.3.2 AT+CGDCONT: Read Command

Example:

```
AT+CGDCONT?
+CGDCONT: 1,"IPV4V6",,,0,0,0,0,0,,0,,,,,

+CGDCONT: 2,"IP","iot.1nce.net"  ,,0,0,,0,,,,,,,,

OK
```

6.3.3 AT+CGDCONT: Test Command

Example:

```
AT+CGDCONT=?
+CGDCONT: (1−15),"IP",,,(0),(0),(0−1),(0−1),(0−2),(0),(0−1),(0),(0),(0),(0) ,(0)
+CGDCONT: (1−15),"IPV6",,,(0),(0),(0−1),(0−1),(0−2),(0),(0−1),(0),(0),(0),(0),(0)
+CGDCONT: (1−15),"IPV4V6",,,(0),(0),(0−1),(0−1),(0−2),(0),(0−1),(0),(0),(0),(0),(0)
+CGDCONT: (1−15),"Non−IP",,,(0),(0),(0−1),(0−1),(0−2),(0),(0−1),(0),(0),(0),(0),(0)

OK
```

6.4 +CGACT: PDP Context Activate or Deactivate

Command	Command Type	Response
AT+CGACT=[<state>[,<cid>	Set	OK or +CME ERROR: <err>
AT+CGACT?	Read	+CGACT: [<cid>,<state>] [+CGACT:<cid>,<state> [...]]
AT+CGACT=?	Test	+CGACT: (list of supported <state>s)

Table 156: AT+CGACT

Description:

The execution command is used to activate or deactivate the specified PDP context. 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. 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.

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.

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 bearermodification 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 activation form of the command activates all defined contexts.

If no <cid>s are specified the deactivation form of the command deactivates all active 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.

Defined values:

<state>: integer.

Value	Description
0	Deactivated
1	Activated

Table 157: +CGACT_State_Description

<cid>: integer. Specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

6.4.1 AT+CGACT: Set Command

The Following command activates or deactivates a PDN connection

6.4.2 AT+CGACT: Read Command

Example:

```
AT+CGACT?
+CGACT: 1,1
+CGACT: 2,0
+CGACT: 3,0
+CGACT: 4,0
+CGACT: 5,0
+CGACT: 6,0
+CGACT: 7,0
+CGACT: 8,0
+CGACT: 9,0
+CGACT: 10,0
+CGACT: 11,0
+CGACT: 12,0
+CGACT: 13,0
+CGACT: 14,0
+CGACT: 15,0

OK
```

6.4.3 AT+CGACT: Test Command

Example:

```
AT+CGACT=?
+CGACT: (0−1)

OK
```

7 SMS Related AT Commands

7.1 +CMGF: Set Message Format

Command	Command Type	Response
AT+CMGF=[<mode>]	Set	OK or +CME ERROR:<err>
AT+CMGF?	Read	+CMGF:<mode>
AT+CMGF=?	Test	+CMGF:(list of supported <index>s)[,(list of supported <mode>s)]

Table 158: AT+CMGF

Description:

Set command tells the TA, which input and output format of messages to use.

<mode> indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from received messages.

Defined values:

<mode>: integer. Mode can be either PDU mode or text mode.

Value	Description
0	PDU mode
1	text mode

Table 159: +CMGF_mode_Description

Example:

7.1.1 AT+CMGF: Set Command

The following command set "text mode":

```
AT+CMGF=1
OK
```

The following command set "PDU mode":

```
AT+CMGF=0
OK
```

7.1.2 AT+CMGF: Read Command

Example:

```
AT+CMGF?
+CMGF: 1

OK
```

7.1.3 AT+CMGF: Test Command

Example:

```
AT+CMGF=?
+CMGF: (0,1)

OK
```

7.2 +CMGD: Delete Message

Command	Command Type	Response
AT+CMGD=<index>[,<delflag>]	Set	OK or +CME ERROR:<err>
AT+CMGF=?	Test	+CMGD:(list of supported <index>)[,(list of supported <delflag>)]

Table 160: AT+CMGD

Description:

Set command deletes message from preferred message storage <mem1> location <index>. If <delflag> is present and not set to 0 then the ME shall ignore <index> and follow the rules for <delflag> shown below. If deleting fails, final result code +CMS ERROR: <err> is returned.

Test command shows the valid memory locations and optionally the supported values of <delflag>.

Defined values:

<index>: integer.

<delflag>: integer. Indicates multiple message deletion request as follows.

Note: Only the <delflag> 0 and 4 are currently implemented.

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.

Table 161: +CMGD_DelFlag_Description

7.3 +CMGL: List Messages

Command	Command Type	Response
AT+CMGL=<stat>	Set	**if text mode (+CMGF=1), command successful and SMS-SUBMITs and/or SMS-DELIVERs:** +CMGL:<index>,<stat>,<oa/da>,[<alpha>],[<scts>] [,<tooa/toda>,<length>]<data>[+CMGL:<index>,<stat>,<da/oa>,[<alpha>],[<scts>] [,<tooa/toda>,<length>]<data>[...]] **if text mode (+CMGF=1), command successful and SMS-STATUS-REPORTs:** +CMGL:<index>,<stat>,<fo>,<mr>,[<ra>],[<tora>], <scts>,<dt>,<st> [+CMGL:<index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>, <dt>,<st>[...]] **if text mode (+CMGF=1), command successful and SMS-COMMANDs:** +CMGL:<index>,<stat>,<fo>,<ct>[+CMGL:<index>,<stat>,<fo>,<ct>[...]] **if text mode (+CMGF=1), command successful and CBM storage:** +CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages> <data>[+CMGL:<index>,<stat>,<sn>,<mid>,<page>,<pages> <data>[...]] **otherwise**: +CMS ERROR:<err>
AT+CMGL=?	Test	+CMGL:(list of supported <stat>)

Table 162: AT+CMGL

Description:

Execution command returns messages with status value <stat> from message storage <mem1> to the TE. If status of the message is 'received unread', status in the storage changes to 'received read'. If listing fails, final result code +CMS ERROR: <err> is returned.

Defined values:

<stat>: integer.

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)

Table 163: +CMGL_stat_Description

<index>: integer. Value in the range of location numbers supported by the associated memory.

<oa>: string. TP-Originating-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tooa>.

<da>: string. TP-Destination-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tooa>.

<alpha>: string. Alphanumeric representation of or corresponding to the entry found in MT phonebook. Implementation of this feature is manufacturer specific, used character set should be the one selected with command Select TE Character Set +CSCS (refer command +CSCS 2.7).

<scts>:string. TP-Service-Centre-Time-Stamp in time-string format.

<toda>: integer. TP-Destination-Address Type-of-Address octet (when first character of is + (IRA 43) default is 145, otherwise default is 129).

<tooa>: integer. TP-Originating-Address Type-of-Address octet.

<length>: integer. Value indicating in the text mode (+CMGF=1) the length of the message body in characters, or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length).

<data>: TP-User-Data in text mode format.

- if indicates that GSM 7 bit default alphabet is used and indicates that TP-User-Data-Header-Indication is not set:
  - if TE character set other than "HEX": ME/TA converts GSM alphabet into current TE character set.
  - if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number.

- if indicates that 8-bit or UCS2 data coding scheme is used, or indicates that TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number.

<pdu>: hexadecimal integer. In the case of SMS: SC address followed by TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)).

7.4 +CMGR: Read Messages

Command	Command Type	Response
AT+CMGR=<index>	Set	**if text mode (+CMGF=1), command successful and SMS-DELIVER:** +CMGR:<stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<data> **if text mode (+CMGF=1), command successful and SMS-SUBMIT:** +CMGR:<stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>]<data> **if text mode (+CMGF=1), command successful and SMS-STATUS-REPORT:** +CMGR:<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> **if text mode (+CMGF=1), command successful and SMS-COMMAND:** +CMGR:<stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toda>],<length><cdata>] **if text mode (+CMGF=1), command successful and CBM storage:** +CMGR:<stat>,<sn>,<mid>,<dcs>,<page>,<pages> <data> **otherwise:** +CMS ERROR:<err>

Table 164: AT+CMGR

Description:

Set command returns message with location value <index> from message storage <mem1> to the TE. About text mode parameters in italics. If status of the message is 'received unread', status in the storage changes to 'received read'. If reading fails, final result code +CMS ERROR: <err> is returned.

Defined values:

<stat>: integer.

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)

Table 165: +CMGR_stat_Description

<index>: integer. Value in the range of location numbers supported by the associated memory.

<oa>: string. TP-Originating-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tooa>.

<da>: string. TP-Destination-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tooa>.

<alpha>: string. Alphanumeric representation of or corresponding to the entry found in MT phonebook. Used character set should be the one selected with command Select TE Character Set +CSCS (see definition of this command in 2.7).

<scts>:string. TP-Service-Centre-Time-Stamp in time-string format.

<toda>: integer. TP-Destination-Address Type-of-Address octet (when first character of is + <da>(IRA 43) default is 145, otherwise default is 129).

<tooa>:integer. TP-Originating-Address Type-of-Address octet.

<length>: integer. Value indicating in the text mode (+CMGF=1) the length of the message body in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length).

<data>: TP-User-Data in text mode format.

- if indicates that GSM 7 bit default alphabet is used and indicates that TP-User-Data-Header-Indication is not set:
  - if TE character set other than "HEX": ME/TA converts GSM alphabet into current TE character set.
  - if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number.

- if indicates that 8-bit or UCS2 data coding scheme is used, or indicates that TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number.

<pdu>: hexadecimal integer. In the case of SMS: SC address followed by TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)).

<fo>: integer. Depending on the command or result code. First octet of SMS-DELIVER, SMS-SUBMIT (default 17), SMSSTATUS-REPORT, or SMS-COMMAND (default 2) in integer format.

<pid>: integer. TP-Protocol-Identifier (default 0).

<dcs>: integer. Depending on the command or result code. SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme.

<sca>: string. RP SC address Address-Value field in string format. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tosca>.

<tosca>: integer. RP SC address Type-of-Address octet.

<vp>: integer or string. Depending on SMS-SUBMIT setting. TP-Validity-Period either in integer format (default 167) or in time-string format.

7.5 +CMGS: Send Message

Command	Command Type	Response
Text mode(+CMGF=1): AT+CMGS=<da>[,<toda>] <CR> <text message is entered> <Ctrl-Z/ESC>	Execute	+CMGS: <mr>[,<scts>] OK If sending fails: +CMS ERROR:<err>
PDU mode(+CMGF=0): AT+CMGS=+CMGS=<length><CR> <PDU is given> <Ctrl-Z/ESC>	Execute	+CMGS: <mr>[,<ackpdu>] OK sending fails: +CMS ERROR:<err>

Table 166: AT+CMGS

Description:
For text mode
Set/Execute command sends message from a TE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <scts> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned. This command should be abortable.

- entered text (TP-Data-Unit) is sent to address <da> and all current settings (refer Set Text Mode Parameters +CSMP 7.12 and Service Centre Address +CSCA 7.10) 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 command line is terminated with <CR>. After that text can be entered from TE to ME/TA.
- the DCD signal shall be in ON state while text is entered.
- the entered text should be formatted as follows:
  - if <dcs> (set with +CSMP 7.12) indicates that GSM 7 bit default alphabet is used and <fo> indicates that TP-User-Data-Header-Indication is not set.
  - if TE character set other than "HEX" (refer command Select TE Char- acter Set +CSCS 2.7): ME/TA converts the entered text into the GSM 7 bit default alphabet. back- space can be used to delete last character and carriage returns can be used (previously mentioned four character sequence shall be sent to the TE after every carriage return entered by the user).
  - If TE character set is "HEX", the entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into the GSM 7 bit default alphabet characters. (e.g. 17 (IRA 49 and 55) will be converted to character (GSM 7 bit default alphabet 23)).

- If <dcs> indicates that 8-bit or UCS2 data coding scheme is used or <fo> indicates that TP-User-Data-Header-Indication is set. The entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into 8-bit octet (e.g. two characters 2A (IRA 50 and 65) will be converted to an octet with integer value 42).
- Sending can be cancelled by giving <ESC> character (IRA 27).
- <ctrl-Z> (IRA 26) must be used to indicate the ending of the message body.

For PDU mode
Execution/Set command sends message from a TE to the network (SMS-SUBMIT). Message reference value is returned to the TE on successful message delivery. Optionally (when +CSMS value is 1 and network supports) 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: is returned. This command should be abortable.

- **<length>**:integer. Indicate the number of octets coded in the TP layer data unit to be given (i.e. SMSC address octets are excluded).
- the TA shall send a four character sequence<CR><LF><greater_than><space> (IRA 13, 10, 62, 32) after command line is terminated with <CR>. After that PDU can be given from TE to ME/TA.
- The DCD signal shall be in ON state while PDU is given.
- The PDU shall be hexadecimal format (similarly as specified for <pdu>) and given in one line. ME/TA converts this coding into the actual octets of PDU.
- When the length octet of the SMSC address (given in the PDU) equals zero, the SMSC address set with command Service Centre Address +CSCA is used. In this case the SMSC Type-of-Address octet shall not be present in the PDU, i.e. TPDU starts right after SMSC length octet.
- Sending can be cancelled by giving <ESC> character (IRA 27).
- <ctrl-Z> (IRA 26) must be used to indicate the ending of PDU.

Defined values:

<da>: string. TP-Destination-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tooa>.

<scts>: string. TP-Service-Centre-Time-Stamp in time-string format.

<toda>: integer. TP-Destination-Address Type-of-Address octet (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129).

<length>: integer. Value indicating in the text mode (+CMGF=1) the length of the message body <data>in characters, or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length).

<mr>: integer. TP-Message-Reference.

<ackpdu>: string. RP-User-Data element of RP-ACK PDU, format is same as for in case of SMS, but without SC address field and parameter shall be bounded by double quote characters like a normal string type parameter.

Example:

7.5.1 AT+CMGS: Execute Command

```
AT+CMGS="+882285000016868"
> Hello world
OK
```

7.6 +CMGW: Write Message to Memory

Command	Command Type	Response
Text mode(+CMGF=1): AT+CMGW=<oa/da>[,<tooa/toda>[,<stat>]]]<CR> <text message is entered> <Ctrl-Z/ESC>	Execute	+CMGW:<index> OK +CMS ERROR:<err>
PDU mode(+CMGF=0): AT+CMGW=<length>[,<stat>]<CR> <PDU is given> <Ctrl-Z/ESC>	Execute	+CMGW:<index> OK +CMS ERROR:<err>

Table 167: AT+CMGW

Description:

Execution command stores message (either SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2>. Memory location <index> of the stored message is returned. By default message status will be set to 'stored unsent', but parameter <stat> allows also other status values to be given. The entering of text is done similarly as specified in command Send Message: +CMGS. If writing fails, final result code +CMS ERROR: <err> is returned.

Note: SMS-COMMANDs and SMS-STATUS-REPORTs can not be stored in text mode.

Defined values:

<stat>: integer.

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)

Table 168: +CMGW_stat_Description

<index>: integer. Value in the range of location numbers supported by the associated memory.

<oa>: string. TP-Originating-Address Address-Value field. BCD numbers(or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tooa>.

<da>:string. TP-Destination-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <toda>.

<tooa>: integer. TP-Originating-Address Type-of-Address octet.<toda> (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129).

<length>: integer. Value indicating in the text mode (+CMGF=1) the length of the message body <data> in characters, or in PDU mode (+CMGF=0), the length of the actual TPvdata unit in octets (i.e. the RP layer SMSC address octets are not counted in the length).

7.7 +CMSS: Send SMS from storage

Command	Command Type	Response
+CMSS=<index>[,<da>[,<toda>]]	Execute	Text mode +CMGF=1: +CMSS: <mr>[,<scts>] OK PDU mode +CMGF=0: +CMSS: <mr>[,<ackpdu>] OK +CMS ERROR:<err>

Table 169: AT+CMSS

Description:

Execution command sends message with location value <index> from preferred message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND). If new recipient address <da> is given given for SMS-SUBMIT, it shall be used instead of the one stored with the message. Reference value <mr> is returned to the TE on successful message delivery.

For text mode, optionally (when +CSMS <service> value is 1 and network supports) <scts> is returned.

For PDU mode, optionally (when +CSMS <service> value is 1 and network supports) <ackpdu> 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. This command should be abortable.

Defined values:

<index>: integer. Value in the range of location numbers supported by the associated memory.

<da>: string. TP-Destination-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in 2.7). Type of address given by <toda>.

<scts>: string. TP-Service-Centre-Time-Stamp in time-string format.

<toda>: integer. TP-Destination-Address Type-of-Address octet (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129).

<mr>: integer. TP-Message-Reference.

<ackpdu>: string. RP-User-Data element of RP-ACK PDU. Format is same as for <pdu> in case of SMS, but without SC address field and parameter shall be bounded by double quote characters like a normal string type Parameter.

7.8 +CNMI: SMS Event Reporting Configuration

Command	Command Type	Response
AT+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	Set	OK +CME ERROR:<err>
AT+CNMI?	Read	+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr> OK
AT+CNMI=?	Test	+CNMI: (list of supported <mode>), (list of supported <mt>), (list of supported <bm>), (list of supported <ds>), (list of supported <bfr>)

Table 170: AT+CNMI

Description:

The command registers or unregisters an SMS client.

Only one AT client can be registered as an SMS client. An existing registration must be released before registering a new client.

Defined values:

<mode>: integer. It controls the processing of unsolicited result codes specified within this command.

Value	Description
1	Discard indication and reject new received message unsolicited result codes when TA-TE link is reserved (e.g. in on-line data mode). Otherwise forward them directly to the TE.
2	Buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation. Otherwise forward them directly to the TE.

Table 171: +CNMI_mode_Description

It is possible that ME/TA result code buffer is 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. Sets the result code indication routing for SMS-DELIVERs.

Value	Description
0	No SMS-DELIVER indications are routed to the TE.
1	If SMS-DELIVER is stored into ME/TA, 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: [<alpha>],<length><CR><LF><pdu> (PDU mode enabled); or+CMT: <oa>, [<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<data> (text mode enabled) 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. Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined in <mt>=1.

Table 172: +CNMI_mt_Description

<bm>: integer. Ignored.
<ds>: integer.

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><pdu> (PDU mode enabled) or +CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<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>

Table 173: +CNMI_ds_Description

<bfr>: integer.

Value	Description
0	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	TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered.

Table 174: +CNMI_bfr_Description

Example:

7.8.1 AT+CNMI: Set Command

The following command registers as a client for MT SMS and status reports:

```
AT+CNMI=3,2,0,1

OK
```

7.8.2 AT+CNMI: Read Command

Example:

```
AT+CNMI?
+CNMI: 3,2,0,1,1

OK
```

7.8.3 AT+CNMI: Test Command

Example:

```
AT+CNMI=?
```

7.9 +CPMS: Preferred SMS message storage

Command	Command Type	Response
AT+CPMS=<mem1>[,<mem2>[,<mem3>]]	Set	+CPMS:<used1>,<total1>,<used2>,<total2>,<used3>,<total3> +CMS ERROR:<err>
AT+CPMS?	Read	+CPMS:<mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> +CMS ERROR:<err>
AT+CPMS=?	Test	+CPMS:(list of supported <mem1>),(list of supported <mem2>),(list of supported <mem3>)

Table 175: AT+CPMS

Description:

Set command selects memory storages <mem1>, <mem2> and <mem3> to be used for reading, writing.

If chosen storage is not appropriate for the ME (but is supported by the TA), final result code +CMS ERROR: <err> shall be returned.

Test command returns lists of memory storages supported by the TA.

Defined values:

<mem1>: string. Memory from which messages are read and deleted (commands List Messages +CMGL, Read Message +CMGR and Delete Message +CMGD).

Value	Description
"BM"	Broadcast message storage
"ME"	ME message storage
"MT"	Any of the storages associated with ME
"SM"	(U)SIM message storage
"TA"	TA message storage
"SR"	Status report storage

Table 176: +CPMS_mem1_Description

<mem2>: string. Memory to which writing and sending operations are made (commands Send Message from Storage +CMSS and Write Message to Memory +CMGW)).

Value	Description
"BM"	Broadcast message storage
"ME"	ME message storage
"MT"	Any of the storages associated with ME
"SM"	(U)SIM message storage
"TA"	TA message storage
"SR"	Status report storage

Table 177: +CPMS_mem2_Description

<mem3>: string. Memory to which received SMS are preferred to be stored (unless forwarded directly to TE. refer command New Message Indications +CNMI). Received CBMs are always stored in "BM" (or some manufacturer specific storage) unless directly forwarded to TE. Received status reports are always stored in "SR" (or some manufacturer specific storage) unless directly forwarded to TE.

Value	Description
"BM"	Broadcast message storage
"ME"	ME message storage
"MT"	Any of the storages associated with ME
"SM"	(U)SIM message storage
"TA"	TA message storage
"SR"	Status report storage

Table 178: +CPMS_mem3_Description

<total1>: integer. Total number of message locations in <mem1>.

<total2>: integer. Total number of message locations in <mem2>.

<total3>: integer. Total number of message locations in <mem3>.

<used1>: integer. Number of messages currently in <mem1>.

<used2>: integer. Number of messages currently in <mem2>.

<used2>: integer. Number of messages currently in <mem3>.

7.10 +CSCA: SMS Service Center Address

Command	Command Type	Response
AT+CSCA=<sca>[,<tosca>]	Set	OK or +CMS ERROR:<err>
AT+CSCA?	Read	+CSCA: <sca>,<tosca> OK
AT+CSCA=?	Test	OK +CMS ERROR:<err>

Table 179: AT+CSCA

Description:

Set 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.

Defined values:

<sca>: string. RP SC address Address-Value field in string format. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7), Type of address given by <tosca>.

<tosca>: integer. RP SC address Type-of-Address octet.

7.11 +CSDH: Show SMS text mode parameters

Command	Command Type	Response
AT+CSDH=[<show>]	Set	OK +CMS ERROR:<err>
AT+CSDH?	Read	+CSDH: <show> OK
AT+CSDH=?	Test	+CSDH: (list of supported <show>) OK +CMS ERROR:<err>

Table 180: AT+CSDH

Description:

Set command controls whether detailed header information is shown in text mode result codes ex: <toda> or <fo>. Test command returns supported values as a compound value.

Defined values:

<show>: integer.

Value	Description
0	Do not show header values defined in commands +CSCA and +CSMP (<sca>, <tosca>, <fo>, <vp>,<pid> and <dcs>) nor <length>, <toda> or <tooa> in +CMT, +CMGL, +CMGR result codes for SMSDELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in +CMGR result code, do not show <pid>, <mn>, <da>, <toda>, <length> or <cdata>
1	Show the values in result codes

Table 181: +CSDH_show_Description

7.12 +CSMP: Set SMS Text Mode Parameters

Command	Command Type	Response
AT+CSMP=[<fo>[,<vp>[,<pid>[,<dcs>]]]]	Set	OK +CMS ERROR:<err>
AT+CSMP?	Read	+CSMP: <fo>,<vp>,<pid>,<dcs> OK
AT+CSMP=?	Test	+CSMP: (list of supported <fo>),(list of supported <vp>),(list of supported <pid>),(list of supported <dcs>) OK CMS ERROR:<err>

Table 182: AT+CSMP

Description:

Set command is used to select values for additional parameters needed when SMS 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 SMS 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, it shall be given as a hexadecimal coded string (refer e.g. <pdu>) with double quotes.

NOTE: When storing a SMS-DELIVER from the TE to the preferred memory storage in text mode (refer command Write Message to Memory +CMGW), <vp> field can be used for <scts>.

Defined values: **<fo>**:integer. Depending on the command or result code: first octet of SMS-DELIVER, SMS-SUBMIT (default 17), SMSSTATUS-REPORT, or SMS-COMMAND (default 2) in integer format.

<pid>: integer. TP-Protocol-Identifier (default 0).

<dcs>: integer. Depending on the command or result code: SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme.

<vp>: integer or string. Depending on SMS-SUBMIT <fo> setting. TP-Validity-Period either in integer format (default 167) or in time-string format.

7.13 +CSMS: Select Message Services

Command	Command Type	Response
AT+CSMS=<service>	Set	+CSMS: <mt>,<mo>,<bm> OK +CMS ERROR:<err>
AT+CSMP?	Read	+CSMS: <service>,<mt>,<mo>,<bm> OK
AT+CSMP=?	Test	+CSMS: (list of supported <service>) OK CMS ERROR:<err>

Table 183: AT+CSMS

Description:

Set command selects 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 chosen service is not supported by the ME (but is supported by the TA), final result code +CMS ERROR: <err> shall be returned. Also read command returns supported message types along the current service setting.

Defined values:

<service>: integer.

Value	Description
0	3GPP Release-13 TS 23.040 (Technical realization of Short Message Service (SMS)) and 3GPP TS 23.041 (Technical realization of Cell Broadcast Service (CBS))
1	3GPP Release 13 TS 23.040 and 3GPP TS 23.041 the requirement of setting 1 is mentioned under corresponding command descriptions.)

Table 184: +CSMS_Service_Description

<mt>, <mo>, <bm>: integer.

Value	Description
0	Type not supported
1	Type supported

Table 185: +CSMS_mt_mo_Description

7.14 %CMGSC: Send Message Large Message

Command	Command Type	Response
if text mode (+CMGF=1): %CMGSC=<da>[,<toda>]<CR> <text is entered> <ctrl-Z/ESC>	Set	**if text mode (+CMGF=1) and sending successful:** %CMGSC: <mr>[,<mr>...] **if sending fails:** +CMS ERROR: <err>
AT+CSMP?	Read	+CSMS: <service>,<mt>,<mo>,<bm> OK
AT+CSMP=?	Test	+CSMS: (list of supported <service>) OK CMS ERROR:<err>

Table 186: AT+CSMS

Description: The standard AT+CMGS command returns single message reference index and assumes that concatenation is handled by the host, therefore only small SMS segments are used by the standard AT+CMGS command.

The AT%CMGSC command is the same as AT+CMGS but extended to allow the host:

- To send large SMS to network. In this case concatenation is required and it is fully handled by the modem which fragments the incoming long SMS, sends few sequential SMS fragments and returns the list of message-references, each is a reference of a single SMS fragment.
- To send large message in a small fragments using concatenation User Data Header (UDH) with each fragment. The fragment parameters shall be manually specified in <id>, <index> and <total> optional parameters to be coded by modem into the UDH of the SMS. In this case (params are present in AT call) the SMS cannot be larger then defined in the standard. In this use-case incoming data is not be divided into pieces and only single SMS will be sent and single message-reference will be returned.

If delivery report has been requested by the sender, then it should be received for each SMS fragment if concatenation is handled by modem. Each delivery report confirms reception of single <mr>. The host shall assume reception of SMS by the peer only if it received delivery report for all the <mr> of the SMS.and +CMT in this document.

Defined values:

<da>: string. TP-Destination-Address Address-Value field. BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS 2.7). Type of address given by <tooa>.

<toda>: integer. TP-Destination-Address Type-of-Address octet (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129).

<mr>:integer. TP-Message-Reference in integer format.

<id>: integer. User Data Header (UDH) concatenated message ID.

<index>: integer. UDH concatenated message index.

<total>: integer. UDH total number of concatenated messages.

8 Socket Related AT commands

8.1 %SOCKETCMD: To Create and Maintain Socket

This command is used to create and maintain a socket by the device.

Command	Command Type	Response
AT%SOCKETCMD=<cmd>[,<param1>[,<param2>[,<param3> ...]]]	Set	**For "INFO" command:** [%SOCKETCMD:<socket_stat>,<socket_type>,<src_ip>,<dst_ip>,<src_port>,<dst_port>[,<socket_dir>,<socket_to>]] **For "SSLINFO" command:** [%SOCKETCMD:<SSL_mode>,<ClientCerId>] **For "LASTERROR" command:** [%SOCKETCMD:<socket_err>] **For "ALLOCATE" command:** %SOCKETCMD:<socket_id> **For "FASTSEND and CONFSEND" command:** [%SOCKETCMD:<wlength>] **For "SSLKEEP" command:** [%SOCKETCMD:<ssl_session_id>] **For other commands:** OK ERROR
AT%SOCKETCMD?	Read	Returns the list of created sockets and their status: [%SOCKETCMD:<socket_id>,<socket_stat>[%SOCKETCMD:<socket_id>,<socket_stat>[...]]] OK
AT%SOCKETCMD=?	Test	%SOCKETCMD: (list of supported <cmd>)

Table 187: AT%SOCKETCMD

Description:

This command is used to create and maintain a socket by the device.

Number of supported sockets is operators/OEM specific configured. It can be ranged from 1 socket to several ones.

- IPv4 format shall use the format (xxx.xxx.xxx.xxx). Where xxx is a decimal number

from 0 to 255. When the leading digits in each segment are 0, the number of digits is adjusted accordingly, and then output. Example: 192.0.2.1, 127.0.0.1, etc.

- The unsolicited %SOCKETEV command is automatically enabled when the socket is opened. The command is sent with <event> in two cases:
  - Rx buffer has more Bytes to read.
  - Socket terminated by peer.
- The AT%SOCKETCMD command is blocking. This may cause blocking of the AT channel for a long time in case of an "OPEN" command.
- The "CLOSE" command is also blocking and can take time (the socket implementation may take about 8 sec to close the connection due to an internal TCP FIN timer).

The "CLOSE" command may be ordered while data is still inside the module. In such cases, the module activates the "close" process only after it has sent the internally-retained data to its destination. However, the module may still drop the internally-retained data in case of connection loss, and in case of PDN closure.

The local IP address cannot be configured by the AT%SOCKETCMD command (it is assigned by the network).

The local IP port can be configured by the AT%SOCKETCMD command, or it can be set automatically by the socket.

Important Information Related to SSL.

- The network allocated SSL session ID is kept and maintained internally by the device per connection allocated "socket ID" until socket deletion. The SSL session ID is kept even when the socket connection is closed (by "DEACTIVATE" subcommand) to allow reuse of the SSL session on new opened socket connection.
- Upon "ACTIVATE" command, if SSL session ID is allocated by the network, then device will try first to recover the existing SSL session ID. If failed to recover SSL connection, then will open new one. "SSLALLOC" command will delete previously allocated SSL session ID.
- Using "SSLKEEP" subcommand, the SSL session may be kept even when the socket connection is deleted to allow reuse of the SSL session on newly created socket connection. For this purpose the SSL session identifier (<ssl_session_id>) returned by "SSLKEEP" subcommand shall be stored for future use.
- To reuse kept SSL session the "ACTIVATE" sub-command for newly created socket shall use this stored SSL session identifier.

User shall delete kept SSL session by "SSLDEL" subcommand when it is not needed any more to prevent limited resource leakage.

Number of supported SSL sessions is the same as a number of configured sockets.

Defined values:

<cmd>: string.

Value	Description	Param
"ALLOCATE"	Allocates socket session with the following parameters	Param1 - 9
"ACTIVATE"	Activates the predefined socket	Param1 - 2
"INFO"	Returns the details of the specific socket ID	Param1
"DEACTIVATE"	Request to deactivate the specific socket ID and release its resources	Param1 - 2
"FASTSEND"	This command activates the predefined socket, writes to the socket, and then deactivates it	Param1 - 3
"DELETE"	Request to delete specific socket ID allocation	Param1 - 2
"LASTERROR"	Request to get the last Socket error code	Param1
"CONFSEND"	Similar to "FASTSEND" this command activates the predefined socket, writes to the socket and then deactivates it. In addition, this command guarantees that data has been transmitted within pre-defined timeout (command is blocking). If not, command returns ERROR. Starting PRODUCTS-15699.	Param1
"SSLALLOC"	Add SSL for specific socket session id with the following SSL parameters	Param1 - 5
"SSLINFO"	Return the SSL details of specific socket ID	Param1
"SETOPT"	Set Socket options for specific socket ID	Param1 - 4
"SSLKEEP"	Keep SSL session of specific socket ID	Param1
"SSLDEL"	Delete kept SSL session	Param1

Table 188: %SOCKETCMD_cmd_Description

For <cmd> "ALLOCATE": Allocates socket session with the following parameters.

<param1>: integer.

Value	Description
"Session ID"	a numerical numeric value defined in NP configuration file which point to the PDN on which the socket should be opened. "Session ID" is defined in AT%CGINFO

Table 189: %SOCKETCMD_Param1_Description

<param2>: string.

Value	Description
"TCP"	For creation of TCP socket (TLS mode when security is enabled)
"UDP"	For creation of UDP socket (DTLS mode when security is enabled)

Table 190: %SOCKETCMD_Param2_Description

<param3>: string.

Value	Description
"OPEN"	The socket opens the TCP/UDP connection with the peer.
"LISTEN"	The socket create TCP/UDP listener
"LISTENP"	The socket create TCP/UDP parent listener socket. Once activated, multiple connected sockets could be spawned from it.

Table 191: %SOCKETCMD_Param3_Description

<param4>: string.

Value	Description
"xxx.xxx.xxx.xxx"	Destination IPv4,xxx = 1 255.

Table 192: %SOCKETCMD_Param4_Description

<param5>: integer.

Value	Description
1 - 65535	Destination UDP/TCP port number in the range from 1 - 65535

Table 193: %SOCKETCMD_Param5_Description

<param6>: string. Optional.

Value	Description
"1 - 65535"	Source (local) UDP/TCP port number in the range 1 - 65535
"0"	auto port selection by the socket and it is also used as the default value

Table 194: %SOCKETCMD_Param6_Description

<param7>: integer. Optional packet size to be used by the TCP/UDP/IP stack for data sending.

Value	Description
0	Automatically selects default value (MTU based)
1-1500	Packet size in bytes

Table 195: %SOCKETCMD_Param7_Description

<param8>: integer. Optional TCP Connection setup timeout. If timer expires, then command return ERROR.

In case that connection type is "OPEN" the timeout event is: No SYN-ACK reply from the peer.
In case that connection type is "LISTEN" the timeout event is: No SYN request from the peer.

Value	Description
30-360 sec	Default is 60 sec. Parameter is irrelevant for parent listening socket; it will be ignored if present.

Table 196: %SOCKETCMD_Param8_Description

<param9>: integer. Optional IP type used to configure preferred IP type for connection. The IPv4v6 type is default for zero Session ID. Otherwise IP type of selected Session ID is used as default.

Value	Description
0	IPv4v6
1	IPv4
2	IPv6

Table 197: %SOCKETCMD_Param9_Description

For <cmd> "ACTIVATE":, Activates the predefined socket.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 198: %SOCKETCMD_ACTIVATE_Param1_Description

<param2>: integer. The optional SSL session ID, if it was kept by "SSLKEEP" beforehand.
For <cmd> "INFO":, Returns the details of the specific socket ID.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 199: %SOCKETCMD_INFO_Param1_Description

For <cmd> "DEACTIVATE": Request to deactivate the specific socket ID and release its resources.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 200: %SOCKETCMD_DEACTIVATE_Param1_Description

<param2>: integer.

Value	Description
0	no need to wait (default)
1	Wait

Table 201: %SOCKETCMD_DEACTIVATE_Param2_Description

For <cmd> "FASTSEND": This command activate the predefined socket, write to the socket and then deactivate it.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 202: %SOCKETCMD_FASTSEND_Param1_Description

<param2>: integer.

Value	Description
1 - 1500	The length in Bytes of the data which needs to be written

Table 203: %SOCKETCMD_FASTSEND_Param2_Description

<param3>: hexadecimal value.

Value	Description
"00"-"FF"	The data, in HEX format (in quotes), which will be written to the specified socket.

Table 204: %SOCKETCMD_FASTSEND_Param3_Description

For <cmd> "DELETE": Request to delete specific socket ID allocation. (including SSL session context if exist)
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 205: %SOCKETCMD_DELETE_Param1_Description

<param2>: integer.

Value	Description
0	no need to wait (default)
1	Wait

Table 206: %SOCKETCMD_DELETE_Param2_Description

For <cmd> "LASTERROR": Request to get the last Socket error code.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 207: %SOCKETCMD_LASTERROR_Param1_Description

For <cmd> "CONFSEND": Similar to "FASTSEND" this command activates the predefined socket, writes to the socket and then deactivates it. In addition, this command guarantees that data has been transmitted within pre-defined timeout (command is blocking). If not, command returns ERROR.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 208: %SOCKETCMD_CONFSEND_Param1_Description

<param2>: integer.

Value	Description
10 - 360	timeout in sec

Table 209: %SOCKETCMD_CONFSEND_Param2_Description

<param3>: integer.

Value	Description
10 - 1500	The length in Bytes of the data which need to be written

Table 210: %SOCKETCMD_CONFSEND_Param3_Description

<param4>: hexadecimal value.

Value	Description
"00" - "FF"	The data, in HEX format (in quotes), which will be written to the specified socket.

Table 211: %SOCKETCMD_CONFSEND_Param4_Description

For <cmd> "SSLALLOC": Add SSL for specific socket session id with the following SSL parameters.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 212: %SOCKETCMD_SSLALLOC_Param1_Description

<param2>: integer. SSL mode

Value	Description
0	mutual authentication (default)
1	authenticate client side only
2	authenticate server side only

Table 213: %SOCKETCMD_SSLALLOC_Param2_Description

<param3>: integer. Certificate profile ID pre-settled by AT%CERTCFG. Default zero profile ID may be used for server authentication only and will apply root CAs stored into Root Trusted folder for authentication.
<param4>: integer. Optional cipher suite filtering option to be applied to the default list of supported ciphers for negotiation with server.

Value	Description
0	white list, to leave only selected cipher suites
1	black list, to remove mentioned cipher suites

Table 214: %SOCKETCMD_SSLALLOC_Param4_Description

<param5>: integer. Optional Optional cipher suite list (white or black).

List of cipher suites as per https://www.iana.org/assignments/tls-parameters/tls-parameters.xhtml definition. All cipher suites in the list are encoded into single string using hexadecimal cipher suite ID separated by ";", i.e. "C02C;C0AD...C003".

For <cmd> "SSLINFO": Return the SSL details of specific socket ID.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 215: %SOCKETCMD_SSLINFO_Param1_Description

For <cmd> "SETOPT": Set Socket options for specific socket ID.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) of the specified socket

Table 216: %SOCKETCMD_SETOPT_Param1_Description

<param2>: integer.

Value	Description
1 - 36000	TCP/UDP aggregation timer in msec (default: 5000). This timer allows improved data transmission efficiency by aggregating several transmissions to single packet.

Table 217: %SOCKETCMD_SETOPT_Param2_Description

<param3>: integer.

Value	Description
1 - 2048	TCP/UDP TX buffer aggregation size in Bytes (default: 1500). This aggregation allows improved data transmission efficiency by aggregating several transmissions to single packet.

Table 218: %SOCKETCMD_SETOPT_Param3_Description

<param4>: integer.

Value	Description
0 - 3008	TCP idle timer in seconds (default: 60). When there is no client/server activity over the predefined time, the socket is deactivated (Socket option TCP_KEEPINTVL)

Table 219: %SOCKETCMD_SETOPT_Param4_Description

For <cmd> "SSLKEEP": Keep SSL session of specific socket ID.
<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) for which SSL session will be kept over socket deletion.

Table 220: %SOCKETCMD_SSLKEEP_Param1_Description

For <cmd> "SSLDEL": Delete kept SSL session.
<param1>: integer.

Value	Description
"Session ID"	The SSL session ID (identifier) which SSL session was kept over socket deletion.

Table 221: %SOCKETCMD_SSLDEL_Param1_Description

<socket_id>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) for which SSL session will be kept over socket deletion.

Table 222: %SOCKETCMD_SSLDEL_Param2_Description

<socket_stat>: string.

Value	Description
"DEACTIVATED"	The socket is not active
"ACTIVATED"	The socket is active
"LISTENING"	The socket is listening

Table 223: %SOCKETCMD_SSLDEL_Param3_Description

<socket_type>: string.

Value	Description
"TCP"	For creation of the TCP socket (TLS mode when security is enabled)
"UDP"	For creation of the UDP socket (DTLS mode when security is enabled)

Table 224: %SOCKETCMD_SSLDEL_Param4_Description

<src_ip>: string.

Value	Description
Source IP address	Source IPv4 or IPv6 address

Table 225: %SOCKETCMD_SSLDEL_Param5_Description

<dst_ip>: string.

Value	Description
Destination IP address	Destination IPv4 or IPv6 address

Table 226: %SOCKETCMD_SSLDEL_Param6_Description

<src_port>: string.

Value	Description
"1 - 65535"	Source UDP/TCP port number

Table 227: %SOCKETCMD_SSLDEL_Param8_Description

<dst_port>: string.

Value	Description
"1 - 65535"	Destination UDP/TCP port number

Table 228: %SOCKETCMD_SSLDEL_Param9_Description

<socket_dir>: integer. The direction of the TCP socket.

Value	Description
0	No set
1	Dialer
2	Listener

Table 229: %SOCKETCMD_SSLDEL_Param10_Description

<socket_to>: integer. TCP connection setup timeout as specified in the "OPEN" command.
<socket_err>: integer. Error values as defined by 3GPP TS 27.007 Release-13 subclause 9.2 for <err> values with extension.
<ssl_session_id>: integer. The SSL session ID.
<wlength>: integer. The actual length in Bytes of data written to the socket in "FASTSEND" command.

8.2 %SOCKETDATA: To send/receive to/from The Socket

Command	Command Type	Response
AT%SOCKETDATA=<cmd>[,<param1>[,<param2>[,<param3>...]]]	Set	**For "RECEIVE" command:** [%SOCKETDATA:<socket_id>[,<rlength>,<moreData>[,<rdata>[,<src_ip>,<src_port>]]]] OK or ERROR **For "SEND" command:** [%SOCKETDATA:<socket_id>[,<wlength>]] OK or ERROR
AT%SOCKETDATA?	Read	ERROR (Not Supported)
AT%SOCKETDATA=?	Test	%SOCKETDATA: (list of supported <cmd>)

Table 230: AT%SOCKETDATA

Description:

This command is used to send/receive to/from the socket.

- An operation that returns with ERROR can be evidence that the TCP socket was closed (by the user, the socket idle timer, or the peer). There is unsolicited indication for socket closure by idle timer or by peer.
- The "SEND" command returns "OK" after the actual transmission of the data, but before "ACK" reception from the peer. This can result in TX buffer fill-up which may cause an additional "SEND" command with an ERROR.
- The application can issue AT%SOCKET="LASTERROR" to get the reason for the last failure.

Defined values:

<cmd>: string.

Value	Description	Param
"SEND"	Write to the socket	Param1 - 5
"RECEIVE"	Read from the socket	Param1 - 2

Table 231: %SOCKETDATA_Cmd_Description

For <cmd> "SEND": Write to the socket.

<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) for which SSL session will be kept over socket deletion.

Table 232: %SOCKETDATA_SEND_Param1_Description

<param2>: integer.

Value	Description
1 - 1500	The length in Bytes of the data which needs to be written.

Table 233: %SOCKETDATA_SEND_Param2_Description

<param3>: hexadecimal. The data, in HEX format (in quotes), which will be written to the specified socket.
<param4>: string. Optional parameter. Applied for UDP datagrams only. Destination IPv4 or IPv6 address.
<param5>: integer. Optional parameter. Applied for UDP datagrams only. Destination port number in the range 1 - 65535.

For <cmd> "RECEIVE": Read from the socket.

<param1>: integer.

Value	Description
"Socket ID"	The socket ID (identifier) for which SSL session will be kept over socket deletion.

Table 234: %SOCKETDATA_RECEIVE_Param1_Description

<param2>: integer.

Value	Description
1 - 1500	The maximal length of the data buffer to be read from the socket.

Table 235: %SOCKETDATA_RECEIVE_Param2_Description

Note1: In UDP mode, RX buffer would only keep NEXT data packet. Please use 1500 to receive maximum current data in module RX buffer at once otherwise Module will drop rest of current data.

Note2: In UDP mode, please limit maximum data packet to be less than 1500 bytes because of maximum data RX buffer of module is 1500 bytes in case of the host cannot receive complete data.

<socket_id>: integer. The socket ID (identifier) of the specified socket.
<rlength>: integer.

Value	Description
1 - 1500	The actual length in Bytes of the data which was actually read.

Table 236: %SOCKETDATA_RECEIVE_rlength_Description

<moreData>: integer. The length on bytes of the data left in the RX buffer.
<rdata>: hexadecimal value.

Value	Description
"00" - "FF"	The read data in HEX format (in quotes).

Table 237: %SOCKETDATA_RECEIVE_rdata_Description

<wlength>: integer.

Value	Description
1 - 1500	The actual length in Bytes of the data written to the socket.

Table 238: %SOCKETDATA_RECEIVE_wlength_Description

<src_ip>: string. Optional parameter, returned for UDP datagrams only. Source IPv4 or IPv6 address
<src_port>: intrger. Optional parameter, returned for UDP datagrams only. Source UDP port number in the range 1 - 65535.

8.3 %MFSOCKETDATA: To send/receive Binary Data

Command	Command Type	Response
AT%MFSOCKETDATA= <cmd>,<param1>,<param2>	Set	**For "RECEIVE" command:** %MFSOCKETDATA:<socket_id>[,<rlength>, <moreData>[,<rdata>[,<src_ip>,<src_port>]]]] OK or ERROR **For "SEND" command:** @<wdata> [%MFSOCKETDATA:<socket_id>,<wlength>] OK or ERROR
AT%MFSOCKETDATA?	Read	ERROR (Not Supported)
AT%MFSOCKETDATA=?	Test	%MFSOCKETDATA: (list of supported <cmd>)

Table 239: AT%MFSOCKETDATA

Description: This command is a binary version used to send/receive binary data to/from the socket, alternative to the AT%SOCKETDATA.
Defined values:

<cmd>: string.

Value	Description
"SEND"	Write to the socket.
"RECEIVE"	Read from the socket.

Table 240: %MFSOCKETDATA_cmd_Description

For "SEND":

<param1>: integer. The socket ID (identifier) of the socket.
<param2>: integer. The length in Bytes of the data which need to be written, range is: 1 to 1500.
<wdata>: After the"@" prompt bytes of data should be entered.

For "RECEIVE":

<socket_id>: integer. The socket ID (identifier) of the specified socket.
<rlength>: integer. The actual length in Bytes of the data which was actually read.

<moreData>: integer. The length on bytes of the data left in the RX buffer.

<rdata>: raw data. The read data, in binary format (in quotes),a byte stream has any kind of characters in the ASCII range [0x00,0xFF].

<wdata>: raw data. The write data, in binary format (in quotes),a byte stream has any kind of characters in the ASCII range [0x00,0xFF].

<wlength>: integer. The actual length in Bytes of data written to the socket.

<src_ip>: string. Optional parameter, returned for UDP datagrams only: Source IPv4 or IPv6 address.

<src_port>: integer. Optional parameter, returned for UDP datagrams only: Source UDP port number in the range 1-65535.

8.4 %SOCKETEV: Notify About Socket Events

Command	Command Type	Response
AT%SOCKETEV= <event_id>,<mode>	Set	OK or ERROR
AT%SOCKETEV?	Read	ERROR (Not Supported)
AT%SOCKETEV=?	Test	%SOCKETEV: (list of supported <event_id>) , (list of supported <mode>)
Unsolicited	Unsolicited	AT%SOCKETEV: :<event_id>,<socket_id> [,<connected_socket_id>]

Table 241: AT%SOCKETEV

Description:

This command is used to notify about socket events. The reporting may be enabled/disabled per event type.

The unsolicited %SOCKETEV command is automatically enabled for all event types when the socket is opened using the "OPEN" or "LISTEN" subcommands of the AT%SOCKETCMD command.

The unsolicited is sent in the following four cases:

- Rx buffer has more Bytes to read
- socket termination due to Idle timer expiration
- Socket terminated by peer.
- New connected socket is accepted/spawned from the listening socket.

There are two types of listener sockets: "synchronous" and "asynchronous". The user must wait for URC, which may occur at any time (or never) for asynchronous sockets. An Asynchronous listening socket is also called a Parent listening socket. Parent listening sockets, and connected sockets that are spawned from it, will have different IDs.

The %SOCKETEV=4 command unsolicited response will be used to notify "accept incoming connection" after activating the parent listening socket. This URC provides both listening and spawned from its connected sockets IDs.

Defined values:

<event_id>: integer.

Value	Description
0	All events, used only in execution command
1	Rx buffer has more Bytes to read
2	Socket deactivate due to idle timer expiry
3	Socket terminated by peer
4	New connected socket is accepted/spawned from parent listening socket

Table 242: %SOCKETEV_Event_Id_Description

<mode>: integer.

Value	Description
0	Disabled unsolicited result response presentation
1	Enabled unsolicited result response presentation

Table 243: %SOCKETEV_mode_Description

<socket_id>: integer. The socket ID (identifier) of the socket (parent for async).
<connected_socket_id>: integer. The socket ID (identifier) of the connected socket spawned from the specified parent listening socket.

9 HTTP/HTTPS Related AT commands

9.1 %HTTPCFG: To Configure HTTP Connection Parameters

AT command to configure HTTP connection parameters. To start new HTTP connection the "NODES" parameters shall be defined at least.

Command	Command Type	Response
AT%HTTPCFG=<obj>,<profile_id>[,[<param1>][,[<param2>]...]]	Set	OK or ERROR
AT%HTTPCFG?	Read	ERROR
AT%HTTPCFG=?	Test	%HTTPCFG: (list of supported <cmd>), (list of supported <profile_id>)

Table 244: AT%HTTPCFG

Description:

AT command to configure HTTP connection parameters. To start new HTTP connection the "NODES" parameters shall be defined at least.

Other configurations may be omitted, default settings are used.

- If "TLS" layer is not configured, unsecured connection will be established by default. It will be considered as misconfiguration if "NODES" URL requires security (https), but "TLS" layer is not configured. Any data access via AT%HTTPCMD/READ/SEND will be rejected for such misconfiguration.
- If "IP" layer is not configured, default PDN will be used.
- If "TIMEOUT" parameters are not configured, default parameters will be selected.

To make this omission confidentially working, it is strictly recommended to call "CLEAR" sub-command before entering new configuration for previously used <profile_id>. Profile ID parameter is introduced to handle multiple pre-defined HTTP configuration settings.The unique ID for multi-profile configuration is assigned by user and then used for all following profile configurations via same AT%HTTPCFG, for data transfer and other operations (AT%HTTPSEND, AT%HTTPSEND,AT%HTTPCMD) and for events (AT%HTTPEV%HTTPEVU).

Default "FORMAT" configuration is:

- Text or pseudo-text raw data transfer.
- Automatic HTTP header generation in AT request (AT%HTTPCMD/SEND).
- The AT response HTTP header is present in response to observe errors (AT%HTTPREAD).

This default configuration may be overridden by explicit "FORMAT" settings and will be applied to any data transfer via same <profile_id>. Some AT response format parameters for specific "GET" operation may be also overridden in AT%HTTPCMD="GET" itself.

Defined values:

<obj>: string.

Value	Description
"NODES"	Configure client & server nodes parameters
"TLS"	Configure TLS layer security parameters
"IP"	Configure IP layer parameters
"FORMAT"	Configure HTTP data/header representation
"TIMEOUT"	Configure timeouts: server and host (switch)
"CLEAR"	Clear all previous configuration settings for specified <profile_id>
"ABORT"	Clear all unread data from incoming buffer for specified <profile_id>

Table 245: %HTTPCFG_Obj_Description

<profile_id>: integer. Default or previously assigned <profile_id>

- 1 - 5: multi-profile mode.

For "NODES":
<param1>: string. URL or IP address.
<param2>: string. Optional authentication user identification string for HTTP.
<param3>: string. Optional authentication password for HTTP.

For "TLS":
<param1>: string. TLS authentication mode.

- 0: mutual authentication (default)
- 1: authenticate client side only
- 2: authenticate server side only

<param2>: integer. TLS predefined authentication context (profile) previously configured by AT%CERTCFG.

For "IP":

<param1>: integer. Session ID numeric PDN identification defined in APN table for specified PDN. If omitted default data PDN is used unless configured differently by AT-SETROUTE.

<param2>: integer. Optional IP type used to configure preferred IP type for connection.

- 0: IPv4v6
- 1: IPv4
- 2: IPv6 (default)

<param3>: integer. Optional destination (server) TCP port number. If omitted default HTTP port number is used, starting PRODUCTS-19261.

- 1 - 65535

<param4>: integer. Optional source (local) TCP port number. If omitted default HTTP port number is used.

- 1 - 65535

For "FORMAT":

<param1>: integer. Data transfer technique.

- 0: Data text mode (default value)
- 1: Data PDU (ASCII encoded hex) mode

<param2>: integer. AT response header presence as part of <data> parameter in AT%HTTPREAD.

- 0: disable
- 1: enable (default value)

<param3>: integer. AT request header presence as a part of <data> parameter in AT%HTTPSEND. If feature is enabled, all HTTP header override parameters in AT%HTTPSEND are irrelevant and ignored.

- 0: disable
- 1: enable (default value)

For "TIMEOUT":

<param1>: integer. Server response timeout. The default value is 120 sec (2 min). If server response is not arrived during this time, server timeout error will be reported via URC. Unit: seconds.

- 1 - 65535

9.2 %HTTPCMD: To Communicate With HTTP Server

Command	Command Type	Response
AT%HTTPCMD=<cmd>,<profile_id>, [<uri>][,<param1>,.....]	Set	OK or ERROR
AT%HTTPCMD?	Read	ERROR
AT%HTTPCMD=?	Test	%HTTPCFG: (list of supported <cmd>), (list of supported <profile_id>)

Table 246: AT%HTTPCMD

Description:

This is AT command to communicate with HTTP server.

All sub commands are unblocking.
The information about command success or fail will be provided in %HTTPEVU URC.
Defined values:

<cmd>: string.

Value	Description
"GET"	Trigger HTTP GET
"DELETE"	Trigger HTTP DELETE

Table 247: %HTTPCMD_Cmd_Description

<profile_id>: integer. Previously assigned <profile_id>.

- 1 - 5: multi-profile mode.

<uri>: string. Optional resource (URI) or requested object. If omitted the default IP/URI defined in AT%HTTPCFG will be used.
For "GET":

<param1>: integer. Optional parameter. Override the format/technique of downloaded data transfer via AT%HTTPREAD (default or as defined by AT%HTTPCFG="FORMAT").

- 0: Data text mode (default value)
- 1:Data PDU (ASCII encoded hex) mode

<param2>: integer. Optional parameter. Override response header presence in AT%HTTPREAD <data> parameter (default or as defined by AT%HTTPCFG="FORMAT").

- 0: disable
- 1: enable (default value)

<param3> - <paramN>: string. Optional HTTP extra header line. Number of extended headers is limited only by overall AT command buffer size of 3KB.

9.3 %HTTPSEND: Sending Data To The Server

Command	Command Type	Response
AT%HTTPSEND= HTTPSEND=<cmd>,<profile_id> [<data_len>],[<uri>][,<param1>...] <data>	Set	OK or ERROR
AT%HTTPSEND?	Read	[%HTTPSEND: <profile_id>,<busy_len>, <free_len>[%HTTPSEND: <profile_id>, <busy_len>,<free_len>...]]
AT%HTTPSEND=?	Test	%HTTPSEND: (list of supported <cmd>),(list of supported <profile_id>)

Table 248: AT%HTTPSEND

Description:

AT command performs a POST or PUT request to HTTP server and triggers sending data to the server.

The <data_len> parameter may be omitted in human debug mode of AT usage. In this use-case data end shall be signaled by Ctrl+Z pressing.

The information about command success or fail will be provided in %HTTPEVU URC.

Defined values:

<cmd>: string.

Value	Description
"PUT"	Trigger HTTP PUT
"POST"	Trigger HTTP POST

Table 249: %HTTPSEND_Cmd_Description

<profile_id>: integer. Previously assigned <profile_id>.

- 1 - 5: multi-profile mode.

<data_len>: integer. Actual data size in bytes to send.

- 1 - 3000 in Data text mode.
- 1 - 1500 in Data PDU (hex) mode

<uri>: string. Optional resource (URI) or requested object.
If omitted the default IP/URL defined in AT%HTTPCFG will be used.

For <param3>=0 of AT%HTTPCFG="FORMAT":

<data> does not contain HTTP header.

<param1>: string. Optional HTTP Content Type identifier. This parameter may be omitted, if default text/plain content is transferred.

For <param3>=1 of AT%HTTPCFG="FORMAT":
HTTP header is part of <data> content.

<param1>: string. Optional HTTP security definition. This parameter indicates the security level for this specific data transfer.

- "http"
- "https"

<param2>: integer. Optional parameter. More pending data indication, which is waiting to be sent using the same POST/PUT sub-command.

- 0: This is the last POST/PUT chunk (default value)
- 1: and more - Size of more pending data to send within the next POST/PUT

<param3>: integer. Optional parameter. Override the format/technique of uploaded data transfer (default or as defined by AT%HTTPCFG="FORMAT")

- 0: Data text mode (default value)
- 1: Data PDU (ASCII encoded hex) mode

<param4> - <paramN>: string. Optional HTTP extra header line. Number of extended headers is limited only by overall AT command buffer size of 3KB. If this AT is used with an essential number of extended headers, the size of <data> shall be decreased in such a way that overall AT string will not exceed 3KB.

<data>: HTTP plain payload without quotes.

9.4 %HTTPREAD: To Read The Body Of HTTP Response

Command	Command Type	Response
AT%HTTPREAD= <profile_id>[,<max_len>]	Set	%HTTPREAD: <data_len> ,<rcv_len> <data> OK or ERROR
AT%HTTPREAD?	Read	[%HTTPREAD: <profile_id>,<rcv_len>[%HTTPREAD: <profile_id>,<rcv_len>[...]]]
AT%HTTPREAD=?	Test	%HTTPREAD: list of supported <profile_id>)

Table 250: AT%HTTPREAD

Description:

AT command is used to read the body of HTTP response. Once URC %HTTPEV informs about some operation confirmation or data received, this AT can be used to retrieve data provided by server.

If <max_len> is omitted or set to 0, whole server data will be transferred.

If <max_len> is less than actual <data_len>, the message will be truncated. The <rcv_len> different from <data_len> in AT command response indicates that message was truncated. If the data is not present for specified <profile_id>, command returns ERROR. Only single packet is stored internally per Profile ID. If it will not be retrieved by user after "GETRCV" URC arrival, next incoming HTTP packet will override previous one.

Use "Content length" (if present) provided in first "GETRCV" URC arrived after AT%HTTPCMD="GET" operation to estimate HTTP GET response size.

Defined values:

<profile_id>: integer. Previously assigned <profile_id>.

- 1 - 5: multi-profile mode.

<max_len>: integer. Max number of bytes of host allocated buffer to read.

- 1 - 3000 in Data text mode.
- 1 - 1500 in Data PDU (hex) mode

<data_len>: integer. Data size in bytes returned by AT.
It could be shorter than actual received data if was truncated by buffer size:

- 1 - 3000 in Data text mode.
- 1 - 1500 in Data PDU (hex) mode

<rcv_len>: integer. Actual data size in bytes received from server and present in the RX buffer.

<data>: HTTP plain payload without quotes.

9.5 %HTTPEV: To Notify About HTTP Events.

Command	Command Type	Response
AT%HTTPEV=<ev_type>,<mode>	Set	OK or ERROR
AT%HTTPEV?	Read	ERROR
AT%HTTPEV=?	Test	%HTTPEV: (list of supported <ev_type>),(list of supported <mode>)
unsolicited	unsolicited	%HTTPEVU:<ev_type>,<profile_id>,<state>[,<res1> [,<res2>,...]]

Table 251: AT%HTTPEV

Description:

The command is intended to notify about HTTP events. Default HTTP mode is URC disabled for all event types. Most of the events are related to asynchronous operation triggered by AT%HTTPCMD/HTTPSEND. Such acknowledgement may be normally disabled. Only "GETRCV" event provides notification about data received from the server.

Note: If TCP session is disconnected because of link lost, no URC is sent.

Defined values:

<ev_type>: string.

Value	Description
"PUTCONF"	PUT procedure confirmation status
"POSTCONF"	POST procedure confirmation status
"DELCONF"	Delete procedure confirmation status
"GETRCV"	GET procedure data arrival event
"SESTERM"	Session terminated remotely or locally
"ALL"	All events, used only in execution command

Table 252: %HTTPEV_EV_Type_Description

<mode>: integer. Status of unsolicited result response presentation.

- 0: Disabled.
- 1: Enabled

<profile_id>: integer. Previously assigned <profile_id>.

If omitted the default IP/URL defined in AT%HTTPCFG will be used. When use the external header, the URL should reserve.

<param1>: string. Optional authorization header. It can omit if no necessary.
<param2>: string. Optional x-ue-token header.

10 GNSS Related AT Commands

GNSS cannot co-exist with LTE data transfer. LTE communication has higher priority over GNSS and, therefore, GNSS is automatically shut down once LTE is active(if it were active). While LTE is active, GNSS cannot be activated and all GNSS AT commands are responded with error.

10.1 AT%IGNSSACT: Activate GNSS Functionality

Activate GNSS functionality.

Command	Command Type	Response
AT%IGNSSACT=<mode>[,<param1>]	Set	OK or ERROR
AT%IGNSSACT?	Read	%IGNSSACT: <active_mode>
AT%IGNSSACT=?	Test	%IGNSSACT: (list of supported <mode>),(range of supported <delay>)

Table 253: AT%IGNSSACT

Description:

Activate GNSS hardware functionality.

Defined values:

<mode>: integer.

Value	Description
0	Stop GNSS.
1	Start GNSS - default mode is periodic infinite recurrence with 1sec interval. Returns OK, if LTE RF usage is currently allowed and ERROR if LTE RF usage is not allowed.
2	Start GNSS with tolerance delay. Same as start, but returns OK even if LTE RF usage is not currently allowed and tries to start GNSS within tolerance delay provided by user.

Table 254: IGNSSACT_Mode_Description

For <cmd>=1 (Start):

<param1>: integer. Optional activation mode.

Value	Description
1	Cold start
2	Hot start (default)

Table 255: IGNSSACT_Cmd_Start

For <cmd>=2 (Delayed Start):
<tolerance>: integer. Tolerance delay in seconds.

Value	Description
0 - 99999	Tolerance delay in second.

Table 256: IGNSSACT_Tolerance_Description

<active_mode>: integer.

Value	Description
0	GNSS is not active.
1	GNSS is active.

Table 257: IGNSSACT_Active_Mode_Description

Example:
Below command is used for cold GNSS start.

```
AT%IGNSSACT=1,1

OK
```

Below command is used for hot GNSS Start.

```
AT%IGNSSACT=1,2

OK
```

Below AT Command is used to stop GNSS Functionality:

```
AT%IGNSSACT=0

OK
```

10.2 AT%IGNSSCFG: Set and Get GNSS run-time mode configuration.

Command	Command Type	Response
AT%IGNSSCFG= <operation>, <category> [,<param1>[,<param2>...]]	Set	For "GET": [AT%IGNSSCFG: <param1>[,<param2>...]] OK
AT%IGNSSCFG?	Read	ERROR
AT%IGNSSCFG=?	Test	%IGNSSCFG: (list of supported <operation>s),(list of supported <category>s),(list of supported <type>s)

Table 258: AT%IGNSSCFG

Description:

Set and Get GNSS run-time mode configuration.

Defined values:

<operation>: string.

Value	Description
"SET"	set the <category> configuration. If this command is used when GNSS is active, new settings will be applied only after GNSS deactivation. The SET command is not persistent, i.e. configurations are lost after power-cycle. This run-time setting overrides the configuration file static setting and/or default SW functionality.
"GET"	get the <category> configuration.

Table 259: IGNSSCFG_Operation_Description

<category>: string.

Value	Description
"SAT"	satellite systems used in the calculation.
"NMEA"	enabled NMEA sentences.

Table 260: IGNSSCFG_Category_Description

<param1>: string.

For "SAT": Satellite System Types.

Value	Description
"GPS"	GPS system(default)
"GLONASS"	GLONASS system.

Table 261: IGNSSCFG_SAT_Description

For "NMEA": NMEA sentence types.

Value	Description
"GGA"	Global Positioning System Fix Data
"GLL"	Geographic Position (Latitude/Longitude)
"GSA"	GNSS DOP and Active Satellites
"GSV"	GNSS Satellites in View
"GNS"	GNSS Fix Data
"RMC"	Recommended Minimum Specific GNSS Data
"VTG"	Course Over Ground and Ground Speed
"ZDA"	Time and Date
"GST"	GPS Pseudo range Noise Statistics

Table 262: IGNSSCFG_NMEA_Description

Example:
Below AT Command is used to configure GPS and GLONASS satellite systems:

```
AT%IGNSSCFG="SET","SAT","GPS","GLONASS"

OK
```

Below AT Command is used to enable NMEA sentences:

```
AT%IGNSSCFG="SET","NMEA","GGA","GSA","GSV","GNS","RMC"

OK
```

10.3 AT%IGNSSINFO: Query GNSS Information

Command	Command Type	Response
AT%IGNSSINFO=<type>	Set	**For "SAT":** %IGNSSINFO: <num_of_sat> [%IGNSSINFO:<PRN>,<elevation>, <azimuth>,<SNR>] [..] **For "FIX" and "LASTFIX":** %IGNSSINFO:<fix_type>,<time>,<date>, <latitude>,<longitude>,<altitude>,<utc> [,<accuracy>[,<speed>],<eph_type> **For "TTFF" :** %IGNSSINFO: <ttff> **For "EPH":** %IGNSSINFO: <eph_status> OK
AT%IGNSSINFO?	Read	ERROR
AT%IGNSSINFO=?	Test	%IGNSSINFO: (list of supported <type>s)

Table 263: AT%IGNSSINFO

Description:

Query GNSS Information.

Defined values:

<type>: string.

Value	Description
"SAT"	returns log of satellite in view.
"FIX"	returns information of current location acquired by the device.
"TTFF"	returns the Time-To-First-Fix of the most recent GNSS activation.
"EPH"	indicates if the last stored Ephemeris is valid or not.
"LASTFIX"	returns the last location on the last fix. Used when fix cannot be obtained and the last location is needed.

Table 264: IGNSSINFO_Type_Description

<num_of_sat>: integer. Number of satellites in view.
<PRN>: integer. Pseudo-random noise code of the satellite.

Value	Description
1-37	GPS system(default)
38-61	GLONASS system.

Table 265: IGNSSINFO_PRN_Description

<elevation>: integer. Satellite elevation.

Value
0 - 90

Table 266: IGNSSINFO_Elevation_Mode_Description

<azimuth>: integer. Satellite azimuth.

Value
0 - 360

Table 267: IGNSSINFO_Azimuth_Mode_Description

<SNR>: integer. Signal strength of the satellite.

Value	Description
0-10	No signal
11-15	Very low signal
16-25	Low signal
26-40	Good signal
>40	Excellent signal

Table 268: IGNSSINFO_SNR_Description

<fix_type>: integer.

Value	Description
0	No FIX
1	MSA
2	MSB

Table 269: IGNSSINFO_Fix_Type_Description

<time>: string. Last fix time, in format hh:mm:ss.

<date>: string. Last fix date, in format dd/mm/yyyy.

<latitude>: string. Which contains floating value, value is omitted if unknown. Latitude as defined and returned by NMEA command GGA. Positive values represent "North", negative values represent "South".

<longitude>: string. Which contains floating value, value is omitted if unknown. Longitude as defined and returned by NMEA command GGA. Positive values represent "East", negative values represent "West".

<altitude>: string. Which contains floating value, value is omitted if unknown. Altitude as defined and returned by NMEA command GGA.

<utc>: integer. The UTC timestamp of the position.

<accuracy>: integer. Radius accuracy in meters.

<speed>: string. Which contains floating value, speed in m/sec.

<ttff>: string. Which contains floating value, time to the first fix of the most recent GNSS activation (in milliseconds).

<eph_type>: string.

Value	Description
"B"	BEP ephemeris
"C"	CEP ephemeris

Table 270: IGNSSINFO_EPH_Type_Description

<eph_status>: integer.

Value	Description
0	Last stored ephemeris is not valid.
1	Last stored ephemeris is valid.

Table 271: IGNSSINFO_EPH_Status_Description

Example:
Get satellites available:

```
AT%IGNSSINFO="SAT"
%IGNSSINFO: 11
%IGNSSINFO:03,36,294,49
%IGNSSINFO:06,53,263,50
%IGNSSINFO:14,42,180,50
%IGNSSINFO:15,13,042,50
%IGNSSINFO:16,08,251,50
%IGNSSINFO:18,56,044,50
%IGNSSINFO:19,25,314,50
%IGNSSINFO:21,46,104,51
%IGNSSINFO:22,71,306,49
%IGNSSINFO:24,14,080,49
%IGNSSINFO:27,51,282,50
```

Below command is used to get the fix:

```
AT%IGNSSINFO="FIX"

%IGNSSINFO: 2,"11:17:02","04/05/2020","32.195970","34.892572","−10.500000"
    ,1588580222000,1,"0.000000","B"
```

10.4 AT%IGNSSEV: Enable GNSS Unsolicited Notification Events

Command	Command Type	Response
AT%IGNSSEV=<event>,<mode>	Set	OK ERROR
AT%IGNSSEV?	Read	%IGNSSEV: <event>,<mode>[,<event>,<mode>...]
AT%IGNSSEV=?	Test	%IGNSSEV: (list of supported <event>),(list of supported <mode>)
unsolicited	unsolicited	%IGNSSEVU: <event>,<event body>

Table 272: AT%IGNSSEV

Description:

Enable GNSS unsolicited notification events.
The unsolicited command is used to deliver information from GNSS to the application.

Defined values:

<event>: string.

Value	Description
"NMEA"	NMEA sentence report.
"SESSIONSTAT"	Status event reported upon GNSS session status change.
"ALLOWSTAT"	Status event reported upon GNSS allowed status change.

Table 273: IGNSSEV_Event_Description

<mode>: integer.

Value	Description
0	Disable <event>
1	Enable <event>

Table 274: IGNSSEV_Mode_Description

<event body>, for "NMEA": string. The event body is of string type representing the NMEA sentence (using quote before and after the sentence).

For **<event body>, for "SESSIONSTAT":** integer. The event body is of integer type as following.

Value	Description
0	NONE (GNSS status unknown)
1	SESSION_BEGIN (GNSS started)
2	SESSION_END (GNSS stopped)

Table 275: IGNSSEV_SESSIONSTAT_Description

For **<event body> for "ALLOWSTAT":** integer. The event body is of integer type as following.

Value	Description
0	GNSS is not allowed.
1	GNSS is allowed.
2	GNSS started automatically, when auto-restart is enabled in the configuration file or when GNSS starts working in delay when tolerance is given.

Table 276: IGNSSEV_ALLOWSTAT_Description

10.5 AT%IGNSSMEM: To Delete specific data from the GNSS storage.

Allows the host to delete specific data from the GNSS storage.

Command	Command Type	Response
AT%IGNSSMEM=<op>,<bitmask>	Set	OK ERROR
AT%IGNSSMEM?	Read	ERROR
AT%IGNSSMEM=?	Test	%IGNSSMEM: (list of supported <op>),(range of supported <bitmask>)

Table 277: AT%IGNSSMEM

Description:

Allows the host to delete specific data from the GNSS storage.

Defined values:

<op>: string.

Value	Description
"ERASE"	ERASE data from GNSS storage.

Table 278: IGNSSMEM_Op_Description

<bitmask>: hex. The data which is required to be deleted. Bitmask can contain any combination of the bits reflected below.

Value	Description
"0"	DELETE_ALL , No support
"0001"	EPHEMERIS
"0002"	ALMANAC
"0004"	POSITION
"0008"	TIME
"10000"	TCXO , No support

Table 279: IGNSSMEM_Bitmask_Description

10.6 AT%IGNSSCEP: CEP data file saved in memory

Allows the host to download, erase or query about CEP data file saved in memory.

Command	Command Type	Response
AT%IGNSSCEP= <op>[,<days>]	Set	For "STAT" %IGNSSCEP:<status>[,<rem_days>, <rem_hours>,<rem_minutes>] OK
AT%IGNSSCEP?	Read	ERROR
AT%IGNSSCEP=?	Test	%IGNSSCEP:(list of supported <op>),(range of supported <days>)

Table 280: AT%IGNSSCEP

Description:

Allows the host to download, erase or query about CEP data file saved in memory.

Defined values:

<op>: string.

Value	Description
"DLD"	Download CEP file for <num_of_days> from Sony Server.
"ERASE"	Erase CEP file from memory.
"STAT"	Query for CEP validity status. In case of CEP valid, returns also the number of days/hours and minutes which will remain valid.

Table 281: IGNSSCEP_Op_Description

<days>: integer. the data which is required to be deleted. Bitmask can contain any combination of the bits reflected below.

Value	Description
1	In day(s)
2	In day(s)
3	In day(s)
7	In day(s)
14	In day(s)
28	In day(s)

Table 282: IGNSSCEP_Days_Description

<rem_days>: integer type. Remaining number of days for CEP validity.

<rem_hours>: integer. Remaining number of hours for CEP validity.

<rem_minutes>: integer. Remaining number of minutes for CEP validity.

11 LWM2M Related AT Commands

11.1 AT%LWM2MCMD: Control the LWM2M client

This command is used to control the LWM2M client.

Command	Command Type	Response
AT%LWM2MCMD=<cmd>[,<param1>[,<param2>[,<param3>]]]	Set	**For "SERVERSINFO" list of server details:** [%LWM2MCMD:<ServerUri>,<ServerID>,<Liftime>,<binding>,<ServerStat>[,<LastRegDate>] [%LWM2MCMD:<cmd>,<ServerUri>,<ServerID>,<Liftime>,<binding>,<ServerStat>[,<LastRegDate>] [...]]] **For "GET_RESOURCE", list of details:** %LWM2MCMD:<ObjectID>[,<ObjectInstanceID>[,<ResourceID>[,<ResourceInstance ID>[,<val>]]]] **For "DISCOVER", list of LWM2M client object(s), object instance(s) [and resource(s)]:** [%LWM2MCMD: <res1>[,<res2>[..]]] **For "PROGRESS", download progress:** %LWM2MCMD: received=<CurDlSize>,total=<TotalImgSize> **For "GET_FOTA_STATE"** : %LWM2MCMD: <FotaState> For other commands : OK ERROR
AT%LWM2MCMD?	Read	ERROR
AT%LWM2MCMD=?	Test	OK

Table 283: AT%LWM2MCMD

Description:
This command is used to control the LWM2M client. It is used by the FOTA manager.
Defined values:

<cmd>: string.

Value	Description
"REGISTER"	Application initiated command to register with the LWM2M server, <param1>, decimal, Short Server ID.
"DEREGISTER"	Application initiated command to Re-register the LWM2M server <param1>, decimal, Short Server ID.
"REGISTERUDP"	Application initiated command to Re-register LWM2M server, <param1», integer, short Server ID.
"BOOTSTARP"	Initiate bootstrap procedure <param1», integer, post bootstrap mode; 0: continue to registration normally after bootstrap (default) 1: avoid registration after bootstrap
"COAPDUMP"	enable lwm2m coap dump. local ip: 11.11.11.11 destination server ip: 22.<sec obj="" short="" id="">.22.22 <param1> - mode "DISABLE": disable "CLI": print to cli "LOG": print to logger <param2> - persistence 0: non 1: persist <param3> - integer. logger size(default 16K), relevant for LOG mode
"UPDATEREP"	FOTA manager report of the update result <param1>, string ; "SUCCESS": Firmware updated successfully "FAIL": Firmware update failed <param2>, integer. For <param1> = "FAIL", provides FOTA Update Result. source 5/0/5) as defined in section E.6 of [10].
"DLRSP"	A command answers to the request from OMA-DM client to start/cancel/defer package download. <param1>, "ACCEPT": Accept the request to start package download "CANCEL": Cancel the request to start package download <param2>, integer. For <param1="CANCEL". provides FOTA Update Result. (resource 5/0/5) as defined in section E.6 of [10].
"RESUME"	Resume download after internal download error (e.g. out of coverage, reboot etc).

Table 284: +LWM2MCMD_cmd_Description

Value	Description
"UPDRSP"	A command answers to the request of OMA-DM client to update firmware with the downloaded package. <param1>, "ACCEPT": Accept the request to start package download "CANCEL": Cancel the request to start package download <param2>, integer. For <param1="CANCEL". provides FOTA Update Result (resource 5/0/5) as defined in section E.6 of [10].
"SERVERSINFO"	A query for server information
"SET_RESOURCE"	Set resource value to LwM2M tree. This command when executed on multi resource instance will generate instance if not already exist. Note that this command can also write single resource instance in case of multi-resource instance. This command is not applicable for Host resources.
"GET_RESOURCE"	Get resource value from LwM2M tree. This command is not applicable for Host resources. This command is not applicable for security resources: /0/x/3, /0/x/5... . This can be a multiline reply (each describing single resource value) when query is sent with omitted optional parameter: Object-instances ID - return all the resource values of of that Object-instances ID Resource ID - return all the multi-resource values of of that Resource ID
"DEL_RESOURCE_ INSTANCE"	Delete specific resource instance of multi-resource instance.
"EXEC_RESOURCE"	Execute resource value to LwM2M tree. <param1>, integer ; see definition of <ObjectID> <param2>, integer ; See definition of <ObjectInstanceID> <param3>, integer ; See definition of <ResourceID> <param4>, integer ; See definition of <ResourceInstanceID> <param5>, string type ; See definition of <val>
"SETINSTANCES"	update the list of object instances at run-time (currently limited to Host Objects). This command completely override previously defined object instance list. <param1> - integer, see definition of <ObjectID> <param2>-<param...> - integer; optional parameters. If no <param2> at all, there won't be any instances of this object, see definition of <ObjectInstanceID>

Table 285: +LWM2MCMD_cmd_Description

Value	Description
"DISCOVER"	to discover object/object instances/object resources. <param1> - string type; the path to the object or object instance tree to discover. Optional parameter. if path is missing, command reports the list of all discovered objects with their instance IDs if path is "/object", command reports the list of all instance IDs located on the path if path is "/object/instance ID", command reports the list of all resource IDs located on the path
"GET_FOTA_STATE"	Return FOTA state
"PROGRESS"	Return download progress
"PORTFOLIO"	Perform operations on object 16 (portfolio), resource 0 (Identity) - Data Storage extension for other Object Instances.
"DLSUS"	Download suspend (applicable for HTTP/S PULL method only). <param1> - string; operation: "SETINSTANCE": Create new instance of object portfolioand set resource 0 values "READ": Read portfolio object parameters "DELETE": Delete portfolio instance For <param1>="SETINSTANCE" <param2> - integer, see definition of <ObjectInstanceID> <param3> - integer, see definition of <ResourceID>, currently supports only resource ID 0 <param4> - integer, see definition of <ResourceInstanceID> <param5> - integer, see definition of <val. Only last written values are saved in the object instance file. Previous values are deleted. For <param1>="READ" <param2>: integer, see definition of <ObjectInstanceID> (Optional parameter) For <param1>="DELETE" <param2> - integer, see definition of <ObjectInstanceID>

Table 286: +LWM2MCMD_cmd_Description

<ServerUri>: string. The Server URI.

<ServerID>: integer. The Server Short ID.

<Liftime>: integer. The server registration period from the last registration date in seconds.

«**binding>**: integer.

Binding Value	Description	LWM2M Ver 1.0	LWM2M Ver 1.1
0	Unknown	Supported	Supported
1	UDP (U)	Supported	Supported
2	UDP queue mode (UQ)	Supported	N/A
3	SMS (S)	Not Supported	Not Supported
4	SMS queue mode (SQ)	Not Supported	N/A
5	UDP with SMS (US)	Supported (SMS only for triggering)	Not Supported
6	UDP queue mode with SMS (UQS)	Supported (SMS only for triggering)	N/A
7	NIDD mode (N)	N/A	Supported

Table 287: +LWM2MCMD_Binding_Description

In LWM2M spec version 1.1 Queue mode is no longer part of server binding mode
In LWM2M spec version 1.1 there is a differentiation between SMS binding and SMS Triggering (wakeup SMS). Since Altair supports SMS only for triggering, binding mode with SMS is not supported.

<ServerStat>: integer.

Value	Description
0	not registered or boostrap not started
1	Registration pending
2	Successfully registered
3	Last registration failed
4	Registration update pending
5	Deregistration pending
6	Bootstrap hold off time
7	Bootstrap request sent
8	Bootstrap on going
9	Bootstrap done
10	Bootstrap failed

Table 288: +LWM2MCMD_ServiceStat_Description

<LastRegDate>: integer. The UTC time in 10msec units counted since 00:00:00 on 1 January, 1900.

«**ObjectID>**: integer. Specifies the LWM2M Object ID.

<ObjectInstanceID>: integer. Specifies the LWM2M Instance ID of the object (Optional parameter).

<ResourceID>: integer. Specifies the LWM2M resource Instance ID of the object instance (Optional parameter).

<ResourceInstanceID>: integer. Specifies the LWM2M resource Instance ID of the object instance (Optional parameter).

<val>: string. Max size 511 bytes, specifies the value of the resource (Optional parameter).

Type	Value
Boolean	"TRUE", "FALSE"
Integer	signed 64 bits integer format.String within " "
Float	double float format.String within " "
Text	String within " "
Buffer (opaque field)	Hexadecimal opaque data is represented as ASCII hex string. The length of hex string is twice longer than actual binary data length in bytes: each hex byte is encoded into 2 ASCII bytes. Data length is limited by 255 Bytes.
Object link	"object;object-instance"
"Observe" Event	"pmin=minimum period & pmax=maximum period&gt=greater than&lt=less than&st=step" All the parameters in the string are optional

Table 289: +LWM2MCMD_Val_Description

<res1>: <res...>: string. Shortened textual representation of the discovered LWM2M tree/sub-tree structure located on the path (<param1> of "DISCOVER").

- if path is missing, <res...> params report the list of all discovered objects with their instance IDs in form of: "/object/instance ID"

- if path is "/object", <rea...> params report the list of all instance IDs located on the path in form of: "/object/instance ID"

- if path is "/object/instance ID", <res...> params report the list of all resource IDs located on the path in form of: "/object/instance ID/resource ID"

<CurDlSize>: integer. Currently downloaded size in bytes.
<TotalImgSize>: integer. Total image size in bytes.
<FotaState>: integer.

Value	Description
0	Idle
1	Pending download
2	During download
3	Download failed
4	Download completed
5	Pending update
6	Update confirmed

Table 290: +LWM2MCMD_Fota_State_Description

Example:

Discover Object ID=16 structure (list of object instances):

```
AT%LWM2MCMD="DISCOVER","/16"
%LWM2MCMD: "/16/0","/16/1"
OK
```

11.2 AT%LWM2MOPEV: Unsolicited Command

Command	Command Type	Response
AT%LWM2MOPEV= <mode>, <event>	Set	OK or ERROR
AT%LWM2MOPEV?	Read	ERROR (not supported)
AT%LWM2MOPEV=?	Test	OK
(unsolicited result code)	unsolicited	%LWM2MEOPV:<event>[,[<serverShortId>],[<ObjectID>],[<ObjectInstanceID>],[<ResourceID>],[<ResourceInstanceID>],[<val>][,<MsgId>]]

Table 291: AT%LWM2MOPEV

Description:

This unsolicited command notifies the host about operations performed by the server on the LWM2M tree.

Notes: In both command and response, a parameter which is not specified will be written as „". URC will not notify about security object events.

Defined values:

<mode>: integer.

Value	Description
0	Disable unsolicited "server operation" event indications
1	Enable unsolicited "server operation" event indications

Table 292: %LWM2MOPEV_Mode_Description

<event>: integer.

Value	Description
0	"Write" operation was received
1	"Execute" operation was received
2-3	Reserved
4	"Write Attributes" operation was received
5	"Discover" operation was received
6	"Read" operation was received
7	"Observe" operation was received
8	"Cancel observation" operation was received
9	Client is offline
10	Client is online
11	Client sent observation notification to a server
12	Client received wakeup SMS
13	Client received notification acknowledge
14	Client ON: LMM2M client exits Client OFF state and tries to re-connect server due to explicitly AT Command registration request
15	Client OFF: LWM2M client has exhausted server connection retries
16	Confirmable NOTIFY failed
17-19	Reserved
20	Bootstrap finished and completed successfully
21	Registration finished and completed successfully all server observation requests are cleaned, the host should clean host objects observation rules too
22	Register update finished and completed successfully
23	De-register finished and completed successfully
24	Notification is was not saved and not sent to server
25-99	Reserved
100	enable all notifications

Table 293: %LWM2MOPEV_Event_Description

<serverShortId>: integer. short server ID (values 0 - 65535).

<ObjectID>: integer. Specifies the LWM2M Object ID.

<ObjectInstanceID>: integer. Specifies the LWM2M Instance ID of the object (Optional parameter).

<ResourceID>: integer. Specifies the LWM2M resource ID of the object instance (Optional parameter).

<ResourceInstanceID>: integer. Specifies the LWM2M resource Instance ID of the object instance (Optional parameter).

<val>: string. Max size 3000 bytes, specifies the value of the resource (Optional parameter).

Type	Value
Boolean	"TRUE", "FALSE"
Integer	signed 64 bits integer format.String within " "
Float	double float format.String within " "
Text	String within " "
Buffer (opaque field)	Hexadecimal opaque data is represented as ASCII hex string. The length of hex string is twice longer than actual binary data length in bytes: each hex byte is encoded into 2 ASCII bytes. Data length is limited by 256 Bytes.
Object link	"object;object-instance"
"Observe" Event	"pmin=minimum period & pmax=maximum period&gt=greater than&lt=less than&st=step" All the parameters in the string are optional

Table 294: +LWM2MOPEV_Val_Description

<MsgId>: integer. COAP message ID (for NOTIFY event). Values (0 - 65535).

Example:

Enable notification for "Write":

```
AT%LWM2MOPEV=1,0
OK
```

11.3 AT%LWM2MEV: Notify Status of Firmware Upgrade process

Command	Command Type	Response
AT%LWM2MEV=<mode>	Set	OK or ERROR
AT%LWM2MEV?	Read	ERROR
AT%LWM2MEV=?	Test	%LWM2MEV: (list of supported <mode>)
(Unsolicited)	Unsolicited	%LWM2MEV:<event>,[<package_size>], [<reserved>],[<package_name>][,<error_type>]

Table 295: AT%LWM2MEV

Description:

AT Command to enable/disable %LWM2MEV URC to host. The URC notifies the status of firmware upgrade process.

Defined values:

<mode>: integer. Status of unsolicited result response presentation.

- 0: Disable unsolicited FOTA event indications (default for external Host)
- 1: Enable unsolicited FOTA event indications (default for internal App)

<event>: integer.

Type	Value
0	PENDING DOWNLOAD
1	PENDING UPDATE
2	DOWNLOAD COMPLETED
3	DOWNLOAD FAILED
4	FOTA CANCELD BY LWM2M SERVER
5-9	Reserved

Table 296: %LWM2MEV_Event_Description

<package_size>: integer. For <event>="PENDING UPDATE", The package size in bytes.

<package_name>: string.

- For <event>="PENDING DOWNLOAD", The file name of download package.
- For <event>="PENDING UPDATE", The file name of update package.

<error_type>: integer. For <event>="DOWNLOAD FAILED"

Type	Value
0	NON FATAL - Download can be resumed by FOTA manager
1	FATAL - Download resume is not possible, FOTA manager shall move to idle

Table 297: %LWM2MEV_Error_Type_Description

11.4 AT%LWM2MOBJEV: Notify to Application

Command	Command Type	Response
AT%LWM2MOBJEV=[<token>],[<serverId>], [<confirmation>],[<fragment_info>],<uri>, <value>[,<uri>,<value>[...]]	Set	OK or ERROR
AT%LWM2MOBJEV?	Read	ERROR (not supported)
AT%LWM2MOBJEV=?	Test	OK

Table 298: AT%LWM2MOBJEV

Description:

This command is used by Host application to send "NOTIFY" or "SEND" (starting LWM2M v1.1 support) with resource value.

The <uri>s in the command can be single or/and multi-resource instance. All <uri> must be from the same object instance, meaning /<Obj ID>/<Obj Inst> must be the same for all resources.

Defined values:

<token>: hexadecimal. If omitted <token> triggers "SEND" message. Up to 8 bytes. (Value range "0"-"FFFFFFFFFFFFFFFF").

<serverId>: integer. LWM2M Short Server ID. Parameter can be omitted is single server is in use. If parameter is omitted for multiple servers use-case, command returns ERROR. (Value range 1-65535).

<confirmation>: integer. Optional. Default value is defined in LWM2M configuration file in "ConfirmNotify" parameter.

Type	Value
0	Notify confirmation default configuration value
1	Notify confirmation is NOT required from the server
2	Notify confirmation is required from the server

Table 299: %LWM2MOBJEV_Confirmation_Description

<fragment_info>: integer. Fragment event information.

All AT commands in a group of AT commands sent with <fragment_info>=1/2 must be for the same Object ID.

Object Instance ID must be not repeated in a group of AT commands sent with <fragment_info>=1/2.

Type	Value
0	Single AT Command for event notification. (default).
1	AT Command is part of group AT commands event and contains a fragment of event message.
2	AT Command is part of group AT commands event and contains the last fragment of event message.

Table 300: %LWM2MOBJEV_Fragment_Description

<uri>: string. Resource URI path example: /<Obj_ID>[/<Obj_Inst>[/<Resource ID>[/Resource Inst >]]].

<val>: string. Max size 3000 bytes, specifies the value of the resource (Optional parameter).

Type	Value
Boolean	"TRUE", "FALSE"
Integer	signed 64 bits integer format.String within " "
Float	double float format.String within " "
Text	String within " "
Buffer (opaque field)	Hexadecimal opaque data is represented as ASCII hex string. The length of hex string is twice longer than actual binary data length in bytes: each hex byte is encoded into 2 ASCII bytes. Data length is limited by 256 Bytes.
Object link	"object;object-instance"
"Observe" Event	"pmin=minimum period & pmax=maximum period&gt=greater than&lt=less than&st=step" All the parameters in the string are optional

Table 301: LWM2MOBJEV_Val_Description

11.5 AT%LWM2MOBJRSP: Application response for %LWM2MCMDU

Command	Command Type	Response
AT%LWM2MOBJRSP=<seq_num>,<ret_code>[,<uri>,<value>[,<uri>,<value>[...]]]	Set	OK or ERROR
AT%LWM2MOBJRSP?	Read	ERROR (not supported)
AT%LWM2MOBJRSP=?	Test	OK

Table 302: AT%LWM2MOBJRSP

Description:

This command is used to provide Host application response for %LWM2MCMDU URC.

Defined values:

<seq_num>: integer. Used for this URC and %LWM2MOBJRSP AT command synchronization. Value range 1-1000 (with wrap around).

<ret_code>: string. CoAP response code.

Type	Value
"2.04"	Changed - operation completed successfully
"2.05"	Content - operation completed successfully
"4.00"	Bad Request - Undetermined error occurred/The format of data to be written is different
"4.01"	Unauthorized - access right permission denied
"4.04"	Not Found - URI not found
"4.05"	Method Not Allowed - Target is not allowed for such operation
"4.06"	Not Acceptable - None of the preferred Content-Formats can be returned.
"4.15"	Unsupported Content-Format - The specified format is not supported.
"5.00"	Internal Server Error (this is also the default value if ret_code value is not supported)

Table 303: %LWM2MOBJRSP_ret_code_Description

<uri>: string. Resource URI path example: /<Obj_ID>[/<Obj_Inst>[/<Resource ID>[/Resource Inst >]]].

<val>: string. Max size 3000 bytes, specifies the value of the resource (Optional parameter).

Type	Value
Boolean	"TRUE", "FALSE"
Integer	signed 64 bits integer format.String within " "
Float	double float format.String within " "
Text	String within " "
Buffer (opaque field)	Hexadecimal opaque data is represented as ASCII hex string. The length of hex string is twice longer than actual binary data length in bytes: each hex byte is encoded into 2 ASCII bytes. Data length is limited by 256 Bytes.
Object link	"object;object-instance"
"Observe" Event	"pmin=minimum period & pmax=maximum period&gt=greater than&lt=less than&st=step" All the parameters in the string are optional

Table 304: LWM2MOBJRSP_Val_Description

11.6 AT%LWM2MOBJDEF: Sets and gets resources definition of Host Objects

Command	Command Type	Response
AT%LWM2MOBJDEF=<cmd>,<object_id>[, <resource_id>,<operation>,<instance_type>, <data_type><resource_id>,<operations>, <instance_type>,<data_type>[...]]]	Set	OK or ERROR
AT%LWM2MOBJDEF?	Read	ERROR (not supported)
AT%LWM2MOBJDEF=?	Test	ERROR

Table 305: AT%LWM2MOBJDEF

Description:

Sets and gets resources definition of Host Objects. Set operation creates new resource and store it into NV.

Defined values:

<cmd>: string.

Type	Value
"GET"	Read Resources definition of Host Object.
"SET"	Define Resources definition of Host Object and create it storing into NV.

Table 306: %LWM2MOBJDEF_cmd_Description

<object_id>: integer. Specifies the LWM2M Object ID. Value range 0-65534.

<resource_id>: integer. Specifies the LWM2M resource ID. Value range 0-65534.

<operation>: string. The type of operation that may be performed on the resource.

Type	Value
"R"	Read-only.
"W"	Write-only.
"RW"	Read and Write.
"X"	Execute.

Table 307: %LWM2MOBJDEF_Operation_Description

<instance_type>: integer.

Type	Value
0	single resource
1	multi resource

Table 308: %LWM2MOBJDEF_instance_Description

<data_type>: string.

Type	Value
"NONE"	Data Type is not relevant (in case if <operation> is "EXE")
"STR"	String.
"INT"	Integer.
"UINT"	Unsigned integer (supported from LWM2M ver 1.1 only) "FLT"
"BOOL"	Boolean
"OPQ"	Opaque
"TIME"	Time
"OL"	Object Link

Table 309: %LWM2MOBJDEF_data_type_Description

Example:

Define object 3305 (Power Measurement) resources 5800, 5806 and 5822:

```
AT%LWM2MOBJDEF="SET",3305,5800,"R",0,"FLT",5680,"W",0,"FLT",5822,"X",0,"
    NONE"
OK
```

Read object 3305 resources definition

```
AT%LWM2MOBJDEF="GET",3305
%LWM2MOBJDEF: 3305,5800,"R",0,"FLT",5680,"W",0,"FLT",5822,"X",0,"NONE"
OK
```

12 MQTT Related AT Commands

12.1 MQTT AT Commands

12.1.1 %MQTTCFG: Configure MQTT Connection Parameters

AT command to configure MQTT connection parameters.

Command	Command Type	Response
AT%MQTTCFG=<obj>,<conn_id>[,[<param1>][,[<param2>]...]]	Set	OK ERROR
AT%MQTTCFG?	Read	ERROR
AT%MQTTCFG=?	Test	%MQTTCFG: (list of supported <cmd>),(list of supported <conn_id>)

Table 310: AT%MQTTCFG

Description:

AT command to configure MQTT connection parameters.To start new MQTT connection the "NODES" parameters shall be defined at least.Other configurations may be omitted, default settings are use :

- If "TLS" layer is not configured, unsecured connection will be established by default.
- If "IP" layer is not configured, default PDN, IP type and default MQTT ports will be used.
- If "PROTOCOL" parameters are not configured, default protocol parameters will be selected.
- If "WILLMSG" parameters are not configured, no Will message will be used.

To make this omission confidentially working, it is strictly recommended to call "CLEAR" sub-command before entering new configuration for previously used or default <conn_id>.

Connection ID parameter is introduced to handle multi-connection MQTT. Use zero value for <conn_id> if single connection is expected. The ID for multi-connection is assigned by user and then used for all connection configuration in current AT%MQTTCFG, command (AT%MQTTCMD) and event (AT%MQTTEV/%MQTTEVU).

Defined values:

<obj>: string.

Value	Description
"NODES"	Configure client & server nodes parameters
"TLS"	Configure TLS layer security parameters
"IP"	Configure IP layer parameters
"WILLMSG"	Configure MQTT will message
"PROTOCOL"	Configure MQTT protocol parameters
"CLEAR"	Clear all previous settings for specified <conn_id>

Table 311: MQTTCMD_Obj_Description

<conn_id>: integer. Default or previously assigned <conn_id>.

- 0: Single MQTT connectivity mode.
- 1 -5: Multi-connected mode.

For "NODES" :
<param1>: string. Unique client ID used to connect to the broker.
<param2>: string. Broker URL or IP address.
<param3>: string. Optional username for broker authentication.
<param4>: string. Optional password for broker authentication.

For "TLS" :
<param1>: string. TLS authentication mode;

- 0: mutual authentication (default).
- 1: Authenticate client side only.
- 2: Authenticate server side only.

<param2>: integer. TLS predefined authentication context (profile) previously configured by AT%CERTCFG. Default zero profile ID may be used for server authentication only and will apply root CAs stored into Root Trusted folder for authentication.

For "IP" :
<param1>: integer. Optional Session ID. Numeric PDN identification defined in APN table for specified PDN. If Session ID=0 or omitted default data PDN is used unless configured differently by AT%SETROUTE;

- 0: Use default data PDN.
- 1: max value defined in NP config file.

<param2>: integer. Optional IP type used to configure preferred IP type for connection.

- 0: IPv4v6 (default).
- 1: IPv4.

- 1: IPv6.

<param3>: integer. Optional destination (server) TCP/UDP port number. If omitted default MQTT port number is used. Value range 1 - 65535.

For "WILLMSG":

<param1>: integer. Will message presence.

- 0: disable (default value).
- 1: enable.

<param2>: integer. Will QoS value.

- 0: at most once delivery (default value).
- 1: at least once delivery.
- 1: exactly once delivery.

<param3>: integer. Will message retain - whether or not the Will Message will be retained across disconnects.

- 0: (default value): the Will Message will not be retained at the MQTT server across disconnects from MQTT client
- 1: the Will Message will be retained by the MQTT server across disconnects from MQTT client (until superseded by another message).

<param4>: string. Will Topic - Standard MQTT Topic Name. It could include various Topic Separators "/" to form various Topic levels.

<param5>: string. The Will message defines the content of the message that is published to the Will topic if the client is unexpectedly disconnected.

For "PROTOCOL":

<param1>: integer. MQTT protocol type for connection.

- 0:MQTT (default).

<param2>: integer. Keep-alive time. The default value is 600 sec (10 min). Unit: second. It defines the maximum time interval between messages received from a client.

- 0: no timeout, keep-alive deactivated.
- 1 - 65535 (18 hours, 12 minutes and 15 seconds.).

<param3>: integer. Clean session type.

- 0: the server must store the subscriptions of the client after it disconnects.
- 1: the server must discard any previously maintained information about the client and treat the connection as "clean". Default policy.

12.1.2 %MQTTCMD: Communicate With MQTT Server (Broker)

Command	Command Type	Response
AT%MQTTCMD=<cmd>, <conn_id>[,<param1>, <param2>[,<param3>[,[<param4>][,<param5>]]]] [<data>]	Set	%MQTTCMD:<"CONNECT"/"DISCONNECT"/ "SUBSCRIBE"/"UNSUBSCRIBE"/"PUBLISH" /"PUBACK"/"REGISTER">,<conn_id>[, [<param1>][,[<param2>]...]] OK
AT%MQTTCMD?	Read	ERROR
AT%MQTTCMD=?	Test	%MQTTCMD: (list of supported <cmd>),(list of supported <conn_id>)

Table 312: AT%MQTTCMD

Description:

AT command to communicate with MQTT server (broker).All commands are unblocking.The information about command success or fail will be provided in %MQTTEVU URC.The Will message used in "CONNECT" shall be predefined in AT%MQTTCFG.

The "PUBRCV" URC can provide incoming publication data in the <data> parameter only for textual or pseudo-textual data transfer (i.e. JSON, PEM, B64, etc.). The arbitrary binary data transfer is possible only to file. Use AT%MQTTCMD="SUBSCRIBE" to define filename for binary data download.

The "PUBLISH" command provides 2 mechanisms to publish data.

- Only textual or pseudo-textual (i.e. JSON, PEM, B64, etc.) data transfer is permitted for direct AT call using <data> parameter.
- The arbitrary binary data transfer is possible only from file.

For non-file "PUBLISH" operation the data size parameter <param4> may be omitted in human debug mode of AT usage. In this use-case Ctrl+Z pressing shall signal data end.

The "SUBSCRIBE" with defined filename parameter will cause that all following server publications will be stored into the file and signaled by %MQTTEVU: "PUBRCV" URC. Use different filenames for different <conn_id> and topic names to prevent file override, if needed. The file for server publication will be always located on temporary storage disk b:/. User shall specify only filename for "SUBSCRIBE" sub-command. Any attempt to specify full path in this command will be rejected with ERROR.

Defined values:

<cmd>: string.

Value	Description
"CONNECT"	Start connection with endpoint
"DISCONNECT"	End connection with endpoint
"SUBSCRIBE"	Subscribe to a topic on the endpoint
"UNSUBSCRIBE"	Stop subscription to a topic on the endpoint.
"PUBLISH"	Send publish packet to endpoint
"PUBACK"	Not support
"REGISTER"	Not support

Table 313: %MQTTCMD_Cmd_Description

<conn_id>: integer. Default or previously assigned <conn_id>.

- 0:single MQTT connectivity mode. Each configuration overrides previous setting
- 1 - 5: multi-connected mode.

<msg_id>: message ID. Value range 1-65535.

For "CONNECT"/"DISCONNECT"
No <param>

For "SUBSCRIBE" :
<param1>: integer. The QoS level at which the client wants to publish the message.

- 0: At most once delivery (default value).
- 1: At least once delivery.
- 2: Exactly once delivery.

<param2>: string. The subscription topic name.

<param3>: string. Optional parameter. Filename to store received publications on b:/.

For "UNSUBSCRIBE" :
<param1>: string. The subscription topic name.

For "PUBLISH":
<param1>: integer. The QoS level at which the client wants to publish the message.

- 0: At most once delivery (default value).
- 1: At least once delivery.
- 2: Exactly once delivery.

<param2>: integer. Whether or not the server will retain the message after it has been delivered to the current subscribers.

- 0: The server will not retain the message after it has been delivered to the current subscribers.
- 1: The server will retain the message after it has been delivered to the current subscribers.

<param3>: string. The publication topic name.

<param4>: integer. Actual data size in bytes for transfer to server.

- 0: Undefined, publish from file.
- 1: 3000

<param5>: string. Optional parameter. Full path to file to publish from.

<data>: string MQTT raw data payload without quotes.

12.1.3 %MQTTEV: Notify About MQTT Events

Command	Command Type	Response
AT%MQTTEV= <ev_type>,<mode>	Set	OK or ERROR
AT%MQTTEV?	Read	ERROR
AT%MQTTEV=?	Test	%MQTTEV: (list of supported <ev_type>), (list of supported <mode>)
Unsolicited	Unsolicited	%MQTTEVU:<ev_type>,<conn_id>,<res1> [,<res2>[,<res3> [,<res4>,<res5>]]][<data>]

Table 314: AT%MQTTEV

Description:

The command is intended to notify about MQTT events.Default MQTT mode is URC disabled for all event types except of "PUBRCV", which is enabled by first call of AT%MQTTCMD="SUBSCRIBE". Most of the events are related to asynchronous operation triggered by AT%MQTTCMD. Such acknowledgement may be normally disabled.

Only "PUBRCV" event provides the data from the topic, to which the client was pre-subscribed by AT%MQTTCMD="SUBSCRIBE".

The "PUBRCV" URC can provide incoming publication data in the <data> parameter only for textual or pseudo-textual (i.e. JSON, PEM, B64, etc.) data transfer. The arbitrary binary data transfer is possible only to file on b:/. Use AT%MQTTCMD="SUBSCRIBE" to define filename for binary data download.

Note: AT%MQTTCMD="PUBLISH" with QoS=0 will not send any acknowledge message and <ev_type>="PUBCONF" is not expected.

Defined values:

<ev_type>: string.

Value	Description
"CONCONF"	Connect procedure confirmation status
"DISCONF"	Graceful disconnect procedure confirmation status
"SUBCONF"	Subscribe procedure confirmation status
"UNSCONF"	Unsubscribe procedure confirmation status
"PUBCONF"	Outgoing publication procedure confirmation status. Optional URC, depends on "PUBLISH" QoS selected
"PUBRCV"	Incoming publication message received
"CONNFAIL"	Connection failure
"PUBRCVSTORFAIL"	Storage failure of received publication. Ordinary if disk out of space or file is opened for writing.
"ALL"	All events, used only in execution command

Table 315: %MQTTCMD_Ev_Type_Description

<mode>: integer. Status of unsolicited result response presentation.

- 0: disable (default value).
- 1: enable.

<conn_id>: integer. Default or previously assigned <conn_id>.

- 0: Single MQTT connectivity mode.
- 1 -5: Connection ID in multi-connected mode

For "CONCONF/"DISCONF" :
<res1>: integer. Result code.

- 0: Success
- 1: Fail

<res2>: integer. Optional error code.

- 0: No Error
- 1: Error

For "UNSCONF" :
<res1>: integer. Message ID value range 1-65535.

<res2>: integer. Result code.

- 0: Success
- 1: Fail

<res3>: integer. Optional error code.

For "SUBCONF"/"PUBCONF" :
<res1>: Message ID value range 1-65535.
<res2>: integer. Result code.

- 0: Success
- 1: Fail

<res3>: integer. Optional error code.

For "PUBRCV"/"PUBRCVSTORFAIL" :
<res1>: Message ID. It may be zero (undefined) for QoS=0 ;

- 0: Undefined
- 1-65535

<res2>: string. The publication topic name.

<res3>: integer. Data size in bytes transferred by this URC. If this parameter is equal to zero, no any <data> arrival is expected in the same URC.

<res4>: integer. Optional data size in bytes stored into file.

<res5>: string. Optional parameter. Filename, where received publication has been stored (or attempted to be stored for "PUBRCVSTORFAIL") on b:/.

<data>: string. MQTT raw data payload without quotes.

12.2 MQTT AT Commands for AWS

12.2.1 %AWSIOTCFG: Configure AWS IoT Cloud

AT command to configure AWS IOT cloud connection parameters.

Command	Command Type	Response
AT%AWSIOTCFG=<cmd>, [<param1>][,<param2> [,<param3>]]	Set	OK ERROR
AT%AWSIOTCFG?	Read	ERROR
AT%AWSIOTCFG=?	Test	%AWSIOTCFG: (list of supported <cmd>)

Table 316: AT%AWSIOTCFG

Description:

AT command to configure AWS IOT cloud connection parameters. To start new AWS IOT connection the "CONN" parameters shall be defined at least. Mandatory TLS profile ID, which shall be pre-configured by AT%CERTCFG, is a special TLS profile, which does not contain both.: root certificate file and root certificate path. The root certificate path is hardcoded in SW and implies the usage of trusted root CA pre-installed into device to support proper AWS security level. If selected TLS certificate profile contains <ca_file> or <ca_path> fields (see AT%CERTCFG), AT command returns ERROR.
If "PROTOCOL" parameters are not configured, default protocol parameters will be selected.

Defined values:

<cmd>: string.

Value	Description
"CONN"	Pre-configure connection parameters
"PROTOCOL"	Pre-configure protocol parameters
"IP"	IP Layer parameters.

Table 317: %AWSIOTCFG_Cmd_Description

For "CONN": Pre-configure connection parameters

<param1>: string. Endpoint URL.

<param2>: integer. TLS predefined authentication context (profile) previously configured by AT%CERTCFG.

<param3>: string. Optional unique client ID used to connect to the broker. The IMEI is used as client ID by default.

For "PROTOCOL":Pre-configure protocol parameters

<param1>: integer. Optional MQTT keep-alive time in seconds. Default 1200 (20 min). Value range 1-1200.

<param2>: integer. Optional QoS setting for "PUBLISH".

- 0: With no confirmation (default value)
- 1: Confirmed (acknowledged)

For "IP": IP layer parameters.
<param1>: integer. Optional Session ID: numeric PDN identification defined in APN table for specified PDN. If Session ID=0 or omitted default data PDN is used unless configured differently by AT%SETROUTE:

- 0: use default data PDN
- 1: max value defined in NP config file

<param2>: Integer. Optional IP type used to configure preferred IP type for connection.

- 0: IPv4v6 (default).
- 1: IPv4.
- 1: IPv6.

12.2.2 %AWSIOTCMD: Communicate with AWS IoT Message Broker

AT command to communicate with AWS IoT message broker.

Command	Command Type	Response
AT%AWSIOTCMD=<cmd> [,<param1> [,<param2>]]	Set	For "SUBSCRIBE"/"UNSUBSCRIBE"/"PUBLISH": [%AWSIOTCMD: <msg_id>]
AT%AWSIOTCMD?	Read	ERROR
AT%AWSIOTCMD=?	Test	%AWSIOTCMD: (list of supported <cmd>s)

Table 318: AT%AWSIOTCMD

Description:

AT command to communicate with AWS IoT message broker.
All commands are unblocking.
The information about command success or fail will be provided in %AWSIOTEVU URC.
Non-zero message ID may be used to pair subscribe, unsubscribe and publish (confirmed) messages with their URCs. At this stage, message ID is not supported, zero value is returned.

Defined values:

<cmd>: string.

Value	Description
"CONNECT"	Start connection with endpoint
"DISCONNECT"	End connection with endpoint
"SUBSCRIBE"	Subscribe to a topic on the endpoint
"UNSUBSCRIBE"	Stop subscription to a topic on the endpoint.
"PUBLISH"	Send publish packet to endpoint

Table 319: %AWSIOTCMD_Cmd_Description

For "SUBSCRIBE": Subscribe (register) to the topic on the endpoint.

<param1>: string. The subscription topic name.

For "UNSUBSCRIBE": Stop subscription (unregister) from the topic on the endpoint
<param1>: string. The subscription topic name.

<cmd> For "PUBLISH":Publish (send) packet to endpoint
<param1>: string. The publication topic name.

<param2>: string. Message that appears in the publication, max length is supported 3000(1500bytes).

<msg_id>: message ID.

- 0: Not in use
- 1-65535

12.2.3 %AWSIOTEV: Notify About AWS IOT Events

The command is intended to notify about AWS IOT events.

Command	Command Type	Response
AT%AWSIOTEV==<ev_type>,<mode>	Set	OK ERROR
AT%AWSIOTEV?	Read	ERROR
AT%AWSIOTEV=?	Test	%AWSIOTEV: (list of supported <ev_type>s), (list of supported <mode>s)
Unsolicited	Unsolicited	%AWSIOTEVU:<ev_type>,<res1>[,<res2>[,<res3]]

Table 320: AT%AWSIOTEV

Description:

The command is intended to notify about AWS IOT events.
Default mode is URC disabled for all event types except of "PUBRCV", which is enabled by first call of AT%AWSIOTCMD="SUBSCRIBE". Most of the events are related to asynchronous operation triggered by AT%AWSIOTCMD. Such acknowledgement may be normally disabled.

Only "PUBRCV" event provides the data from the topic, to which the client was pre-subscribed (pre-registered) by AT%AWSIOTCMD="SUBSCRIBE".

Note: AT%AWSIOTCMD="PUBLISH" in unconfirmed mode (no ACK) will not send any acknowledge message and <ev_type>="PUBCONF" is not expected.

Non-zero message ID may be used to pair subscribe, unsubscribe and publish (confirmed) messages sent by AT%AWSIOTCMD with their URCs. At this stage, message ID is not supported, zero value is always reported.

Note: If TCP session is disconnected because of link lost, no URC is sent.

Defined values:

<ev_type>: string.

Value	Description
"CONCONF"	Connect procedure confirmation status
"DISCONF"	Graceful disconnect procedure confirmation status
"SUBCONF"	Subscribe procedure confirmation status
"UNSCONF"	Unsubscribe procedure confirmation status
"PUBCONF"	Outgoing publication procedure confirmation status. Optional URC, depends on "PUBLISH" QoS selected
"PUBRCV"	Incoming publication message received
"CONNFAIL"	Connection failure
"PUBRCVSTORFAIL"	Storage failure of received publication. Ordinary if disk out of space or file is opened for writing.
"ALL"	All events, used only in execution command

Table 321: %AWSIOTEV_Ev_Type_Description

<mode>: integer. Status of unsolicited result response presentation.

- 0: disable (default value).
- 1: enable.

For "CONCONF/"DISCONF" :
<res1>: integer. result code.

- 0: Success
- 1: Fail

For "SUBCONF"/"UNSCONF"/"PUBCONF":
<res1>: Message ID.

- 0: not in use
- 1-65535

<res2>: integer. Result code.

- 0: Success
- 1: Fail

For "PUBRCV":
<res1>: string. The publication topic name.
<res2>: string. Publication message content received from endpoint.

12.3 Example: MQTT AT Commands for AWS

In this example, the Adrastea-Icreates and subscribes a specific topic, then sends the data to AWS and receives data from AWS.

1. Load the User Certificate

```
at%certcmd="write","ca-certificate.pem.crt",0,"-----BEGIN CERTIFICATE
    -----**********-----END CERTIFICATE-----"

OK
```

2. Load the user private key.

```
at%certcmd="write","ca-private.pem.key",1,"-----BEGIN RSA PRIVATE
    KEY-----**********-----END RSA PRIVATE KEY-----"

OK
```

When using the AT%CERTCMD="WRITE" command, avoid CR characters when pasting command. To do so, copy the command to an editor that supports EOL (end-of-line) format conversion and convert it to UNIX format (i.e., LF format). Then copy and paste this converted content to PuTTY/teraterm.

3. Read the User Certificate:

```
AT%CERTCMD="READ","ca-certificate.pem.crt"
%CERTCMD:"-----BEGIN CERTIFICATE
    -----**********-----END CERTIFICATE-----"

OK
```

4. Add certificates to the profile:

```
AT%CERTCFG="ADD",1,,,"ca-certificate.pem.crt","ca-private.pem.key"
OK
```

5. Allow AWS events:

```
AT%AWSIOTEV="ALL",1
OK
```

6. Connect an AWS session:

```
AT%AWSIOTCFG="CONN","a18jcdjlx073x-ats.iot.eu-central-1.
    amazonaws.com",1,"we-iot-device-t1"
OK
```

7. Configure AWS IOT cloud connection parameters:

```
AT%AWSIOTCFG="PROTOCOL",1200,1
OK
```

8. Connect to the server:

```
AT%AWSIOTCMD="CONNECT"
OK
```

9. Wait to get the connection event:

```
%AWSIOTEVU:"CONCONF",0
```

10. Subscribe to topic "test":

```
AT%AWSIOTCMD="SUBSCRIBE","test"
%AWSCMD: 1
OK
```

11. Get subscription success notification:

```
%AWSIOTEVU:"SUBCONF",1,0
```

12. Publish some "DATA" to topic "test":

```
AT%AWSIOTCMD="PUBLISH","test","DATA"
%AWSCMD: 2
OK
```

13. Get the Notification:

```
%AWSIOTEVU:"PUBCONF",1,0
```

14. Received data from the Server:

```
%AWSIOTEVU:"PUBRCV","test","{"message":␣"Hello From AWS"}"
```

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