
AT Command User Guide

For Customer Development

Special notes

This document is a confidential document only for internal.

History

Version	Change
1.0	1 st version

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1 General commands

1.1 Request identification information ATl

Command	Possible responses
I	Manufacturer: <manufacture> Model: <model> Revision: <revision> SVN: <svn> IMEI: <IMEI> OK

1.1.1 Description

This command causes the ME to transmit one or more lines of information text, determined by the manufacturer, followed by a final result code.

1.1.2 Persistent after power down

NA

1.1.3 Defined values

<manufacture>: Manufacture name.

<model>: Model name.

<revision>: Software version number.

<svn>: Software SVN which reported to network.

<IMEI>: Device IMEI

1.2 Command echo ATE

Command	Possible responses
E[<value>]	OK

1.2.1 Description

The setting of this parameter determines whether or not the ME echoes characters received from the DTE during command state and online command state (see 5.2.3).

1.2.2 Persistent after power down

NO

1.2.3 Defined values

[value]:

-
- 0 ME does not echo characters during command state and online command state.
- 1(default) ME echoes characters during command state and online command state.

1.3 Request manufacturer identification +GMI

Command	Possible responses
+GMI	<manufacturer> OK

1.3.1 Description

Execution command causes the ME to return one or more lines of information text <manufacturer>, determined by the MT manufacturer, which is intended to permit the user of the ME 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.

1.3.2 Persistent after power down

NA

1.3.3 Defined values

<manufacturer>: the total number of characters, including line terminators, in the information text shall not exceed 2048 characters.

1.4 Request model identification +GMM

Command	Possible responses
+GMM	<model> OK

1.4.1 Description

Execution command causes the ME to return one or more lines of information text <model>, determined by the MT manufacturer, which is intended to permit the user of the ME 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.

1.4.2 Persistent after power down

NA

1.4.3 Defined values

<model>: the total number of characters, including line terminators, in the information text shall not exceed 2048 characters.

1.5 Request revision identification +GMR

Command	Possible responses
+GMR	<revision> OK

1.5.1 Description

Execution command causes the ME to return one or more lines of information text <revision>, determined by the MT manufacturer, which is intended to permit the user of the ME 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.

1.5.2 Persistent after power down

NA

1.5.3 Defined values

<revision>: the total number of characters, including line terminators, in the information text shall not exceed 2048 characters.

1.6 Request product serial number identification +CGSN

Command	Possible responses
+CGSN	<sn> OK

1.6.1 Description

Execution command causes the ME to return one or more lines of information text <sn>, determined by the MT manufacturer, which is intended to permit the user of the ME to identify the individual MT to which it is connected to. Typically, the text will consist of a single line containing the IMEI (International Mobile Station Equipment Identity; refer 3GPP TS 23.003 [7]) number of the MT, but manufacturers may choose to provide more information if desired.

1.6.2 Persistent after power down

NA

1.6.3 Defined values

<IMEI>: the total number of characters, including line terminators, in the information text shall not exceed 2048 characters.

1.7 Request international mobile subscriber identity +CIMI

Command	Possible responses
+CIMI	<IMSI> OK

1.7.1 Description

Execution command causes the ME 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.

1.7.2 Persistent after power down

NA

1.7.3 Defined values

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

1.8 Request clock now +CCLK

Command	Possible responses
+CCLK=<time>	+CME ERROR:
+CCLK?	+CCLK: +CME ERROR:
+CCLK=?	

1.8.1 Description

Set command sets the real-time clock of the MT. If setting fails in an MT error, +CME ERROR: is returned. Refer subclause 9.2 for possible values.

Read command returns the current setting of the clock.

1.8.2 Define value

<time>: string type value; format is "yy/MM/dd,hh:mm:ss", where characters indicate year (two last digits), month, day, hour, minutes, seconds (Return to GMT). E.g. 6th of May 1994, 22:10:00 equals to "94/05/06,22:10:00"

NOTE: This command relies on the NITZ information sent by the network to update the system time. If no time update is received, the current device system time will be used.

At present, it is recommended to use the ntp server to obtain the latest time on the host side, and the CCLK command is used as an auxiliary query method to support nitz update time on the network

2 Network service related commands

2.1 Subscriber number +CNUM

Command	Possible response(s)
+CNUM	+CNUM: [<alpha1>,<number1>,<type1>[,<speed>,<service>[,<itc>]] [<CR><LF>+CNUM: [<alpha2>,<number2>,<type2>[,<speed>,<service>[,<itc>]] [...]] OK

2.1.1 Description

Action command returns the MSISDNs related to the subscriber (this information can be stored in the SIM/UICC or in the MT). When storing information in the SIM/UICC, if the currently selected card slot contains a SIM card or a UICC with an active GSM application, the information is stored in the EFMSISDN under DFTelecom. If the currently selected card slot contains a UICC with an active USIM application, the information is stored in the EFMSISDN under ADFUSIM). If subscriber has different MSISDN for different services, each MSISDN is returned in a separate line.

EFMSISDN is stored in SIM/UICC's local phonebook application, which is activated by AT\$QCPBMPREF=1.

2.1.2 Persistent after power down

NA

2.1.3 Defined values

<alphax>: optional alphanumeric string associated with <numberx>; used character set should be the one selected with command Select TE Character Set +CSCS

<numberx>: string type phone number of format specified by <typex>

<typex>: type of address octet in integer format (refer 3GPP TS 24.008 [8] subclause 10.5.4.7)

<speed>: integer type

- 0 autobauding (automatic selection of the speed; this setting is possible in case of 3.1 kHz modem and non-transparent service)
- 1 300 bps (V.21)
- 2 1200 bps (V.22)
- 3 1200/75 bps (V.23)
- 4 2400 bps (V.22bis)
- 5 2400 bps (V.26ter)
- 6 4800 bps (V.32)
- 7 9600 bps (V.32)
- 12 9600 bps (V.34)
- 14 14400 bps (V.34)

15 19200 bps (V.34)
16 28800 bps (V.34)
17 33600 bps (V.34)
34 1200 bps (V.120)
36 2400 bps (V.120)
38 4800 bps (V.120)
39 9600 bps (V.120)
43 14400 bps (V.120)
47 19200 bps (V.120)
48 28800 bps (V.120)
49 38400 bps (V.120)
50 48000 bps (V.120)
51 56000 bps (V.120)
65 300 bps (V.110)
66 1200 bps (V.110)
68 2400 bps (V.110 or X.31 flag stuffing)
70 4800 bps (V.110 or X.31 flag stuffing)
71 9600 bps (V.110 or X.31 flag stuffing)
75 14400 bps (V.110 or X.31 flag stuffing)
79 19200 bps (V.110 or X.31 flag stuffing)
80 28800 bps (V.110 or X.31 flag stuffing)
81 38400 bps (V.110 or X.31 flag stuffing)
82 48000 bps (V.110 or X.31 flag stuffing)
83 56000 bps (V.110 or X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI or RDI service in order to get FTM)
84 64000 bps (X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI service in order to get FTM)
115 56000 bps (bit transparent)
116 64000 bps (bit transparent)
120 32000 bps (PIAFS32k)
121 64000 bps (PIAFS64k)
130 28800 bps (multimedia)
131 32000 bps (multimedia)
132 33600 bps (multimedia)
133 56000 bps (multimedia)
134 64000 bps (multimedia)
all other values below 128 are reserved by the present document.

<service>: integer type (service related to the phone number)

0 asynchronous modem

1 synchronous modem

all other values below 128 are reserved by the present document

<itc>: integer type (information transfer capability)

-
- 0 3,1 kHz
 - 1 UDI

2.2 Network registration +CREG

Command	Possible response(s)
+CREG=[<n>]	OK
+CREG?	+CREG: <n>,<stat>[,<lac>,<ci>[,<AcT>]] OK
+CREG=?	+CREG: (list of supported <n>s) OK

2.2.1 Description

Set command controls the presentation of an unsolicited result code +CREG: <stat> when <n>=1 and there is a change in the MT's circuit mode network registration status, or unsolicited result code +CREG: <stat>[,<lac>,<ci>[,<AcT>]] when <n>=2 and there is a change of the network cell.

NOTE 1: If the MT also supports GPRS services and/or EPS services, the +CGREG command and +CGREG: result codes and/or the +CEREG command and +CEREG: result codes apply to the registration status and location information for those services.

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 <lac>, <ci> and <AcT> are returned only when <n>=2 and MT is registered in the network.

2.2.2 Persistent after power down

NO

2.2.3 Defined values

<n>: integer type

- 0 disable network registration unsolicited result code (default)
- 1 enable network registration unsolicited result code +CREG: <stat>
- 2 enable network registration and location information unsolicited result code +CREG: <stat>[,<lac>,<ci>[,<AcT>]]

<stat>: integer type; circuit mode registration status

- 0 not registered, MT is not currently searching a new operator to register to
- 1 registered, home network
- 2 not registered, but MT is currently searching a new operator to register to
- 3 registration denied
- 4 unknown
- 5 registered, roaming

<lac>: string type; two byte location area code or tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; four byte GERAN/UTRAN/E-UTRAN cell ID in hexadecimal format

<AcT>: integer type; access technology of the serving cell

- 0 GSM
- 1 GSM Compact
- 2 UTRAN
- 3 GSM w/EGPRS (see NOTE 1)
- 4 UTRAN w/HSDPA (see NOTE 2)
- 5 UTRAN w/HSUPA (see NOTE 2)
- 6 UTRAN w/HSDPA and HSUPA (see NOTE 2)
- 7 E-UTRAN

NOTE 1: 3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.

NOTE 2: 3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

2.3 PLMN selection +COPS

Command	Possible response(s)
+COPS=[<mode>[,<format>[,<oper>[,<AcT>]]]]	OK
+COPS?	+COPS: <mode>[,<format>,<oper>[,<AcT>]] OK
+COPS=?	+COPS: [list of supported (<stat>,long alphanumeric <oper>,short alphanumeric <oper>,numeric <oper>[,<AcT>])s][,.(list of supported <mode>s),(list of supported <format>s)] OK

2.3.1 Description

Set command forces an attempt to select and register the GSM/UMTS/EPS 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 by the MT or is forced by this command to operator <oper> (it shall be given in format <format>) to a certain access technology, indicated in <AcT>. If the selected operator is not available, no other operator shall be selected (except <mode>=4). If the selected access technology is not available, then the same operator shall be selected in other access technology. The selected operator name format shall apply to further read commands (+COPS?) also. <mode>=2 forces an attempt to deregister from the network. The selected mode affects to all further network registration (e.g. after <mode>=2, MT shall be unregistered until <mode>=0 or 1 is selected).

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.

Test command returns a set of five parameters, each representing an operator present in the network. A set consists of an integer indicating the availability of the operator <stat>, long and short alphanumeric format of the name of the operator, numeric format representation of the operator and access technology. Any of the formats may be unavailable and should then be an empty field. The list of operators shall be in order: home network, networks referenced in SIM or active application in the UICC (GSM or USIM) in the following order: HPLMN selector, User controlled PLMN selector, Operator controlled PLMN selector and PLMN selector (in the SIM or GSM application), and other networks.

It is recommended (although optional) that after the operator list ME returns lists of supported <mode>s and <format>s. These lists shall be delimited from the operator list by two commas.

The access technology selected parameters, <AcT>, should only be used in terminals capable to register to more than one access technology. Selection of <AcT> does not limit the capability to cell reselections, even though an attempt is made to select an access technology, the phone may still re-select a cell in another access technology.

2.3.2 Persistent after power down

NO

2.3.3 Defined values

<mode>: integer type

- 0 automatic (<oper> field is ignored) (default)
- 1 manual (<oper> 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
- 4 manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode (<mode>=0) is entered

<format>: integer type

- 0 long format alphanumeric <oper>(default)
- 1 short format alphanumeric <oper>
- 2 numeric <oper>

<oper>: string type; <format> indicates if the format is alphanumeric or numeric; long

alphanumeric format can be upto 16 characters long and short format up to 8 characters (refer GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer 3GPP TS 24.008 [8] subclause 10.5.1.3) which consists of a three BCD digit country code coded as in ITU-T Recommendation E.212 [10] Annex A, plus a two BCD digit network code, which is administration specific; returned <oper> shall not be in BCD format, but in IRA characters converted from BCD; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network code digit 3)(network code digit 2)(network code digit 1)

<stat>: integer type

- 0 unknown
- 1 available
- 2 current
- 3 forbidden

<AcT>: integer type; access technology selected

- 0 GSM
- 1 GSM Compact
- 2 UTRAN
- 3 GSM w/EGPRS (see NOTE 1)
- 4 UTRAN w/HSDPA (see NOTE 2)
- 5 UTRAN w/HSUPA (see NOTE 2)
- 6 UTRAN w/HSDPA and HSUPA (see NOTE 2)
- 7 E-UTRAN

NOTE 1: 3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.

NOTE 2: 3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

2.4 Facility lock +CLCK

Command	Possible response(s)
+CLCK=<fac>,<mode>[,<passwd>[,<class>]]	OK when <mode>=2 and command successful: +CLCK: <status>[,<class1> [<CR><LF>+CLCK: <status>,<class2> [...]] OK
+CLCK=?	+CLCK: (list of supported <fac>s) OK

2.4.1 Description

Execute 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) should be returned only if service is not active for any <class>.

Call barring facilities are based on GSM/UMTS supplementary services (refer 3GPP TS 22.088 [6]). The interaction of these with other commands based on other GSM/UMTS supplementary services is described in the GSM/UMTS standard.

Test command returns facility values supported as a compound value.

2.4.2 Persistent after power down

NA

2.4.3 Defined values

<fac> values reserved by the present document:

- "CS" CNTRL (lock CoNTRoL surface (e.g. phone keyboard))
- "PS" PH-SIM (lock PHone to SIM/UICC card installed in the currently selected card slot) (MT asks password when other than current SIM/UICC card inserted; MT may remember certain amount of previously used cards thus not requiring password when they are inserted)
- "PF" lock Phone to the very First inserted SIM/UICC card (also referred in the present document as PH-FSIM) (MT asks password when other than the first SIM/UICC card is inserted)
- "SC" SIM (lock SIM/UICC card installed in the currently selected card slot) (SIM/UICC asks password in MT power-up and when this lock command issued)
- "AB" All Barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)
- "AG" All outGoing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)
- "AC" All inComing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)
- "FD" SIM card or active application in the UICC (GSM or USIM) fixed dialling memory feature (if PIN2 authentication has not been done during the current session, PIN2 is required as <passwd>)
- "PN" Network Personalization (refer 3GPP TS 22.022 [33])
- "PU" network sUbsset Personalization (refer 3GPP TS 22.022 [33])
- "PP" service Provider Personalization (refer 3GPP TS 22.022 [33])
- "PC" Corporate Personalization (refer 3GPP TS 22.022 [33])

<mode>: integer type

- 0 unlock
- 1 lock
- 2 query status

<status>: integer type

- 0 not active
- 1 active

<passwd>: string type; shall be the same as password specified for the facility from the MT user interface or with command Change Password +CPWD

<classx> is a sum of integers each representing a class of information (default 7 - voice, data and fax):

- 2 data (refers to all bearer services; with <mode>=2 this may refer only to some bearer service if ME does not support values 16, 32, 64 and 128)

- 8 short message service
- 16 data circuit sync
- 32 data circuit async
- 64 dedicated packet access

2.5 Change password +CPWD

Command	Possible response(s)
+CPWD=<fac>,<oldpwd>,<newpwd>	OK
+CPWD=?	+CPWD: list of supported (<fac>,<pwdlength>)s OK

2.5.1 Description

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

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

2.5.2 Persistent after power down

NA

2.5.3 Defined values

<fac>:

"P2" SIM PIN2

refer Facility Lock +CLCK for other values

<oldpwd>, <newpwd>: string type; <oldpwd> shall be the same as password specified for the facility from the MT user interface or with command Change Password +CPWD and <newpwd> is the new password; maximum length of password can be determined with <pwdlength>

<pwdlength>: integer type maximum length of the password for the facility

2.6 Preferred PLMN list +CPOL

Command	Possible response(s)
+CPOL=[<index>][,<format>[,<oper>[,<GSM_AcT>,<GSM_Compact_AcT>,<UTRAN_AcT>,<E-UTRAN_AcT>]]]	OK

+CPOL?	+CPOL: <index1>,<format>,<oper1>[,<GSM_AcT1>,<GSM_Compact_AcT1>,<UTRAN_AcT1>,<E-UTRAN_AcT1>] [<CR><LF>+CPOL: <index2>,<format>,<oper2>[,<GSM_AcT2>,<GSM_Compact_AcT2>,<UTRAN_AcT2>,<E-UTRAN_AcT2>] [...]] OK
+CPOL=?	+CPOL: (list of supported <index>s),(list of supported <format>s) OK

2.6.1 Description

This command is used to edit the PLMN selector with Access Technology lists in the SIM card or active application in the UICC (GSM or USIM).

Execute command writes an entry in the SIM/USIM list of preferred PLMNs, previously selected by the command +CPLS. If no list has been previously selected, the User controlled PLMN selector with Access Technology, EFPLMNwAcT, is the one accessed by default. If <index> is given but <oper> is left out, entry is deleted. If <oper> is given but <index> is left out, <oper> is put in the next free location. If only <format> is given, the format of the <oper> in the read command is changed. The Access Technology selection parameters, <GSM_AcT>, <GSM_Compact_AcT> and <UTRAN_AcT> and <E-UTRAN_AcT> are required when writing User controlled PLMN selector with Access Technology, EFPLMNwAcT, Operator controlled PLMN selector with Access Technology EFOPLMNwAcT and HPLMN selector with Access Technology EFHPLMNwAcT, see 3GPP TS 31.102 [59].

NOTE 1: MT can also update the User controlled PLMN selector with Access Technology, EFPLMNwAcT, automatically when new networks are selected.

NOTE 2: The Operator controlled PLMN selector with Access Technology EFOPLMNwAcT, can only be written if the write access condition in the SIM/USIM has been previously verified.

Read command returns all used entries from the SIM/USIM list of preferred PLMNs, previously selected by the command +CPLS, with the Access Technologies for each PLMN in the list.

Test command returns the whole index range supported by the SIM.

2.6.2 Defined values

<indexn>: integer type; the order number of operator in the SIM/USIM preferred operator list

<format>: integer type

- 0 long format alphanumeric <oper>
- 1 short format alphanumeric <oper>
- 2 numeric <oper> (default)

<opern>: string type; <format> indicates if the format is alphanumeric or numeric (see +COPS)

<GSM_AcTn>: integer type; GSM access technology:

- 0 access technology not selected

1 access technology selected

<GSM_Compact_AcTn>: integer type; GSM compact access technology

0 access technology not selected

1 access technology selected

<UTRAN_AcTn>: integer type; UTRAN access technology

0 access technology not selected

1 access technology selected

<E-UTRAN_AcTn>: integer type; E-UTRAN access technology

0 access technology not selected

1 access technology selected

2.7 Selection of preferred PLMN list +CPLS

Command	Possible response(s)
+CPLS=<list>	OK
+CPLS?	+CPLS: <list> OK
+CPLS=?	+CPLS: (list of supported <list>s) OK

2.7.1 Description

This command is used to select one PLMN selector with Access Technology list in the SIM card or active application in the UICC (GSM or USIM), that is used by +CPOL command.

Execute command selects a list in the SIM/USIM.

Read command returns the selected PLMN selector list from the SIM/USIM

Test command returns the whole index range supported lists by the SIM/USIM

2.7.2 Persistent after power down

NA

2.7.3 Defined values

<list>: integer type

- 0 User controlled PLMN selector with Access Technology EFPLMNwAcT, if not found in the SIM/UICC then PLMN preferred list EFPLMNsel (this file is only available in SIM card or GSM application selected in UICC) (default)
- 1 Operator controlled PLMN selector with Access Technology EFOPLMNwAcT
- 2 HPLMN selector with Access Technology EFHPLMNwAcT

2.8 Read operator names +COPN

Command	Possible response(s)
---------	----------------------

+COPN	+COPN: <numeric1>,<alpha1> [<CR><LF>+COPN: <numeric2>,<alpha2> [...]] OK
+COPN=?	OK

2.8.1 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.

2.8.2 Persistent after power down

NA

2.8.3 Defined values

<numericn>: string type; operator in numeric format (see +COPS)

<alphan>: string type; operator in long alphanumeric format (see +COPS)

3 MT control and status commands

3.1 Setting Operation Mode +CFUN

Command	Possible responses
+CFUN=[<fun>[,<rst>]]	OK
+CFUN?	+CFUN: <fun> OK
+CFUN=?	+CFUN: (list of supported <fun>s), (list of supported <rst>s) OK

3.1.1 Description:

The execution command is executed to set the ME mode or restart the ME.

The read command is executed to return the current mode.

The test command is executed to return the parameter values supported by this command

3.1.2 Persistent after power down

NO

3.1.3 Defined value:

<fun>: integer type

- 0 Indicates that the minimum mode is used.(default)
- 1 Indicates that the complete function is used.
- 4 Indicates that the offline mode is used and the RF RX/TX channel is disabled.
- 5 Reserved.
- 6 Indicates that the function is reset (the offline mode must be used before reset).

<rst>: integer type

- 0 do not reset the MT before setting it to <fun> power level(default)

NOTE: This shall be always default when <rst> is not given.

- 1 reset the MT before setting it to <fun> power level

3.2 Enter PIN +CPIN

Command	Possible response(s)
+CPIN=<pin>[,<newpin>]	OK
+CPIN?	+CPIN: <code> OK
+CPIN=?	OK

3.2.1 Description

Set command sends to the MT a password which is necessary before it can be operated (SIM PIN, SIM PUK, etc.). If the PIN is to be entered twice, the ME shall automatically repeat the PIN. If no PIN request is pending, no action is taken towards MT and an error message, +CME ERROR, is returned to TE.

NOTE 1: SIM PIN, SIM PUK, SIM PIN2 and SIM PUK2 refer to the PIN of the selected application on the UICC. For example, in an UTRAN context, the selected application on the currently selected UICC should be a USIM and the SIM PIN then represents the PIN of the selected USIM. See 3GPP TS 31.101 [65] for further details on application selection on the UICC.

If the PIN required is SIM PUK or SIM PUK2, the second pin is required. This second pin, <newpin>, is used to replace the old pin in the SIM.

NOTE 2: Commands which interact with MT that are accepted when MT is pending SIM PIN, SIM PUK, are: +GMI, +GMM, +GMR, +CGSN, D112; (emergency call), +CPAS, +CFUN, +CPIN, +CPINR, +CDIS (read and test command only), and +CIND (read and test command only).

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

3.2.2 Persistent after power down

NA

3.2.3 Defined values

<pin>, <newpin>: string type values

<code>: values reserved by the present document:

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

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)

3.3 Signal quality +CSQ

Command	Possible response(s)
+CSQ	+CSQ: <RSSI>,<BER> OK

+CSQ=?	+CSQ: (LIST OF SUPPORTED <RSSI>S),(LIST OF SUPPORTED <BER>S) OK
--------	--

3.3.1 Description

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

Test command returns values supported as compound values.

3.3.2 Persistent after power down

NA

3.3.3 Defined values

<rsi>: integer type

0 -113 dBm or less

1 -111 dBm

2...30 -109... -53 dBm

31 -51 dBm or greater

99 not known or not detectable

<ber>: integer type; channel bit error rate (in percent)

0...7 as RXQUAL values in the table in 3GPP TS 45.008 [20] subclause 8.2.4

99 not known or not detectable

3.4 Indicator control +CIND

Command	Possible response(s)
+CIND=[<IND>[,<IND>[,...]]]	OK
+CIND?	+CIND: <IND>[,<IND>[,...]] OK
+CIND=?	+CIND: (<DESCR>,(LIST OF SUPPORTED <IND>S))[,(<DESCR>,(LIST OF SUPPORTED <IND>S))[,...]] OK

3.4.1 Description

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

returned. If certain indicator is not writable, setting of it should be ignored. If parameter is empty field, indicator shall remain in the previous value.

Read command returns the status of MT indicators. If MT is not currently reachable, +CME ERROR: <err> is returned.

Test command returns pairs, where string value <descr> is a maximum 16 character description of the indicator and compound value is the allowed values for the indicator. If MT is not currently reachable, +CME ERROR: <err> is returned.

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

3.4.2 Persistent after power down

NA

3.4.3 Defined values

<ind>: integer type value, which shall be in range of corresponding <descr>

<descr> values reserved by the present document and their <ind> ranges:

"battchg"	battery charge level (0-5) (not support on IK511)
"signal"	signal quality (0-5)
"service"	service availability (0-1)
"call"	call in progress (0-1) (not support on IK511)
"roam"	roaming indicator (0-1)
"smsfull"	a short message memory storage in the MT has become full (1), or memory locations are available (0); i.e. the range is (0-1)
"GPRS coverage"	GPRS coverage availability (0-1)
"callsetup"	(0-3) (not support on IK511)

3.5 Restricted SIM access +CRSM

Command	Possible response(s)
+CRSM=<COMMAND>[,<FILEID>[,<P1>[,<P2>[,<P3>[,<DATA>[,<PATHID>]]]]]	+CRSM: <sw1>,<sw2>[,<RESPONSE>] OK
+CRSM=?	OK

3.5.1 Description

By using this command instead of Generic SIM Access +CSIM TE application has easier but more limited access to the SIM database. 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.

3.5.2 Persistent after power down

NA

3.5.3 Defined values

<command> (command passed on by the MT to the SIM; refer 3GPP TS 51.011 [28]):

176 READ BINARY

178 READ RECORD

192 GET RESPONSE

214 UPDATE BINARY

220 UPDATE RECORD

242 STATUS

203 RETRIEVE DATA

219 SET DATA

all other values are reserved

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

<fileid>: integer type; 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 [28]. Optional files may not be present at all.

<P1>, <P2>, <P3>: integer type; parameters passed on by the MT to the SIM. These parameters are mandatory for every command, except GET RESPONSE and STATUS. The values are described in 3GPP TS 51.011 [28]

<data>: information which shall be written to the SIM (hexadecimal character format; refer +CSCS)

<pathid>: string type; contains the path of an elementary file on the SIM/UICC in hexadecimal format as defined in ETSI TS 102 221 [60] (e.g. "7F205F70" in SIM and UICC case). The <pathid> shall only be used in the mode "select by path from MF" as defined in ETSI TS 102 221 [60].

NOTE 3: Since valid elementary file identifiers may not be unique over all valid dedicated file identifiers the <pathid> indicates the targeted UICC/SIM directory path in case of ambiguous file identifiers. For earlier versions of this specification or if <pathid> is omitted, it could be implementation specific which one will be selected.

<sw1>, <sw2>: integer type; 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). STATUS and GET RESPONSE return data, which gives information about the current elementary datafield. This information includes the type of file and its size (refer 3GPP TS 51.011 [28]). 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

3.6 Set to factory-defined configuration &F

Command	Possible response(s)
&F[<value>]	OK

3.6.1 Description

This command instructs the ME to set all parameters to default values specified by the manufacturer, which may take into consideration hardware configuration switches and other manufacturer-defined criteria. This command may not be aborted.

3.6.2 Persistent after power down

NA

3.6.3 Defined values

[value]:

- 0 Set parameters to factory defaults.
- Other value reserved for manufacturer proprietary use.

4 Commands for packet domain

4.1 Define PDP Context +CGDCONT

Command	Possible response(s)
+CGDCONT=[<CID>[,<PDP_TYPE>[,<APN>[,<PDP_ADDR>[,<D_COMP>[,<H_COMP>[,<IPv4ADDRALLOC>[,<EMERGENCY INDICATION>]]]]]]]]	OK
+CGDCONT?	+CGDCONT: <CID>,<PDP_TYPE>,<APN>,<PDP_ADDR>,<D_COMP>,<H_COMP>[,<IPv4ADDRALLOC>[,<EMERGENCY INDICATION>]] [<CR><LF>+CGDCONT: <CID>,<PDP_TYPE>,<APN>,<PDP_ADDR>,<D_COMP>,<H_COMP>[,<IPv4ADDRALLOC>[,<EMERGENCY INDICATION>]] [...]] OK
+CGDCONT=?	+CGDCONT: (RANGE OF SUPPORTED <CID>S),<PDP_TYPE>,,,(LIST OF SUPPORTED <D_COMP>S),(LIST OF SUPPORTED <H_COMP>S),(LIST OF SUPPORTED <IPv4ADDRALLOC>S),(LIST OF SUPPORTED <EMERGENCY INDICATION>S) [<CR><LF>+CGDCONT: (RANGE OF SUPPORTED <CID>S),<PDP_TYPE>,,,(LIST OF SUPPORTED <D_COMP>S),(LIST OF SUPPORTED <H_COMP>S),(LIST OF SUPPORTED <IPv4ADDRALLOC>S),(LIST OF SUPPORTED <EMERGENCY INDICATION>S)] OK

4.1.1 Description

The set command specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, <cid>. The number of PDP contexts that may be in a defined state at the same time is given by the range returned by the test command.

For EPS the PDN connection and its associated EPS default bearer is identified herewith. For EPS the <PDP_addr> parameter value shall be omitted.

A special form of the set command, +CGDCONT=<cid> causes the values for context number <cid> to become undefined.

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

The test command returns values supported as a compound value. If the MT supports several PDP types, <PDP_type>, the parameter value ranges for each <PDP_type> are returned on a separate

line.

4.1.2 Persistent after power down

YES

4.1.3 Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value = 1) is returned by the test form of the command.

NOTE 1: The <cid>s for network-initiated PDP contexts will have values outside the ranges indicated for the <cid> in the test form of the commands +CGDCONT and +CGDSCONT.

<PDP_type>: a string parameter which specifies the type of packet data protocol

IP	IPv4 only (IETF STD 5)
PPP	Point to Point Protocol (IETF STD 51)
IPV6	IPv6 only (IETF RFC 2460)
IPV4V6	IPv4v6 (See 3GPP TS 24.301 [83])

NOTE 2: Only IP, IPV6 and IPV4V6 values are supported for EPS services.

<APN>: a string parameter which is a logical name that is used to select the GGSN or the external packet data network.

If the value is null or omitted, then the subscription value will be requested.

<PDP_addr>: a string parameter that identifies the MT in the address space applicable to the PDP.

If the parameter value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested.

The read form of the command will continue to return the null string even if an address has been allocated during the PDP startup procedure. The allocated address(es) may be read using the +CGPADDR command.

NOTE 3: For EPS, this field or the parameter value of the field is omitted.

<d_comp>: a numeric parameter that controls PDP data compression (applicable for SNDTCP only) (refer 3GPP TS 44.065 [61])

0	off
1	on (manufacturer preferred compression)
2	V.42bis

Other values are reserved.

<h_comp>: a numeric parameter that controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

0	off
1	on (manufacturer preferred compression)
2	RFC1144 (applicable for SNDTCP only)
3	RFC2507
4	RFC3095 (applicable for PDCP only)

Other values are reserved.

<IPv4AddrAlloc>: a numeric parameter that controls how the MT/ME requests to get the IPv4 address information

0 IPv4 Address Allocation through NAS Signalling

1 IPv4 Address Allocated through DHCP

<emergency indication>: a numeric parameter used to indicate whether the PDP context is for emergency bearer services or not.

0 PDP context is not for emergency bearer services

1 PDP context is for emergency bearer services

4.2 Define Secondary PDP Context +CGDSCONT

Command	Possible response(s)
+CGDSCONT=[<CID>,<P_CID>,<PDP_TYPE>[,<D_COMP>[,<H_COMP>]]]	OK
+CGDSCONT?	+CGDSCONT: <CID>,<P_CID>,<PDP_TYPE>,<D_COMP>,<H_COMP>,<IM_CN_SIGNALLING_FLAG_IND> [<CR><LF>+CGDSCONT: <CID>,<P_CID>,<PDP_TYPE>,<D_COMP>,<H_COMP> [...]] OK
+CGDSCONT=?	+CGDSCONT: (RANGE OF SUPPORTED <CID>S),(LIST OF <P_CID>S FOR ACTIVE PRIMARY CONTEXTS), <PDP_TYPE>,(LIST OF SUPPORTED <D_COMP>S),(LIST OF SUPPORTED <H_COMP>S) OK

4.2.1 Description

The set command specifies PDP context parameter values for a Secondary PDP context identified by the (local) context identification parameter, <cid>. The number of PDP contexts that may be in a defined state at the same time is given by the range returned by the test command.

In EPS the command is used to define traffic flows.

A special form of the set command, +CGDSCONT=<cid> causes the values for context number <cid> to become undefined.

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

4.2.2 Persistent after power down

YES

4.2.3 Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition. The parameter is

local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value = 1) is returned by the test form of the command.

NOTE: The <cid>s for network-initiated PDP contexts will have values outside the ranges indicated for the <cid> in the test form of the commands +CGDCONT and +CGDSCONT.

<p_cid>: a numeric parameter which specifies a particular PDP context definition which has been specified by use of the +CGDCONT command. The parameter is local to the TE-MT interface. The list of permitted values is returned by the test form of the command.

<PDP_type>: a string parameter which specifies the type of packet data protocol

IP Internet Protocol (IETF STD 5)

PPP Point to Point Protocol (IETF STD 51)

IPv6 Internet Protocol, version 6 (IETF RFC 2460)

IPv4V6 Virtual <PDP_type> introduced to handle dual IP stack UE capability. (See 3GPP TS 24.301 [83])

NOTE 2: Only IP, IPv6 and IPv4V6 values are supported for EPS services.

<d_comp>: a numeric parameter that controls PDP data compression (applicable for SND CPonly) (refer 3GPP TS 44.065 [61])

0 off

1 on (manufacturer preferred compression)

2 V.42bis

Other values are reserved.

<h_comp>: a numeric parameter that controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

0 off

1 on (manufacturer preferred compression)

2 RFC1144 (applicable for SND CP only)

3 RFC2507

4 RFC3095 (applicable for PD CP only)

Other values are reserved.

4.3 PS attach or detach +CGATT

Command	Possible Response(s)
+CGATT[=<STATE>]	OK
+CGATT?	+CGATT: <STATE> OK
+CGATT=?	+CGATT: (LIST OF SUPPORTED <STATE>S) OK

4.3.1 Description

The execution command is used to attach the MT to, or detach the MT from, the Packet Domain service. After the command has completed, the MT remains in V.250 command state. If the MT is already in the requested state, the command is ignored and the OK response is returned. If the requested state cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.

The read command returns the current Packet Domain service state.

The test command is used for requesting information on the supported Packet Domain service states.

NOTE: This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

4.3.2 Persistent after power down

NA

4.3.3 Defined Values

<state>: a numeric parameter that indicates the state of PS attachment

0 detached

1 attached

Other values are reserved and will result in an ERROR response to the execution command.

4.4 PDP context activate or deactivate +CGACT

Command	Possible Response(s)
+CGACT=[<STATE>[,<CID>[,<CID>[,...]]]]	OK
+CGACT?	+CGACT: <CID>,<STATE> [<CR><LF>+CGACT: <CID>,<STATE> [...]] OK
+CGACT=?	+CGACT: (LIST OF SUPPORTED <STATE>S) OK

4.4.1 Description

The execution command is used to activate or deactivate the specified PDP context (s). After the command has completed, the MT remains in V.250 command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If the requested state for any specified context cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command. If the MT is not PS attached when the activation form of the command is executed, the MT first performs a PS attach and then attempts to activate the specified contexts. If the attach fails then the MT responds with ERROR or, if extended error responses are enabled, with the appropriate failure-to-attach error message.

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.

For EPS, the activation request for an EPS bearer resource will be answered by the network by either an EPS dedicated bearer activation or EPS bearer modification request. The request must be accepted by the MT before the PDP context can be set in to established state.

If no <cid>s are specified, the 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.

NOTE. This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

4.4.2 Persistent after power down

NA

4.4.3 Defined Values

<state>: a numeric parameter that indicates the state of PDP context activation

0 deactivated

1 activated

Other values are reserved and will result in an ERROR response to the execution command.

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

4.5 GPRS network registration status +CGREG

Command	Possible response(s)
+CGREG=[<N>]	+CME ERROR: <ERR>
+CGREG?	+CGREG: <N>,<STAT>[,<LAC>,<CI>[,<AcT>,<RAC>]]
+CGREG=?	+CGREG: (LIST OF SUPPORTED <N>S)

4.5.1 Description

The set command controls the presentation of an unsolicited result code +CGREG: <stat> when <n>=1 and there is a change in the MT's GPRS network registration status in GERAN/UTRAN, or unsolicited result code +CGREG: <stat>[,<lac>,<ci>[,<AcT>,<rac>]] when <n>=2 and there is a change of the network cell in GERAN/UTRAN; in this latest case <AcT>, <lac>, <rac> and <ci> are sent only if available.

NOTE 1. If the GPRS MT also supports circuit mode services in GERAN/UTRAN and/or EPS services in E-UTRAN, the +CREG command and +CREG: result codes and/or the +CEREG command and +CEREG: result codes apply to the registration status and location information for those services.

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 <lac>, <ci>, <AcT> and <rac>, if available, are returned only when <n>=2 and MT is

registered in the network.

4.5.2 Persistent after power down

NO

4.5.3 Defined values

<n>: a numeric parameter

- 0 disable network registration unsolicited result code (default)
- 1 enable network registration unsolicited result code +CGREG: <stat>
- 2 enable network registration and location information unsolicited result code +CGREG: <stat>[,<lac>,<ci>[,<AcT>,<rac>]]

<stat>: a numeric parameter that indicates the GPRS registration status

- 0 not registered, MT is not currently searching an operator to register to
- 1 registered, home network
- 2 not registered, but MT is currently trying to attach or searching an operator to register to
- 3 registration denied
- 4 unknown (e.g. out of GERAN/UTRAN coverage)
- 5 registered, roaming
- 6 registered for "SMS only", home network (not applicable)
- 7 registered for "SMS only", roaming (not applicable)
- 8 attached for emergency bearer services only (see NOTE 2) (applicable only when <AcT> indicates 2,4,5,6)

NOTE 2: 3GPP TS 24.008 [8] and 3GPP TS 24.301 [83] specify the condition when the MS is considered as attached for emergency bearer services.

<lac>: string type; two bytes location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; four byte GERAN/UTRAN cell ID in hexadecimal format

<AcT>: a numeric parameter that indicates the access technology of the serving cell

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

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

NOTE 4: 3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

<rac>: string type; one byte routing area code in hexadecimal format

4.6 PDP Context Modify +CGCMOD

Command	Possible Response(s)
+CGCMOD=[<CID>[,<CID>[,...]]]	OK
+CGCMOD=?	+CGCMOD: (LIST OF <CID>S ASSOCIATED WITH ACTIVE CONTEXTS) OK

4.6.1 Description

The execution command is used to modify the specified PDP context (s) with respect to QoS profiles and TFTs. After the command has completed, the MT returns to V.250 online data state. If the requested modification for any specified context cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

For EPS, the modification request for an EPS bearer resource will be answered by the network by an EPS bearer modification request. The request must be accepted by the MT before the PDP context is effectively changed.

If no <cid>s are specified, the activation form of the command modifies all active contexts.

The test command returns a list of <cid>s associated with active contexts.

4.6.2 Persistent after power down

NA

4.6.3 Defined Values

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

4.7 Enter data state +CGDATA

Command	Possible Response(s)
+CGDATA=[<L2P>[,<CID>[,<CID>[,...]]]]	CONNECT
+CGDATA=?	+CGDATA: (LIST OF SUPPORTED <L2P>S) OK

4.7.1 Description

The execution command causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more Packet Domain PDP types. This may include performing a PS attach and one or more PDP context activations. If the <L2P> parameter value is unacceptable to the MT, the MT shall return an ERROR or +CME ERROR response. Otherwise, the MT issues the intermediate result code CONNECT and enters V.250 online data state.

Commands following +CGDATA command in the AT command line shall not be processed by the MT.

The detailed behavior after the online data state has been entered is dependent on the PDP type. It is described briefly in 3GPP TS 27.060 [34] and in more detail in 3GPP TS 29.061 [39] and the specifications for the relevant PDPs. PS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not already been performed using the +CGATT and +CGACT commands.

If context activation takes place during the PDP startup, one or more <cid>s may be specified in order to provide the information needed for the context activation request(s).

During each PDP startup procedure the MT may have access to some or all of the following information -

- The MT may have a priori knowledge, for example, it may implement only one PDP type.

- The command may have provided an <L2P> parameter value.

- The TE may provide a PDP type and/or PDP address to the MT during in the PDP startup procedure.

If any of this information is in conflict, the command will fail.

Any PDP type and/or PDP address present in the above information shall be compared with the PDP type and/or PDP address in any context definitions specified in the command in the order in which their <cid>s appear. For a context definition to match -

- The PDP type must match exactly.

- The PDP addresses are considered to match if they are identical or if either or both addresses are unspecified. For example, a PPP NCP request specifying PDP type = IP and no PDP address would cause the MT to search through the specified context definitions for one with PDP type = IP and any PDP address.

The context shall be activated using the matched value for PDP type and a static PDP address if available, together with the other information found in the PDP context definition. If a static PDP address is not available then a dynamic address is requested.

If no <cid> is given or if there is no matching context definition, the MT shall attempt to activate the context with whatever information is available to the MT. The other context parameters shall be set to their default values.

If the activation is successful, data transfer may proceed.

After data transfer is complete, and the layer 2 protocol termination procedure has completed successfully, the V.250 command state is re-entered and the MT returns the final result code OK.

In the event of an erroneous termination or a failure to start up, the V.250 command state is re-entered and the MT returns the final result code NO CARRIER or, if enabled, +CME ERROR. Attach, activate and other errors may be reported.

The test command is used for requesting information on the supported layer 2 protocols.

This command may be used in both normal and modem compatibility modes.

4.7.2 Persistent after power down

NA

4.7.3 Defined Values

<L2P>: a string parameter that indicates the layer 2 protocol to be used between the TE and MT

- NULL none, for PDP type OSP:IHOSS (Obsolete)

- PPP Point-to-point protocol for a PDP such as IP

If the value is omitted, the layer 2 protocol is unspecified. Other values are reserved and will

result in an ERROR response.

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

4.8 Show PDP address(es) +CGPADDR

Command	Possible response(s)
+CGPADDR=[<cid>[,<cid>[,...]]]	+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]] [<CR><LF>+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]] [...]] OK
+CGPADDR=?	+CGPADDR: (LIST OF DEFINED <cid>S) OK

4.8.1 Description

The execution command returns a list of PDP addresses for the specified context identifiers.

The test command returns a list of defined <cid>s.

4.8.2 Persistent after power down

NA

4.8.3 Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands). If no <cid> is specified, the addresses for all defined contexts are returned.

<PDP_addr_1> and <PDP_addr_2>: each is a string that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic. For a static address, it will be the one set by the +CGDCONT and +CGDSCONT commands when the context was defined. For a dynamic address it will be the one assigned during the last PDP context activation that used the context definition referred to by <cid>. Both <PDP_addr_1> and <PDP_addr_2> are omitted if none is available. Both <PDP_addr_1> and <PDP_addr_2> are included when both IPv4 and IPv6 addresses are assigned, with <PDP_addr_1> containing the IPv4 address and <PDP_addr_2> containing the IPv6 address.

The string is given as dot-separated numeric (0-255) parameter of the form:

a1.a2.a3.a4 for IPv4 and

a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16 for IPv6.

When +CGPIAF is supported, it's settings can influence the format of the IPv6 address in parameter <PDP_addr_1> or <PDP_addr_2> returned with the execute form of +CGPADDR.

NOTE: In dual-stack terminals (<PDP_type> IPV4V6), the IPv6 address will be provided in <PDP_addr_2>. For terminals with a single IPv6 stack (<PDP_type> IPV6) or due to backwards compatibility, the IPv6 address can be provided in parameter <PDP_addr_1>.

4.9 GPRS mobile station class +CGCLASS

Command	Possible Response(s)
+CGCLASS=[<CLASS>]	OK
+CGCLASS?	+CGCLASS: <CLASS> OK
+CGCLASS=?	+CGCLASS: (LIST OF SUPPORTED <CLASS>S) OK

4.9.1 Description

The set command is used to set the MT to operate according to the specified mode of operation, see 3GPP TS 23.060 [47]. If the requested mode of operation is not supported, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

The read command returns the mode of operation set by the TE, independent of the current serving cell capability and independent of the current serving cell Access Technology. If no value has been set by the TE previously, the return value shall be the highest mode of operation that can be supported by the MT.

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

4.9.2 Persistent after power down

NO

4.9.3 Defined Values

<class>: a string parameter which indicates the mode of operation

A Class-A mode of operation (A/Gb mode), or CS/PS mode of operation (Iu mode) (highest mode of operation)

NOTE: <class> A means that the MT would operate simultaneous PS and CS service

Other values are reserved and will result in an ERROR response to the set command.

4.10 Dial ATD

Command	Possible Response(s)
D[<DIAL_STRING>][:]	OK

4.10.1 Description

This command instructs the ME to originate a call. This may include several steps, depending upon the ME type, such as: connecting to the line (going off-hook), waiting for the network to indicate readiness to receive call addressing information (wait for dial tone), signaling call addressing information to the network (dialing the number), monitoring the line for call progress signals (e.g., busy), and instructing the underlying ME to start the call origination procedure (modulation handshaking).

All characters appearing on the same command line after the **"D"** are considered part of the call addressing information to be signaled to the network, or modifiers used to control the signaling process (collectively known as a "dial string"), up to a semicolon character (IA5 3/11) or the end of the command line. If the dial string is terminated by a semicolon, the ME does not start the call origination procedure as defined for the underlying ME, but instead returns to command state after completion of the signaling of call addressing information to the network.

Any characters appearing in the dial string that the ME does not recognize as a valid part of the call addressing information or as a valid modifier shall be ignored. This permits characters such as parentheses and hyphens to be included that are typically used in formatting of telephone numbers.

Abort ability

The D command may be aborted. If the ME is connected to the line, it disconnects from the line in an orderly manner as required by the state of the connection. Aborting the connection by reception of a character is generally possible at any time before the ME enters online data state, but may not be possible during some states of connection establishment such as handshaking. The ME shall issue a final result code; which result code to issue shall be determined by the manufacturer, and may depend upon the state of the connection at the time the character was received from the DTE. If a **CONNECT** or **CONNECT <text>** result code is received by the DTE, this indicates that the attempt to abort the command was not successful, possibly due to the state of connection establishment at the time the character was sent.

V.250 – D command result codes

Alphabetic	Description
CONNECT	If connection is successfully established and X0 is selected. This result code is transmitted immediately before circuit 109 is turned on
CONNECT <text>	If connection is successfully established and Xn is selected where " n " is any value other than 0. This result code is transmitted immediately before circuit 109 is turned on. The contents of <text> are manufacturer-specific, and may include indication of DTE interface speed, line speed, error control and data compression techniques in use, and other information
NO CARRIER	If a connection cannot be established, or was aborted by reception of an additional character from the DTE
ERROR	If issued while in online command state
BUSY	If busy signal detection is enabled or the W or @ dial modifier is used, and a busy signal is detected

NO ANSWER	If the "@" dial modifier is used, and remote ringing followed by five seconds of silence is not detected before the expiration of the connection timer defined by S7
NO DIALTONE	If dial tone detection is enabled or the W dial modifier is used, and no dial tone is detected within the associated timeout period
OK	If command is aborted by either reception of an additional character from the DTE or by the DTE turning off circuit 108 (if &D1 or &D2 is selected), or if the dial string is terminated by a semicolon character

4.10.2 Persistent after power down

NA

4.10.3 Defined Values

<DIAL_STRING>: A string of 0 or more of the characters:

"0 1 2 3 4 5 6 7 8 9 * # + A B C D"

4.11 Set pdp-ip authentication \$QCPDPP

Command	Possible responses
\$QCPDPP= <cid>,<auth_type>,<password>,<username>	OK

4.11.1 Description:

This command can sets authentication for PDP-IP packet data calls.

Defines authentication parameters on a per connection basis;

This command is suitable for some carrier: to obtain different IPs through different ppp accounts

4.11.2 Defind value:

<cid>

1 to 24

<auth_type>

0 –None, Neither username nor password accepted

1 –PAP, Username and password accepted

2 –CHAP, Only password (secret) accepted

5 Mobile termination errors

5.1 Report mobile termination error +CMEE

Command	Possible response(s)
+CMEE=[<n>]	OK
+CMEE?	+CMEE: <n> OK
+CMEE=?	+CMEE: (list of supported <n>s) OK

5.1.1 Description

Set command disables or enables the use of final result code +CME ERROR: <err> as an indication of an error relating to the functionality of the MT. When enabled, MT related errors cause +CME ERROR: <err> final result code instead of the regular ERROR final result code. ERROR is returned normally when error is related to syntax, invalid parameters, or ME functionality.

Test command returns values supported as a compound value.

5.1.2 Persistent after power down

NO

5.1.3 Defined values

<n>: integer type.

- 0 disable +CME ERROR: <err> result code and use ERROR instead
- 1 enable +CME ERROR: <err> result code and use numeric <err> values
- 2 enable +CME ERROR: <err> result code and use verbose <err> values

5.2 Mobile termination error result code +CME ERROR

5.2.1 General

The operation of +CME ERROR: <err> final result code is similar to the regular ERROR result code: if +CME ERROR: <err> is the result code for any of the commands in a command line, none of the following commands in the same command line is executed (neither ERROR nor OK result code shall be returned as a result of a completed command line execution). The format of <err> can be either numeric or verbose. This is set with command +CMEE.

NOTE: ITU-T Recommendation V.250 [14] command V does not affect the format of this result code.

<err> values (numeric format followed by verbose format):

5.2.2 General errors

Numeric Text

0	phone failure
1	no connection to phone
2	phone-adaptor link reserved
3	operation not allowed
4	operation not supported
5	PH-SIM PIN required
6	PH-FSIM PIN required
7	PH-FSIM PUK required
10	SIM not inserted (See NOTE 1)
11	SIM PIN required
12	SIM PUK required
13	SIM failure (See NOTE 1)
14	SIM busy (See NOTE 1)
15	SIM wrong (See NOTE 1)
16	incorrect password
17	SIM PIN2 required
18	SIM PUK2 required
20	memory full
21	invalid index
22	not found
23	memory failure
24	text string too long
25	invalid characters in text string
26	dial string too long
27	invalid characters in dial string
30	no network service
31	network timeout
32	network not allowed - emergency calls only
40	network personalization PIN required
41	network personalization PUK required
42	network subset personalization PIN required
43	network subset personalization PUK required
44	service provider personalization PIN required
45	service provider personalization PUK required
46	corporate personalization PIN required
47	corporate personalization PUK required
48	hidden key required (See NOTE 2)
49	EAP method not supported
50	Incorrect parameters
100	unknown

NOTE 1: This error code is also applicable to UICC.

NOTE 2: This key is required when accessing hidden phonebook entries.

5.2.3 GPRS-related errors

5.2.3.1 Errors related to a failure to perform an attach

Numeric Text

- 103 Illegal MS (#3)
- 106 Illegal ME (#6)
- 107 GPRS services not allowed (#7)
- 111 PLMN not allowed (#11)
- 112 Location area not allowed (#12)
- 113 Roaming not allowed in this location area (#13)

NOTE: Values in parentheses are 3GPP TS 24.008 [8] cause codes.

5.2.3.2 Errors related to a failure to activate a context

Numeric Text

- 132 service option not supported (#32)
- 133 requested service option not subscribed (#33)
- 134 service option temporarily out of order (#34)
- 149 PDP authentication failure

NOTE: Values in parentheses are 3GPP TS 24.008 [8] cause codes.

5.2.3.3 Errors related to a failure to disconnect a PDN

Numeric Text

- 151 Last PDN disconnection not allowed (#49)

NOTE 1: This error is returned when the MT detects an attempt to disconnect the last PDN or the network returns a response message with cause value #49.

NOTE 2: Values in parentheses are 3GPP TS 24.301 [83] cause codes.

5.2.3.4 Other GPRS errors

Numeric Text

- 148 unspecified GPRS error
- 150 invalid mobile class

Other values in the range 101 - 150 are reserved for use by GPRS

6 SMS commands

6.1 General

6.1.1 Message Format +CMGF

Command	Possible response(s)
+CMGF=[<mode>]	OK
+CMGF?	+CMGF: <mode> OK
+CMGF=?	+CMGF: (list of supported <mode>s) OK

6.1.1.1 Description

Set command tells the ME, 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. Mode can be either PDU mode (entire TP data units used) or text mode (headers and body of the messages given as separate parameters).

Test command returns supported modes as a compound value.

6.1.1.2 Persistent after power down

NO

6.1.1.3 Defined Values

<mode>:

- 0 PDU mode (default when implemented)
- 1 text mode

6.1.2 Service Centre Address +CSCA

Command	Possible response(s)
+CSCA=<sca>[,<tosca>]	OK
+CSCA?	+CSCA: <sca>,<tosca> OK
+CSCA=?	OK

6.1.2.1 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.

6.1.2.2 Persistent after power down

NA

6.1.3 Set Text Mode Parameters +CSMP

Command	Possible response(s)
+CSMP=[<fo>[,<vp>[,<pid>[,<dc>]]]]	OK
+CSMP?	+CSMP: <fo>,<vp>,<pid>,<dc> OK
+CSMP=?	OK

6.1.3.1 Description

Set command is used to select values for additional parameters needed when SM is sent to the network or placed in a storage when text format message mode is selected. It is possible to set the validity period starting from when the SM is received by the SMSC (<vp> is in range 0... 255) or define the absolute time of the validity period termination (<vp> is a string). The format of <vp> is given by <fo>. If ME supports the EVPF, see 3GPP TS 23.040 [3], it shall be given as a hexadecimal coded string (refer e.g. <pdu>) with double quotes.

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

6.1.3.2 Persistent after power down

NO

6.1.4 New Message Indications to TE +CNMI

Command	Possible response(s)
+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	OK
+CNMI?	+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr> OK
+CNMI=?	+CNMI: (list of supported <mode>s),(list of supported <mt>s),(list of supported <bm>s),(list of supported <ds>s),(list of supported <bfr>s) OK

6.1.4.1 Description

Set command selects the procedure, how receiving of new messages from the network is indicated to the TE when TE is active, e.g. DTR signal is ON. If TE is inactive (e.g. DTR signal is OFF), message receiving should be done as specified in 3GPP TS 23.038 [2].

NOTE 1: When DTR signal is not available or the state of the signal is ignored (V.25ter command &D0), reliable message transfer can be assured by using +CNMA acknowledgement procedure.

<mode> controls the processing of unsolicited result codes specified within this command, <mt> sets the result code indication routing for SMS-DELIVERs, <bm> for CBMs and <ds> for SMS-STATUS-REPORTs. <bfr> defines the handling method for buffered result codes when <mode> 1, 2 or 3 is enabled. If ME does not support requested item (although ME does), final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values.

Test command gives the settings supported by the ME as compound values.

6.1.4.2 Persistent after power down

NO

6.1.4.3 Defined Values

<mode>

NOTE 3: The buffering mechanism may as well be located in the ME; the setting affects only to unsolicited result codes specified within this command):

- 0 Buffer unsolicited result codes in the ME. If ME result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications.
- 1 Discard indication and reject new received message unsolicited result codes when ME-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 ME when ME-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.

NOTE 4: It is possible that ME result code buffer is in volatile memory. In this case messages may get lost if the power of ME 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> (the rules for storing received SMs depend on its data coding scheme (refer 3GPP TS 23.038 [2]), preferred memory storage (+CPMS) setting and this value;

NOTE 5: If AT command interface is acting as the only display device, the ME must support storing of class 0 messages and messages in the message waiting indication group (discard message);

- 0 No SMS-DELIVER indications are routed to the TE.
- 1 If SMS-DELIVER is stored into ME, 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>,<dcsc>,<sca>,<tosca>,<length>]<CR><LF><data> (text mode enabled; about parameters in italics, refer command Show Text Mode Parameters +CSDH)

If ME has its own display device, then class 0 messages and messages in the message waiting indication group (discard message) may be copied to both ME display and to TE. In this case, ME shall send the acknowledgement to the network.

Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined in <mt>=1.

- 3 Class 3 SMS-DELIVERs are routed directly to TE using unsolicited result codes defined in <mt>=2. Messages of other data coding schemes result in indication as defined in <mt>=1.

6.1.5 Delete Message +CMGD

Command	Possible response(s)
+CMGD=<index>[,<delflag>]	OK
+CMGD=?	+CMGD: (list of supported <index>s)[,(list of supported <delflag>s)] OK

6.1.5.1 Description

Execution 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. See chapter Message Service Failure Result Code for <err> values.

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

6.1.5.2 Persistent after power down

NA

6.1.5.3 Defined values

<index>: an integer in range of 0~99.

<delflag>: an integer indicating multiple message deletion request as follows:

0 (or omitted) 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.

6.1.6 Preferred Message Storage +CPMS

Command	Possible response(s)
+CPMS=<mem1>[,<mem2>[,<mem3>]]	+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> OK or +CMS ERROR: <err>
+CPMS?	+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> OK or +CMS ERROR: <err>
+CPMS=?	+CPMS: (list of supported <mem1>s),(list of supported <mem2>s), (list of supported <mem3>s) OK

6.1.6.1 Description

Set command selects memory storages <mem1>, <mem2> and <mem3> to be used for reading, writing, etc. If chosen storage is not appropriate for the ME, final result code +CMS ERROR: <err> shall be returned. See chapter Message Service Failure Result Code for a list of possible <err> values.

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

6.1.6.2 Persistent after power down

No

6.1.6.3 Defined values

<mem1>:storage of reading and deleting SMS. “ME” as default.

<mem2>: storage of writing and sending SMS. “ME” as default.

<mem3>: storage of received SMS. “SR” as default.

“ME”, “MT” storage in ME. The max number allowed is 100 messages.

“SM”, “SR” storage in SIM card. The max number allowed depends on SIM card capability.

6.1.7 Message Service Failure Result Code +CMS ERROR

Final result code +CMS ERROR: <err> indicates an error related to mobile equipment or network. The operation is similar to ERROR result code. None of the following commands in the same command line is executed. Neither ERROR nor OK result code shall be returned. ERROR is returned normally when error is related to syntax or invalid parameters.

6.1.7.1 Defined Values

<err> values used by common messaging commands:

- 0...127 3GPP TS 24.011 [6] clause E.2 values
- 128...255 3GPP TS 23.040 [3] clause 9.2.3.22 values.
- 300 ME failure
- 301 SMS service of ME reserved
- 302 operation not allowed
- 303 operation not supported
- 304 invalid PDU mode parameter
- 305 invalid text mode parameter
- 310 (U)SIM not inserted
- 311 (U)SIM PIN required
- 312 PH-(U)SIM PIN required
- 313 (U)SIM failure
- 314 (U)SIM busy
- 315 (U)SIM wrong
- 316 (U)SIM PUK required
- 317 (U)SIM PIN2 required
- 318 (U)SIM PUK2 required
- 320 memory failure
- 321 invalid memory index
- 322 memory full
- 330 SMSC address unknown
- 331 no network service
- 332 network timeout
- 340 no +CNMA acknowledgement expected
- 500 unknown error
- other values in range 256...511 are reserved

6.2 TEXT MODE

6.2.1 List Messages +CMGL

Command	Possible response(s)
---------	----------------------

+CMGL[=<stat>]	if text mode (+CMGF=1), command successful and SMS-SUBMITs and/or SMS-DELIVERs: +CMGL: <index>,<stat>,<oa/da>,[<alpha>],[<scts>][,<tooa/toda>,<length>]<CR><LF><data>[<CR><LF> +CMGL: <index>,<stat>,<da/oa>,[<alpha>],[<scts>][,<tooa/toda>,<length>]<CR><LF><data>[...]] if text mode (+CMGF=1), command successful and SMS-STATUS-REPORTs: +CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>[<CR><LF> +CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>[...]] OK
+CMGL=?	+CMGL: (list of supported <stat>s) OK

6.2.1.1 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. See chapter Message Service Failure Result Code for <err> values.

NOTE: If the selected <mem1> can contain different types of SMs (e.g. SMS-DELIVERs, SMS-SUBMITs, SMS-STATUS-REPORTs), the response may be a mix of the responses of different SM types. TE application can recognize the response format by examining the third response parameter. Test command shall give a list of all status values supported by the ME.

6.2.1.2 Persistent after power down

NA

6.2.2 Read Message +CMGR

Command	Possible response(s)
+CMGR=<index>	if text mode (+CMGF=1), command successful and SMS-DELIVER: +CMGR: <stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcsc>,<sca>,<tosca>,<length>]<CR><LF><data> if text mode (+CMGF=1), command successful and SMS-SUBMIT: +CMGR: <stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcsc>,[<vp>],<sca>,<tosca>,<length>]<CR><LF><data> if text mode (+CMGF=1), command successful and SMS-STATUS-REPORT: +CMGR: <stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> OK

+CMGR=?	
---------	--

6.2.2.1 Description

Execution command returns message with location value <index> from message storage <mem1> to the TE. 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. See chapter Message Service Failure Result Code for <err> values.

6.2.2.2 Persistent after power down

NA

6.2.2.3 Defined values

<index>: an integer in range of 0~99.

6.2.3 Send Message +CMGS

Command	Possible response(s)
if text mode (+CMGF=1): +CMGS=<da>[,<toa>]<CR> text is entered<ctrl-Z/ESC>	if text mode (+CMGF=1) and sending successful: +CMGS: <mr>[,<scts>] OK if sending fails: +CMS ERROR: <err>
+CMGS=?	OK

6.2.3.1 Description

Execution command sends message from a TE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the TE on successful message delivery. Value can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values.

- entered text (3GPP TS 23.040 [3] TP-Data-Unit) is sent to address <da> and all current settings (refer Set Text Mode Parameters +CSMP and Service Centre Address +CSCA) are used to construct the actual PDU in ME.
- the ME 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.
- the DCD signal shall be in ON state while text is entered.
- the echoing of entered characters back from the ME is controlled by V.25ter echo command E.
- the entered text should be formatted as follows:
- if <dcs> (set with +CSMP) indicates that 3GPP TS 23.038 [2] GSM 7 bit default alphabet is used and <fo> indicates that 3GPP TS 23.040 [3] TP-User-Data-Header-Indication is not set:
- if TE character set other than "HEX" (refer command Select TE Character Set +CSCS in 3GPP TS 27.007 [9]): ME converts the entered text into the GSM 7 bit default alphabet according to rules

of Annex A; backspace 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 converts into the GSM 7 bit default alphabet characters. (e.g. 17 (IRA 49 and 55) will be converted to character Π (GSM 7 bit default alphabet 23)).
- if <dc> indicates that 8-bit or UCS2 data coding scheme is used or <fo> indicates that 3GPP TS 23.040 [3] TP-User-Data-Header-Indication is set: the entered text should consist of two IRA character long hexadecimal numbers which ME 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.

6.2.3.2 Persistent after power down

NA

6.2.4 Send Message from Storage +CMSS

Command	Possible response(s)
+CMSS=<index>[,<da>[,<tda>]]	if text mode (+CMGF=1) and sending successful: +CMSS: <mr>[,<scts>] OK if sending fails: +CMS ERROR: <err>
+CMSS=?	OK

6.2.4.1 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. Optionally (when 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. See chapter Message Service Failure Result Code for a list of <err> values.

6.2.4.2 Persistent after power down

NA

6.2.5 Write Message to Memory +CMGW

Command	Possible response(s)
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if text mode (+CMGF=1): +CMGW[=<oa/da>[,<tooa/toda>[,<stat>]]]<CR> text is entered<ctrl-Z/ESC>	+CMGW: <index> OK
+CMGW=?	OK

6.2.5.1 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. See chapter Message Service Failure Result Code for <err> values.

NOTE: SMS-STATUS-REPORTs cannot be stored in text mode.

6.2.5.2 Persistent after power down

NA

6.2.6 Send Command +CMGC

Command	Possible response(s)
if text mode (+CMGF=1): +CMGC=<fo>,<ct>[,<pid>[,<mn>[,<da>[,<toda>]]]]<CR> text is entered<ctrl-Z/ESC>	if text mode (+CMGF=1) and sending successful: +CMGC: <mr>[,<scts>] OK if sending fails: +CMS ERROR: <err>
+CMGC=?	OK

6.2.6.1 Description

Execution command sends a command message from a TE to the network (SMS-COMMAND). The entering of text (3GPP TS 23.040 [3] TP-Command-Data) is done similarly as specified in command Send Message +CMGS, but the format is fixed to be a sequence of two IRA character long hexadecimal numbers which ME converts into 8-bit octets (refer +CMGS). Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when 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. See chapter Message Service Failure Result Code for a list of <err> values.

6.2.6.2 Persistent after power down

NA

6.2.7 New Message Acknowledgement to ME +CNMA

Command	Possible response(s)
if text mode (+CMGF=1): +CNMA	OK
+CNMA=?	OK

6.2.7.1 Description

Execution command confirms correct reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer command +CNMI tables 2 and 4). ME shall not send another +CMT or +CDS result code to TE before previous one is acknowledged.

If ME does not get acknowledgement within required time (network timeout), ME should respond as specified in 3GPP TS 24.011 [6] to the network. ME shall automatically disable routing to TE by setting both <mt> and <ds> values of +CNMI to zero.

If command is executed, but no acknowledgement is expected, or some other ME related error occurs, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for a list of <err> values.

NOTE: In case that a directly routed message must be buffered in ME (possible when +CNMI parameter <mode> equals 0 or 2) or AT interpreter remains too long in a state where result codes cannot be sent to TE (e.g. user is entering a message using +CMGS), acknowledgement (RP-ACK) must be sent to the network without waiting +CNMA command from TE. Later, when buffered result codes are flushed to TE, TE must send +CNMA acknowledgement for each result code. In this way, ME can determine if message should be placed in non-volatile memory and routing to TE disabled (+CNMA not received). Refer command +CNMI for more details how to use <mode> parameter reliably.

6.2.7.2 Persistent after power down

NA

6.3 PDU MODE

6.3.1 List Messages +CMGL

Command	Possible response(s)
---------	----------------------

+CMGL[=<stat>]	if PDU mode (+CMGF=0) and command successful: +CMGL: <index>,<stat>,[<alpha>],<length><CR><LF><pdu> [<CR><LF>+CMGL:<index>,<stat>,[<alpha>],<length><CR><LF><pdu> [...]] OK otherwise: +CMS ERROR: <err>
+CMGL=?	+CMGL: (list of supported <stat>s) OK

6.3.1.1 Description

Execution command returns messages with status value <stat> from preferred message storage <mem1> to the TE. Entire data units <pdu> are returned. 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. See chapter Message Service Failure Result Code for <err> values.

Test command shall give a list of all status values supported by the ME.

6.3.1.2 Persistent after power down

NA

6.3.2 Read Message +CMGR

Command	Possible response(s)
+CMGR=<index>	if PDU mode (+CMGF=0) and command successful: +CMGR: <stat>,[<alpha>],<length><CR><LF><pdu> OK otherwise: +CMS ERROR: <err>
+CMGR=?	

6.3.2.1 Description

Execution command returns message with location value <index> from preferred message storage <mem1> to the TE. Status of the message and entire message data unit <pdu> is returned. 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. See chapter Message Service Failure Result Code for <err> values.

6.3.2.2 Persistent after power down

NA

6.3.2.3 Defined values

<index>: an integer in range of 0~99.

6.3.3 Send Message +CMGS

Command	Possible response(s)
if PDU mode (+CMGF=0): +CMGS=<length><CR> <i>PDU is given</i> <ctrl-Z/ESC>	if PDU mode (+CMGF=0) and sending successful: +CMGS: <mr>[,<ackpdu>] OK if sending fails: +CMS ERROR: <err>
+CMGS=?	

6.3.3.1 Description

Execution 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 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. See chapter Message Service Failure Result Code for a list of <err> values.

- <length> must indicate the number of octets coded in the TP layer data unit to be given (i.e. SMSC address octets are excluded).
- the ME 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.
- the DCD signal shall be in ON state while PDU is given.
- the echoing of given characters back from the ME is controlled by V.25ter echo command E.
- the PDU shall be hexadecimal format (similarly as specified for <pdu>) and given in one line; ME 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.

6.3.3.2 Persistent after power down

NA

6.3.4 Send Message from Storage +CMSS

Command	Possible response(s)
+CMSS=<index>[,<da>[,<tda>]]	if PDU mode (+CMGF=0) and sending successful: +CMSS: <mr>[,<ackpdu>] OK if sending fails: +CMS ERROR: <err>
+CMSS=?	

6.3.4.1 Description

Execution command sends message with location value <index> from message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND). If new recipient address <da> is 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. Optionally (when 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. See chapter Message Service Failure Result Code for a list of <err> values.

6.3.4.2 Persistent after power down

NA

6.3.5 Write Message to Memory +CMGW

Command	Possible response(s)
if PDU mode (+CMGF=0): +CMGW=<length>[,<stat>]<CR> PDU is given <ctrl-Z/ESC>	+CMGW: <index> OK
+CMGW=?	OK

6.3.5.1 Description

Execution command stores a message 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. (ME manufacturer may choose to use different default <stat> values for different message types.) The entering of PDU is done similarly as specified in command Send Message +CMGS. If writing fails, final result code +CMS ERROR: <err> is returned. See chapter Message Service Failure Result Code for <err> values.

6.3.5.2 Persistent after power down

NA

6.3.6 Send Command +CMGC

Command	Possible response(s)
if PDU mode (+CMGF=0): +CMGC=<length><CR> <i>PDU is given</i> <ctrl-Z/ESC>	if PDU mode (+CMGF=0) and sending successful: +CMGC: <mr>[,<ackpdu>] OK
+CMGC=?	OK

6.3.6.1 Description

Execution command sends a command message from a TE to the network (SMS-COMMAND). The entering of PDU is done similarly as specified in command Send Message +CMGS. Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when 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. See chapter Message Service Failure Result Code for a list of <err> values.

6.3.6.2 Persistent after power down

NA

6.3.7 New Message Acknowledgement to ME +CNMA

Command	Possible response(s)
if PDU mode (+CMGF=0): +CNMA[=<n>[,<length>[<CR> <i>PDU is given</i> <ctrl-Z/ESC>]]]	OK
+CNMA=?	if PDU mode (+CMGF=0): +CNMA: (list of supported <n>s) OK

6.3.7.1 Description

Execution command confirms reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer command +CNMI tables 2 and 4). In PDU mode, it is possible to send either positive (RP-ACK) or negative (RP-ERROR) acknowledgement to the network. Parameter <n> defines which one will be sent. Optionally (when <length> is greater than zero) an acknowledgement TPDU (SMS-DELIVER-REPORT for RP-ACK or RP-ERROR) may be sent to the network. The entering of PDU is done similarly as specified in command Send Message +CMGS, except that the format of <ackpdu> is used instead of <pdu> (i.e. SMSC address field is not present). PDU shall not be bounded by double quotes. ME shall not send another +CMT or +CDS result code to TE before previous one is acknowledged.

If ME does not get acknowledgement within required time (network timeout), ME should respond

as specified in 3GPP TS 24.011 [6] to the network. ME shall automatically disable routing to TE by setting both `<mt>` and `<ds>` values of `+CNMI` to zero.

If command is executed, but no acknowledgement is expected, or some other ME related error occurs, final result code `+CMS ERROR: <err>` is returned. See chapter Message Service Failure Result Code for a list of `<err>` values.

NOTE: In case that a directly routed message must be buffered in ME (possible when `+CNMI` parameter `<mode>` equals 0 or 2) or AT interpreter remains too long in a state where result codes cannot be sent to TE (e.g. user is entering a message using `+CMGS`), acknowledgement (RP-ACK) must be sent to the network without waiting `+CNMA` command from TE. Later, when buffered result codes are flushed to TE, TE must send `+CNMA [=0]` acknowledgement for each result code. In this way, ME can determine if message should be placed in non-volatile memory and routing to TE disabled (`+CNMA [=0]` not received). Refer command `+CNMI` for more details how to use `<mode>` parameter reliably.

Test command returns a list of supported `<n>` values.

6.3.7.2 Persistent after power down

NA

6.3.7.3 Defined Values

`<n>`:

- 0 command operates similarly as defined for the text mode
- 1 send RP-ACK (or buffered result code received correctly)
- 2 send RP-ERROR (if PDU is not given, ME shall send SMS-DELIVER-REPORT with 3GPP TS 23.040 [3] TP-FCS value set to 'FF' (unspecified error cause))

7 TCL Specified commands

7.1 Setup FOTA AT^TOTA

Command	Possible responses
^TOTA=<step>	OK
-	^TOTA: <step>,<status>[,<new_version>]

7.1.1 Description:

This command is used to setup FOTA, and report the FOTA status.

NOTE: Before setting up FOTA process, send AT^TCONN=1 to establish data connection for FOTA.

7.1.2 Persistent after power down

NA

7.1.3 Defined value:

<step>:

- 1 Check new version
- 2 Start firmware download and upgrade

<status>:

- 0 Check succeeds
- 1 Start to download
- 2 Download finishes
- 3 Reboot to recovery mode and start to upgrade

<new_version>: String type. The version number of target software. If UE's software is up to date, the value is absent.

For example:

```
AT+CGDCONT=2,"ipv4v6","test" //set APN for FOTA connection on profile2
```

//if profile2 is same as profile1, it has to disconnect data on profile1 first by host script (or Windows network manager)

```
AT^TCONN=1//setup data connection for FOTA
```

```
AT^TOTA=1//check new version
```

```
OK
```

```
^TOTA:1,0,IK511_00_02.00_99// Check succeeds, new version is IK511_00_02.00_99
```

```
AT^TOTA=2// Start download and upgrade
```

```
OK
```

```
^TOTA:2,1,IK511_00_02.00_99// Start to download
```

```
^TOTA:2,2,IK511_00_02.00_99// Download finishes
```

```
^TOTA:2,3,IK511_00_02.00_99// will reboot to recovery mode and start to upgrade
```

7.2 Read SIM ICCID AT^TICCID

Command	Possible responses
AT^TICCID	TICCID: <iccid> OK
AT^TICCID?	ERROR
AT^TICCID=?	OK

7.2.1 Description:

This command is used to read ICCID from SIM EF_{ICCID} file.

7.2.2 Persistent after power down

NA

7.2.3 Defined value:

<iccid>: ICCID stored in SIM EF_{ICCID} file

7.3 Switch USB mode AT^TUSB

Command	Possible responses
AT^TUSB=<mode>	OK
AT^TUSB?	^TUSB: <mode> OK
AT^TUSB=?	^TUSB: (list of <mode>s) OK

7.3.1 Description:

This command is used to switch device's USB mode. When executing the command, device will reboot automatically and switch to new mode in next power cycle.

The value of <mode> is persistent during a reboot or power cycle, and recovered to default value after factory reset.

7.3.2 Persistent after power down

YES

7.3.3 Defined value:

<mode>:

0(default) modem + diag + AT interface + MBIM. PID 0x00B6. MBIM is recommended for Windows10 as high-speed data service.

1 RNDIS + modem + diag. PID 0x01AA. Recommended using on Linux for

high-speed data service. Modem interface is available for AT command interaction.

7.4 Connect/disconnect RNDIS data AT^TCONN

Command	Possible responses
AT^TCONN=<conn>	OK
AT^TCONN?	^TCONN:<conn_status> OK
AT^TCONN=?	^TCONN: (list of <conn>)

7.4.1 Description:

This command is used to connect or disconnect data service via RNDIS. RNDIS is recommended on Linux for high-speed data service.

Before setting up data connection via RNDIS, send AT^TUSB=1 to switch device into RNDIS mode first.

In default USB MODE 0(modem mode), this command is also used for FOTA dedicated connection. It sets up/terminates data connection with APN 2(AT+CGDCONT <cid>=2) fixedly.

7.4.2 Persistent after power down

NA

7.4.3 Defined value:

<conn>:

- 0 disconnect data service
- 1 connect data service

<conn_status>: current status of data connection. The value is updated after connecting or disconnecting finishes.

- 0 data service is disconnected
- 1 data service is connected

For example:

AT^TUSB=1 //switch to RNDIS mode

AT^TCONN =1 //setup data connection via RNDIS

7.5 Set DHCP info AT^TDHCPSET

Command	Possible responses
AT^TDHCPSET=<ip_addr>,<subnet_mask>,<ip_start>,<ip_end>	OK

AT^TDHCPSET?	IP address: <ip_addr> Subnet mask: <subnet_mask> DHCP IP start address: <ip_start> DHCP IP end address: <ip_end> OK
AT^TDHCPSET=?	

7.5.1 Description:

This command is used to set and query DHCP configurations.

7.5.2 Persistent after power down

Yes

7.5.3 Defined value:

<ip_addr>: IP address of DHCP gateway.

<subnet_mask>: subnet mask.

<ip_start>: Start IP address of DHCP IP pool.

<ip_end>: End IP address of DHCP IP pool.

For example:

```
AT^TDHCPSET=192.168.0.1,255.255.255.0,192.168.0.100,192.168.0.200
```

```
OK
```

```
AT^TDHCPSET?
```

```
IP address: 192.168.0.1
```

```
Subnet mask: 255.255.255.0
```

```
DHCP IP start address : 192.168.0.100
```

```
DHCP IP end address : 192.168.0.200
```

```
OK
```

7.6 Configure Extended System ^TNWCFG

Command	Possible responses
AT^TNWCFG=<acqorder>,<band>,<roam>,<srvdomain>,<lteband>,<reserve1>,<reserve2>	OK
AT^TNWCFG?	^TNWCFG: <acqorder>,<band>,<roam>,<srvdomain>,<lteband> OK
AT^TNWCFG=?	^TNWCFG: (list of supported <acqorder>s),(list of supported

	(<band>,<band_name>)s),(list of supported <roam>s),(list of supported <srvidomain>s),(list of supported (<lteband>,<lteband_name>)s) OK
--	--

7.6.1 Description:

This command sets the system mode, network access order, frequency band, roaming support, domain, and other features.

NOTE: Keep <reserver1> and <reserver2> as mandatory when executing set command, putting 2 commas after <lteband>.

7.6.2 Persistent after power down

YES

7.6.3 Defined value:

<acqorder>: a string type value that specifies the network access order. Its value can be "00", "99" or a combination of the following values:

"00" Automatic

"01" GSM

"02" UMTS

"03" LTE

"99" No change

For example,

The "03" value indicates LTE only.

The "030201" value indicates the order of LTE->WCDMA->GSM.

It's not allowed to set lower RAT as prefer, for example "010203".

In specialty, the "99" value is not combined with other values, indicating no change of the network access order.

The "00" value is not combined with other values, indicating automatic network access order as LTE->WCDMA->GSM.

<band>: Hexadecimal value that specifies the GSM & WCDMA frequency bands, which is related to the system mode and dependent on the board performance. The possible values of <band> are the following values and their combinations (excluding 0x3FFFFFFF and 0x40000000).

NOTE: The value of <band> and <acqorder> have to correspond. When setting WCDMA frequency

bands, <acqorder> has to set to or include “02”, e.g. “02” or “0302” or “00”. When <acqorder> is “03” as LTE only, it’s unable to set GSM & WCDMA frequency bands.

3F FF FF FF	All bands
40 00 00 00	Band not changed
8 00 00	GSM 850
1 00	Extended GSM 900
80	GSM DCS 1800
20 00 00	GSM PCS 1900
40 00 00	WCDMA BCI (2100)
80 00 00	WCDMA BCII (1900)
2 00 00 00	WCDMA BCIV (1700)
4 00 00 00	WCDMA BCV (850)
8 00 00 00	WCDMA BCVI (800)
2 00 00 00 00 00 00	WCDMA BCVIII (900)
4 00 00 00 00 00 00	WCDMA BCIX (1700)

<band_name>: String type value that indicates the GSM & WCDMA frequency band name.

For WCDMA, it is named in WCDMA BCx format, in which, x indicates the actual Band Class (refer to 3GPP TS 25.101 Table 5.1). If multiple bands are simultaneously supported, it is separated by / (for example, WCDMA BC I/WCDMA BC II).

For GSM, it is named in GSM850/GSM1800.... format.

<roam>: Indicates whether roaming data is enabled automatically.

- 0 disabled
- 1 enabled
- 2 No change
- 3 Any

<srvdomain>: Indicates the domain setting.

- 0 CS_ONLY
- 1 PS_ONLY
- 2 CS_PS
- 3 ANY
- 4 No change

<lteband>: Hexadecimal value that specifies the LTE frequency band. The value of <lteband> can be one of the following values and their combinations (excluding 0x7FFFFFFFFFFFFFFF).

NOTE: The value of <lteband> and <acqorder> have to correspond. When setting LTE frequency bands, <acqorder> has to set to or include “03”, e.g. “03” or “0302” or “00”.

7F FF FF FF FF FF FF	All bands
40 00 00 00	No band change

1	LTE BC1
2	LTE BC2
4	LTE BC3
8	LTE BC4
10	LTE BC5
40	LTE BC7
80	LTE BC8
8 00	LTE BC12
10 00	LTE BC13
4 00 00	LTE BC19
8 00 00	LTE BC20
8 00 00 00	LTE BC28
80 00 00 00 00	LTE TDD BC40
8 00 00 00 00 00 00 00	LTE BC71

<lteband_name>: a string type value that indicates the LTE frequency band name. It is displayed in LTE BCx format, in which, x indicates the actual Band Class. If multiple bands are simultaneously supported, it is separated by / (for example, LTE BC1/LTE BC2).

7.7 Query Extended System Information ^TNWQRY

Command	Possible responses
^TNWQRY	^TNWQRY: <srv_status>,<srv_domain>,<roam_status>,<sim_state>,<reserved>, <sysmode>,<sysmode_name>,<submode>,<submode_name> OK

7.7.1 Description:

This command queries the current system information, such as the system service status, domain, roaming status, system mode, and SIM card state.

7.7.2 Persistent after power down

NA

7.7.3 Defined value:

<srv_status>: indicates the system service status.

- 0 No services
- 1 Restricted services
- 2 Valid services
- 3 Restricted regional services
- 4 Power saving or hibernate state

<srv_domain>: indicates the system service domain.

- 0 No services
- 1 CS service only
- 2 PS service only
- 3 PS+CS services
- 4 Not registered to CS or PS; searching now

<roam_status>: indicates the roaming status.

- 0 Not roaming
- 1 Roaming

<sim_state>: indicates the state of the SIM card.

- 0 Invalid SIM card
- 1 Valid SIM card
- 2 Invalid SIM card in CS
- 3 Invalid SIM card in PS
- 4 Invalid SIM card in PS and CS
- 255 No SIM card is found

<sysmode>: indicates the system mode.

- 0 NO SERVICE
 - 4 GSM
 - 5 WCDMA
 - 8 LTE
- Other values reserved

<sysmode_name>: a string type value that indicates the system mode name corresponding to <sysmode>. For example, if <sysmode>=5, <sysmode_name>="WCDMA".

<submode>: indicates the system sub-mode.

- 0 NO SERVICE
- 1 GPRS
- 2 EDGE
- 3 HSDPA
- 4 HSUPA

5 WCDMA
9 GSM
11 LTE
12 HSDPA+
Other values reserved

<submode_name>: indicates system sub-mode. (Its value can be extended.)

This parameter returns the name of the current network sub-mode in character string. The value of <submode_name> is the character string corresponding to the value of <submode> in the command.

7.8 Query signal quality ^TNWSQ

Command	Possible responses
^TNWSQ?	^TNWSQ: <sysmode>[,<value1>[,<value2>[,<value3>[,<value4>]]]] OK
^TNWSQ=?	^TNWSQ: list of supported <sysmode>s OK

7.8.1 Description:

This command is used to query the signal strength and quality.

7.8.2 Persistent after power down

NA

7.8.3 Defined value:

<sysmode>:

NOSERVICE no service is available

GSM GSM/GRPS/EDGE mode

WCDMA WCDMA/HSDPA/HSPA mode

LTE LTE mode

For GSM,

<value1>: positive value of GSM RSSI in units of dBm

1~72 -1dBm~-72dBm as strong signal

73~99 -73~-99dBm
100~128 -100dBm~-128dBm as weak signal

For WCDMA,

<value1>: positive value of WCDMA RSSI in units of dBm.

1~72 -1dBm~-72dBm as strong signal

73~99 -73~-99dBm

100~128 -100dBm~-128dBm as weak signal

<value2>: positive value of WCDMA RSCP in units of dBm. The range is -120dBm to -25dBm.

<value3>: positive value of WCDMA Ec/Io in units of 0.5dB. For example, 2 means -1dB.

For LTE,

<value1>: positive value of LTE RSSI in units of dBm.

44~86 -44dBm~-86dBm as strong signal

87~104 -87dBm~-104dBm

105~114 -105dBm~-114dBm as weak signal

<value2>: positive value of LTE RSRP in units of dBm.

44 or less -44dBm or stronger as strong signal

45~139 -45dBm~-139dBm

140 or more -140dBm or weaker as weak signal

<value3>: real value of LTE SNR in units of 0.1 dB. For example, 160 means -16dB. The larger the value, the better the signal quality.

<value4>: positive value of LTE RSRQ in units of dB. For example, 3 means -3dB. The range is 3 to 20(-3dB to -20dB)

7.9 Set LED mode AT^TLED

Command	Possible responses
AT^TLED=<led_mode>	OK
AT^TLED?	^TLED: <led_mode> OK
AT^TLED=?	^TLED: (list of <led_mode>) OK

7.9.1 Description:

This command is used to enable or disable LED.

The LED mode will be stored on the device persistently even after reboot. It's recovered to default

value after factory reset.

7.9.2 Persistent after power down

Yes

Defined value:

<led_mode>:

0 disable LED

1(default)enable LED

7.10 Querying Resident Band ^TBAND

Command	Possible responses
^TBAND?	^TBAND: <sysmode>,<bandinfo>
	OK

7.10.1 Description:

This command queries the current system information, such as the system service status, domain, roaming status, system mode, and SIM card state.

7.10.2 Persistent after power down:

NA

7.10.3 Defind value:

<sysmode>: indicates the system mode.

0 NO SERVICE

4 GSM

5 WCDMA

8 LTE

Other values reserved

<bandinfo>: A hexadecimal value that refers to ^TNWCFG. It corresponds to the value of ^TNWCFG <band> or <lteband> according to <sysmode>.

For example,

AT^TBAND?

^TBAND: 8,1

OK

8 means current resident RAT is LTE, and 1 means current resident band is LTE BC1 referring to ^TNWCFG <lteband>.

7.11 Set data authentication info AT^TAUTH

Command	Possible responses
AT^TAUTH=<PLMN>,<cid>[,<auth_type>[,<password>[,<username>]]]	OK
AT^TAUTH?	^TAUTH: <PLMN>,<cid>,<auth_type>,<password>,<username> [^TAUTH: <PLMN>,<cid>,<auth_type>,<password>,<username>] OK
AT^TAUTH=?	^TAUTH:(list of supported<cid>s),(list of supported <auth_type>s),, OK

7.11.1 Description:

This command is used to set authentication parameters of data service. They are corresponding to APN (AT+CGDCONT) via <cid>.

AT^TAUTH=<cid> is used to clear authentication parameters by <cid>.

7.11.2 Persistent after power down

Yes

7.11.3 Defined value:

<PLMN>: String type. 5-digit or 6-digit PLMN of the operator.

<cid>: Integer type. Index of PDP context.

<auth_type>: Integer type. Authentication protocol

0 None

1 PAP

2 CHAP

3 PAP & CHAP

<password>: String type. Password of handshake protocol.

<username>: String type. Username of handshake protocol.