



AT Commands Manual



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1. Introduction

1.1 Purpose of the document

This document describes the messages exchanged between an external application and the TM2 GSM/GPRS mobile station based on AT commands in order to control incoming / outgoing calls, SMS administration, mobile station behavior and GPRS connections.

1.2 Terms and Abbreviations

Abbreviation / Term	Explanation / Definition
APN	Access Point Name
AT	AT Command Interpreter Software Subsystem, or attention
BSD	Berkley Standard Distribution
CB	Cell Broadcast
CM	Connection Management
CSD	Circuit-Switched Data
DA	Destination Address
DCE	Data Communication Equipment
DCM	Data Connection Manager
DNS	Domain Name Server
DTE, TE	Data Terminal Equipment
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
ICMP	Internet Control Message Protocol
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
L3	Layer 3
ME	Mobile Equipment
MN	Mobile Network Software Subsystem
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NVM	Non-Volatile Memory
PDU	Protocol Data Unit
PSD	Packet-Switched Data
QoS	Quality of Service
RFU	Reserved for Future Use



Abbreviation / Term	Explanation / Definition
SC	Service Centre
SI	SIM Application Part Software Subsystem
SIM	Subscriber Identity Module
SMS	Short Message Service
TA	Terminal Adapter
TCP	Transfer Control Protocol
UDP	User Datagram Protocol



2 AT commands features

2.1 Serial interface settings

The serial driver works after start up with the following settings:

- Data-rate 115200 bps;
- Format: 8N1 (eight data bits, no parity bit and one stop bit);
- RTS/CTS flow control (HW flow control).

Please use the commands +IPR, +IFC, +ICF to change these settings.

2.2 Command line

The commands start normally with AT (means Attention) and finish with a <CR> character. Only for writing or sending a SMS CtrlZ or ESC terminates the command; <CR> is used between the 2 parts of the SMS (address and text).

2.3 Default values

If the command parameters are optional, they can be also left out in the command line. In such cases normal default values are assumed as follows:

in case of integer type parameters, the default value is 0, except the cases specified for each concerned command;

in case of text parameters, the default value is an empty string, except the cases specified for each concerned command.

2.4 Information responses and result codes

If verbose responses are enabled with command V1, information responses start and end with <CR><LF>. If numeric format is enabled with V0, the <CR><LF> header is omitted.

If verbose result codes are enabled with command V1 and the command line has been performed successfully, result code <CR><LF>OK<CR><LF> is sent. If numeric responses are enabled with command V0, result code 0<CR> is sent instead.

If verbose result codes are enabled with command V1 and parameter values of a command are not accepted by the TA or the command itself is invalid or cannot be performed for some reason, result code <CR><LF>ERROR<CR><LF> is sent. If numeric responses are enabled with command V0, result code 4<CR> is sent instead.

ERROR (or 4) result code may be replaced by +CME ERROR: <error> in case of selected value +CMEE=1 (<error> is numeric) or +CMEE=2 (error has a verbose value). Therefore, when +CMEE is set to a not equal to 0 value, if the command syntax is wrong +CME ERROR: 100 or +CME ERROR: unknown is sent.

If the parameters are wrong or the command cannot be performed for some reasons, +CME ERROR: <error> or +CMS ERROR: <error> is sent: <error> gives hints to the kind of the error.

If no SIM-card is present or the PIN was not correctly entered, +CME ERROR: <error> is sent for the most commands.

In the following description <CR><LF> are intentionally omitted.



3 General behaviours

3.1 Start up and initialization

A complete start up can take place only with a SIM-card with disabled PIN-check. For a SIM-card with enabled PIN-check the most commands are answered with +CME ERROR: SIM-PIN requested. After entering PIN via +CPIN command, which allows a start up completion, a lot of SIM-files will be read; it is possible that some commands are affected for a few seconds.

The serial interface driver does not allow a new command, until the old one is terminated by OK or +CME ERROR: <error>.

If at start up the MS detects inconsistencies related to the NVRAM the following message is displayed: “! NVR DOES NOT FIT TO SW-VERSION. NVR-update is needed !”

3.2 Multiplexing mode +CMUX

Command syntax	Description
AT+CMUX=<mode>[,<subset>[,<port_speed>[,<N1>[,<T1>[,<N2>[,<T2>[,<T3>[,<k>]]]]]]]	This command enables the multiplexing protocol control channel as defined in GSM07.10.
Test command AT+CMUX=?	+CMUX: (list of supported <mode>s),(list of supported <subset>s),(list of supported <port_speed>s),(list of supported <N1>s),(list of supported <T1>s),(list of supported <N2>s),(list of supported <T2>s),(list of supported <T3>s),(list of supported <k>s) OK
Read command AT+CMUX?	+CMUX: <mode>[,<subset>[,<port_speed>[,<N1>[,<T1>[,<N2>[,<T2>[,<T3>[,<k>]]]]]]] or +CME ERROR: <error>
Set command AT+CMUX=<mode>[,<subset>[,<port_speed>[,<N1>[,<T1>[,<N2>[,<T2>[,<T3>[,<k>]]]]]]]	OK or +CME ERROR: <error>

This command enables the multiplexing protocol control channel as defined in GSM07.10. The AT command sets the parameters for the Control Channel. If parameters are left out, the default value is used. The final response code OK or +CME ERROR: <err> is returned using the old interface speed; the parameters become active only after sending OK.

It is stated that the +CMUX command usage while multiplexing, generates a +CME_ERROR: operation not allowed.

The user must install the driver for the PC.

Read command returns the current mode and the settings. It is allowed only when mux control channel has been previously activated.

Test command returns the supported modes and parameters.

<mode> (multiplexer Transparency Mechanism):

- 0: Basic option
- Default value: 0

<subset>:

This parameter defines the way in which the multiplexer control channel is set up. A virtual channel may subsequently be set up differently but in the absence of any negotiation for the settings of a virtual channel, the virtual channel shall be set up according to the control channel <subset> setting.

- 0: UIH frames used only
- Default value: 0

<port_speed> (transmission rate); Values for a future implementation:

- 1: 9600 bit/s
- 2: 19200 bit/s
- 3: 38400 bit/s
- 4: 57600 bit/s
- 5: 115200 bit/s



- 6: 230400 bits/s
- 7: 1 Mbit/s

Currently the <port_speed> parameter is not supported; this parameter has to be empty or 0 and the value 0 is always displayed in case of read command:

- 0: port speed is not specified
- Default value: 0

<N1> (maximum frame size):

- 1-32768
- Default value: 31

Currently only the range 1-1509 is supported.

<T1> (acknowledgement timer in units of ten milliseconds):

- 1-255, where 10 is default (100 ms)

<N2> (maximum number of re-transmissions):

- 0-100, where 3 is default

Currently only the range 0-5 is supported.

<T2> (response timer for the multiplexer control channel in units of ten milliseconds):

- 2-255, where 30 is default (300 ms)

NOTE: T2 must be longer than T1.

<T3> (wake up response timer in seconds):

- 1-255, where 10 is default;

Currently the <T3> parameter is not supported; it has to be empty or 0 and the value 0 is returned in case of read command:

- 0: T3 is not specified

<k> (window size, for Advanced operation with Error Recovery options):

- 1-7, where 2 is default

Currently the Advanced option and the parameter <k> are not supported; this parameter value has to be empty or 0 and the value 0 is returned in case of read command.



4 General commands

4.1 Manufacturer identification +CGMI	
Command syntax	Description
AT+CGMI	This command gives the manufacturer identification. OK or +CME ERROR: <error>
Test command AT+CGMI=?	OK

4.2 Request model identification +CGMM	
Command syntax	Description
AT+CGMM	This command gives the model identification. OK or +CME ERROR: <error>
Test command AT+CGMM =?	OK

4.3 Request revision identification +CGMR	
Command syntax	Description
AT+CGMR	This command gives the revised version of the mobile station. OK or +CME ERROR: <error>
Test command AT+CGMR =?	OK

4.4 Request product serial number identification +CGSN	
Command syntax	Description
AT+CGSN	This command gets the product serial number, known as IMEI (International Mobile Equipment Identity) of the MS. <IMEI> OK or +CME ERROR: <error>
Test command AT+CGSN =?	OK

4.5 Set TE character set +CSCS	
Command syntax	Description
AT+CSCS=<chset> Set command AT+CSCS="IRA"	This command selects the TE character set. OK or +CME ERROR: <error>
Read command AT+CSCS?	+CSCS="IRA" OK
Test command AT+CSCS=?	OK

<chset>:

- "GSM": GSM default alphabet (GSM03.38 6.2.1);
- "HEX" character strings consist only of hexadecimal numbers from 00 to FF; e.g. "032FE6" equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set shall be done;



- "IRA": international reference alphabet (ITU-T T.50);
- "PCCP437": PC character set Code Page 437;
- "8859-1": ISO 8859 Latin 1 character set.

4.6 Request international mobile subscriber identification +CIMI

Command syntax	Description
AT+CIMI Note: read the IMSI (15 digits starting with MCC / 3 digits and MNC / 2digits)	This command allows requesting the international mobile subscriber identity IMSI (International Mobile Subscriber Identity), which is intended to permit the TE user to identify the individual SIM which is attached to ME. <IMSI> OK or +CME ERROR: <error>
Test command AT+CIMI=?	OK

4.7 Card identification +CCID

Command syntax	Description
AT+CCID	This command returns the ICCID of the SIM-card. +CCID: <ICCID> OK or +CME ERROR: <error>
Read command AT+CCID	Same as above
Test command AT+CCID=?	OK

4.8 Request complete capabilities list +GCAP

Command syntax	Description
AT+GCAP	This command requests the list of capabilities, containing the corresponding command names. +GCAP: +FCLASS, +CGSM OK or +CME ERROR: unknown

4.9 Repeat last command A/

Command syntax	Description
A/	This syntax allows repeating the previously executed command again. Only the A/ command can not be repeated.



5 Mobile equipment control and status commands

5.1 Phone activity status +CPAS

Command syntax	Description
AT+CIMI	This execution command returns the activity status <pas> of the MT. +CPAS: <pas> OK or +CME ERROR: <error>
Test command AT+CPAS=?	OK

<pas> may be:

- 0: ready (MT allows commands from TA/TE)
- 1: unavailable (MT does not allow commands from TA/TE)
- 2: unknown (MT is not guaranteed to respond to instructions)
- 3: ringing (MT is ready for commands from TA/TE, but the ringer is active)
- 4: call in progress (MT is ready for commands from TA/TE, but a call is in progress)
- 5: asleep (MT is unable to process commands from TA/TE because it is in a low functionality state)

5.2 Switch off MS +CPWROFF

Command syntax	Description
AT+CPWROFF	This command allows to switch off the MS. Note: Usage of this command implies that the part of command line placed thereafter will be ignored. OK or +CME ERROR: <error>
Test command AT+CPWROFF=?	OK

5.3 Set phone functionality +CFUN

Command syntax	Description
AT+CFUN=<fun>	This command selects the level of functionality <fun> in the MS. Only some values of <fun> are allowed (see Defined values). Note: if the syntaxes +CFUN=0 or +CFUN=15 (resets) are used, the rest of the command line, placed after that, will be ignored. OK or +CME ERROR: <error>
AT+CFUN=0	Set minimum functionality i.e. MS is switched off OK
AT+CFUN=1	Set full functionality mode OK
AT+CFUN=6	Allow SIM-TK commands and enables fetching of proactive commands by SIM-PPL from SIM OK
AT+CFUN=7	Disable SIM-TK commands and enables fetching of proactive commands by SIM-PPL from SIM OK
AT+CFUN=8	Disable fetching of proactive commands by SIM-APPL from SIM-card OK
AT+CFUN=15	Reset MS without resetting SIM



Read command AT+CFUN?	+CFUN: <power_mode>,<STK_mode>
Test command AT+CFUN=?	+CFUN: (list of supported <fun>'s) e.g. +CFUN: (0,1,6,7,8,15) OK

<fun> selected functionality which may be:

- 0 : minimum functionality meaning switch off of the MS
- 1: full functionality meaning start up MS (from offline mode)
- 6: enables the SIM-toolkit interface and fetching of proactive commands by SIM-APPL from the SIM-card
- 7: disables the SIM-toolkit interface and enables fetching of proactive commands by SIM-APPL from the SIM-card
- 8: disable fetching of proactive commands by SIM-APPL from the SIM-card
- 15: silent reset (reset MS without resetting the SIM)
- 16: silent reset (reset MS with resetting the SIM)

<power_mode> may be:

- 1: MS is switched on
- 2: invalid mode

<STK_mode> may be:

- 0: inactive state
- 6: enables the SIM-toolkit interface and fetching of proactive commands by SIM-APPL from the SIM-card
- 7: disables the SIM-toolkit interface and enables fetching of proactive commands by SIM-APPL from the SIM-card
- 8: disable fetching of proactive commands by SIM-APPL from the SIM-card

5.4 Battery charge +CBC

Command syntax	Description														
AT+CBC	<p>This execution command returns battery status <bcs> and battery charge level <bcl> of the MT.</p> <p>The charge level <bcl> will be also used to build and display the indicator "battchg" i.e. battery charge level in the response code +CIND and in the unsolicited result code +CIEV. The following mapping of "battchg" to <bcl> exists:</p> <table style="margin-left: 20px;"> <tr><td>"battchg"</td><td><bcl></td></tr> <tr><td>0</td><td>< 17 %</td></tr> <tr><td>1</td><td>< 33 %</td></tr> <tr><td>2</td><td>< 50 %</td></tr> <tr><td>3</td><td>< 67 %</td></tr> <tr><td>4</td><td>< 83 %</td></tr> <tr><td>5</td><td>>= 83 %</td></tr> </table> <p>+CBC: <bcs>,<bcl> OK or +CME ERROR: <error></p>	"battchg"	<bcl>	0	< 17 %	1	< 33 %	2	< 50 %	3	< 67 %	4	< 83 %	5	>= 83 %
"battchg"	<bcl>														
0	< 17 %														
1	< 33 %														
2	< 50 %														
3	< 67 %														
4	< 83 %														
5	>= 83 %														
Test command AT+CBC=?	+CBC: (list of supported <bcs>'s),(list of supported <bcl>'s) OK														

<bcs> may be:

- 0: MT is powered by the battery
- 1: MT has a battery connected, but is not powered by it
- 2: MT does not have a battery connected
- 3: Recognized power fault, calls inhibited

<bcl> may be:

- 0: battery is exhausted, or MT does not have a battery connected
- 1...100: battery has 1-100 percent remaining



5.5 Indicator control +CIND

Command syntax	Description
AT+CIND Set command AT+CIND=[<ind>[,<ind>[,...]]]	This set command is used to set the values of MT indicators. <ind> value 0 means that the indicator is off, 1 means that the indicator is on, 2 is more substantial than 1, and so I read command returns the status of MT indicators. The test command returns pairs, where string value <descr> is a maximum 16 character description of the indicator and compound value is the allowed value for the indicator. OK or +CME ERROR: <error>
Read command AT+CIND?	+CIND: <ind>[,<ind>[,...]] OK
Test command AT+CIND=?	+CIND: (“battchg”,(0-5)),(“signal”,(0-5)),(“service”,(0-1)),(“sounder”,(0-1)),(“message”,(0-1)),(“call”,(0-1)),(“roam”,(0-1)),(“smsfull”,(0-1 or 0,2-5 s. note below)),(“gprs”,(0-1)),(“callsetup”,(0-3)),(“callheld”,(0-1)) OK

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

<descr> values reserved by the norm and their <ind> ranges; it may have the values:

- “battchg” battery charge level (0-5); see also +CBC for details;
- “signal” signal quality (0-5); see also +CSQ for details;
- “service” service availability (0-1);
- “sounder” sounder activity (0-1);
- “message” message received (0-1);
- “call” call in progress (0-1); 0 means no call active, 1 means a call is active;
- “roam” roaming indicator (0-1); see also +CREG for details;
- “smsfull” at receiving of a SMS the used memory storage becomes full (1), or memory allocations are available (0); see also the note below;
- “gprs” indicating the GPRS registration status: 2 means GPRS registered, 1 means GPRS available but not registered, 0 means not registered and GPRS network not available;
- “callsetup” call setup status indicator destined for Bluetooth usage (not covered by TS27.007); possible values are: 0: “not currently in call setup”; 1: “incoming call process ongoing”; 2: “outgoing call setup is ongoing”; 3: “remote party being alerted in an ongoing call”;
- “callheld” call held indicator destined for Bluetooth usage (not covered by TS27.007)

Note: the handling related to “smsfull” is dependent from the presence of the compiler switch DR_TE_SM_EXTERNAL. The range 0-1 of this parameter exists, if the compiler switch DR_TE_SM_EXTERNAL does not exist; otherwise the values 0, 2, 3, 4, 5 are provided for and they have the meaning:

- 0: memory allocations are available
- 2: the last free SMS entry on the SIM card is used
- 3: a new MT SMS call-2 can not be stored on the SIM because the storage is full
- 4: a new SMS not-class-2 can not be stored because the external storage is full, whereby the storage on the SIM card is still free
- 5: a new SMS can not be stored because the external storage and the SMS storage on the SIM card are full.



5.6 Mobile termination event reporting +CMER

Command syntax	Description
AT+CMER=[<mode>[,<keyp>[,<disp>[,<ind>[,<bfr>]]]]] Set command AT+CMER=1,1,0,2,1	This set command enables or disables sending of unsolicited result codes from TA to TE in the case of key pressings, display changes and indicator state changes. <mode> controls the processing of unsolicited result codes specified within this command. OK or +CME ERROR: <error>
Read command AT+CMER=?	+CMER: <mode>,<keyp>,<disp>,<ind>,<bfr> e.g. +CMER: 1,1,0,2,1 OK
Test command AT+CMER=?	+CMER: (list of supported <mode>'s),(list of supported <keyp>'s),(list of supported <disp>'s),(list of supported <ind>'s),(list of supported <bfr>'s) OK

<mode> may be:

- 0: buffer unsolicited result codes in the TA
- 1: discard unsolicited result codes when the V.24 interface is reserved for data; otherwise display them on TE directly
- 2: buffer unsolicited result codes in TA when the V.24 interface is reserved and flush them after reservation; otherwise display them on TE directly
- 3: forward unsolicited result codes directly to the DTE

<keyp> can have the values:

- 0: no keypad event reporting
- 1: keypad event reporting via +CKEV: <key>,<press> (s. +CKPD) for those keys which are not caused via +CKPD when the V.24 interface is not reserved
- 2: keypad event reporting via +CKEV: <key>,<press> for all keys when the V.24 interface is not reserved

<disp> can have the values

- 0: no display event reporting

<ind> can have the values:

- 0: no indicator event reporting
- 1: indicator event reporting using result code +CIEV: <ind>,<value>. <ind> indicates the indicator order number (as specified for +CIND) and <value> is the new value indicator. Only the indicator events which are not caused by +CIND shall be indicated by the TA to the TE.
- 2: indicator event reporting using result code +CIEV: <ind>,<value>. All indicator events shall be directed from TA to TE.

<bfr> may have the following values:

- 0: TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered
- 1: TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...3 is entered (OK response shall be given before flushing the codes).



5.7 Clock +CCLK	
Command syntax	Description
AT+CCLK=<time>	This set command sets the real-time clock of the ME
Set command AT+CCLK="02/07/01,14:54:00" "	OK or +CME ERROR: <error>
Note: set date to July 1-st, 2002 and time to 14:54	
Read command AT+CCLK?	+CCLK: "02/07/01,14:55:00" OK
Test command AT+CCLK=?	OK

<time>: string type value; format is "yy/MM/dd,hh:mm:ss+TZ", wherein characters indicates year, month, day, hour, minutes, seconds.

TZ: Time zone information represented by two digits. The time zone information is optional; if it was entered it is always accepted, but the display of TZ for query contains this information (in updated form) only if the network supports the time zone information.

5.8 Alarm +CALA	
Command syntax	Description
AT+CALA=<time>[,<n>[,<type>e],[<text>[,<recurr>[,<silent>]]]]	This set command sets an alarm time in the MT. At expiration a predefined text is displayed. There can be an array of different types of alarms, and each alarm may cause different text to be displayed in the MT display. If setting fails, a +CME ERROR: <error> is returned. To set up a recurrent alarm for more days in the week, the <recurr> parameter is used. When an alarm is timed out and executed, first the alarm actions are executed as display of provided text and e.g sound alarm, and second, the unsolicited alarm code +CALV: <n> is displayed on DTE, even if the alarm was silent.
Set command AT+CALA="02/07/01,14:56:00+04",1,1,"Alarm"	OK or +CME ERROR: <error>
Read command AT+CALA?	[+CALA: <time>,<n1>,<type>,[<text>],[<recurr>],<silent> [<CR><LF>+CALA: <time>,<n2>,<type>,[<text>],[<recurr>],<silent> [...]] i.e. +CALA: "02/07/01,14:56:00+04",1,1,"Alarm",0 OK
Test command AT+CALA=?	+CALA: (list of supported <n>s),(list of supported <type>s),<tlength>,<rlength>,(list of supported <silent>'s) OK i.e. +CALA: (1-3),(0),255,13,(0-1)

<time>: string type value; format is "yy/MM/dd,hh:mm:ss+tz", wherein characters indicates year, month, day, hour, minutes, seconds and time zone.

<n>, **<n1>**, **<n2>**: integer type value indicating the index of the alarm; the maximum number of alarms is 3; if not indicated by user, default value 1 is assumed;

<type>: type of the alarm; this parameter is ignored

<text>: string type value indicating the text that could be displayed when alarm time is reached; this parameter is ignored

<tlength>: integer type value indicating the maximum length of <text>; this parameter is ignored

<recurr>: string type value (maximum string length is 13) indicating day of week for the alarm in one of the following formats:



“<1..7>[,<1..7>[...]]” – Sets a recurrent alarm for one or more days in the week. The digits 1 to 7 corresponds to the days in the week, Monday (1), ..., Sunday (7).

Example: The string “1,2,3,4,5” may be used to set an alarm for some weekdays.

“0” – Sets a recurrent alarm for all days in the week and all following weeks

<rlength>: integer type value indicating the maximum length of <recurr>

<silent>: Integer type value indicating if the alarm is silent or not:

- 1: the alarm will be silent and the only result from the alarm is the unsolicited result code +CALV;
- 0: the alarm will not be silent.

Alternatively you can switch off the data module after set the alarm; in this case the data module switch as soon the alarm is expired. The following procedure can be followed:

- Set the RTC clock by AT command: AT+CCLK="06/12/29,11:00:00" (you can check the time set by AT+CCLK?);
- Set the RTC alarm by at command: AT+CALA="06/12/29,11:01:00",1,0,"";",0 (you can check the alarm set by AT+CALA?);
- switch off the DUT with AT+CPWROFF

Output:

- The DUT switches on as soon as the minute is expired and answers “+CALV:1”. Try to send “AT” on the hyper terminal, the DUT replies properly.

5.9 Delete alarm +CALD

Command syntax	Description
AT+CALD=<n>	This action command deletes an alarm in the MT.
Set command AT+CALD=0	OK or +CME ERROR: <error>
Test command AT+CALD=?	+CALD: (0) i.e. list of <n>s OK

<n> integer type value indicating the index of the alarm; the maximum number of alarms is 3.

5.10 Restricted SIM access +CRSM

Command syntax	Description
AT+CRSM=<command>[,<file id>[,<P1>,<P2>,<P3>[,<data>]]]	This command allows an easy access to the SIM database. By using this command instead of Generic SIM Access +CSIM DTE application has easier but more limited access to the SIM database. Set command transmits to the MS the SIM <command> and its required parameters. MS handles internally all SIM-MS interface locking and file selection routines. As response to the command, MS sends the actual SIM information parameters and response data. MS 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.
Set command AT+CRSM=176,28471,0,0,3 Note: read ACMmax AT+CRSM=176,28423,0,0,9 Note: read IMSI AT+CRSM=178,28473,0,4,3 Note: read ACM AT+CRSM=176,28481,0,0,5 Note: read PUKT	+CRSM: <sw1>,<sw2>[,<response>] OK or +CME ERROR: <error>
Test command AT+CRSM=?	OK



<command> may be

- 176 read binary
- 178 read record
- 192 get response
- 214 update binary
- 220 update record
- 242 status

<fileid> integer type; this is the identifier of a elementary datafile on SIM. Mandatory for every command except STATUS and may be e.g.:

- 28471 meaning ACMmax file (6F37)
- 28423 meaning IMSI file (6F07)
- 28473 meaning ACM file (6F39)
- 28481 meaning PUKT file (6F41)
- 28482 meaning SMS file (6F42)

<P1>, **<P2>**, **<P3>** integer type defining the request. These parameters are mandatory for every command, except GET RESPONSE and STATUS. The values are described in GSM 51.011.

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

<sw1>, **<sw2>** integer type containing the SIM information and can be:

- 0x90 0x00 normal entry of the command
- 0x9F 0xXX length XX of the response data
- 0x92 0x0X update successful but after using an internal retry routine X times
- 0x92 0x40 memory problem
- 0x94 0x00 no EF selected
- 0x94 0x02 out of range (invalid address)
- 0x94 0x04 file ID not found; pattern not found
- 0x94 0x08 file is inconsistent with the command
- 0x98 0x02 no CHV initialized
- 0x98 0x04 access cond. Not fullfiled / unsucc. CHV verify / authent.failed
- 0x98 0x08 in contradiction with CHV status
- 0x98 0x10 in contradiction with invalidation status
- 0x98 0x40 unsucc. CHV-verif. Or UNBLOCK CHF / CHV blocked /UNBL.blocked
- 0x98 0x50 increase can not be performed. Max. value reached
- 0x67 0xXX incorrect parameter P3
- 0x6B 0xXX incorrect parameter P1 or P2
- 0x6D 0xXX unknown instruction code given in the command
- 0x6E 0xXX wrong instruction class given in the command
- 0x6F 0xXX technical problem with no diagnostic given

<response> response of successful completion of the command previously issued (hexadecimal character format; refer +CSCS – string containing hexadecimal characters -). 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 GSM 51.011 [28]). After READ BINARY or READ RECORD command the requested data will be returned. <response> is not returned after a successful UPDATE BINARY or UPDATE RECORD command.



5.11 Alert sound mode +CALM

Command syntax	Description
AT+CALM=<n> Set command AT+CALM=0	This command is used to select the general alert sound mode of the ME. OK or +CME ERROR: <error>
Read command AT+CALM?	+CALM: <mode> OK
Test command AT+CALM=?	+CALM: (0-1) OK

<mode> may be:

- 0 normal mode
- 1 silent mode

5.12 Ringer sound level +CRSL

Command syntax	Description
AT+CRSL=<level> Set command AT+CRSL=2	This command is used to select the ringer sound level of the ME used for incoming calls, alarms and SMS receptions. OK or +CME ERROR: <error>
Read command AT+CRSL?	+CRSL: <level> OK
Test command AT+CRSL=?	+CRSL: (0-5) OK

<level> may be a value in range 0-5 (0 means mute).

5.13 Speech volume level +CLVL

Command syntax	Description
AT+CLVL=<level> Set command AT+CLVL=30	This command is used to select the speech volume of the ME. OK or +CME ERROR: <error>
Read command AT+CLVL?	+CLVL: <level> OK
Test command AT+CLVL=?	+CLVL: (0-100) OK



5.14 Mute control +CMUT

Command syntax	Description
AT+CMUT=<n>	This command is used to enable and disable the uplink voice muting during a voice call (only for the active line).
Set command AT+CMUT=0	OK or +CME ERROR: <error>
Read command AT+CMUT?	+CMUT=<n> OK
Test command AT+CMUT=?	+CMUT: (0-1) OK

<n> may be:

- 0 mute off
- 1 mute on

5.15 Call meter maximum event +CCWE

Command syntax	Description
AT+CCWE=<mode>	This command allows the sending of an unsolicited result code +CCWV to TE, when enabled. The warning is issued approximately when 30 seconds call time remains. It is also sent when starting a call if less than 30 s call time remains.
Set command AT+CCWE=1	OK or +CME ERROR: <error>
Read command AT+CCWE?	+CCWE: <mode> OK
Test command AT+CCWE=?	+CCWE: (0-1) OK

<mode> may be:

- 0 disable the call meter warning event
- 1 enable the call meter warning event

5.16 Set greeting text +CSGT

Command syntax	Description
AT+CSGT=<mode>[,<text>]	This command sets and activates the greeting text in the ME. The greeting text is shown in the ME display when the ME is turned on. The command can also deactivate a text.
Set command AT+CSGT=1,"Hello user"	OK or +CME ERROR: <error>
Read command AT+CSGT?	+CSGT: <text>,<mode> OK
Test command AT+CSGT=?	+CSGT: (list of <mode>s),<text> OK

<text> string type containing the greeting text.

<mode> may be:

- 0 turn off greeting text
- 1 turn on greeting text

<lttext> maximum length of the <text>.



5.17 Automatic Time Zone Update +CTZU

Command syntax	Description
AT+CTZU=<onoff> Set command AT+CTZU=1	This set command enables and disables automatic time zone update via NITZ. OK or +CME ERROR: <error>
Read command AT+CTZU?	+CTZU: <onoff> OK
Test command AT+CTZU=?	+C: (0-1) i.e. list of supported <onoff>s OK

<onoff> integer type value indicating:

- 0: disable automatic time zone via NITZ (default)
- 1: enable automatic time zone update via NITZ.

5.18 Time Zone Reporting +CTZR

Command syntax	Description
AT+CTZR=<onoff> Set command AT+CTZR=1	This set command enables and disables the time zone change event reporting. If the reporting is enabled, the MT returns the unsolicited result code +CTZV: <tz> whenever the time zone is changed. OK or +CME ERROR: <error>
Read command AT+CTZR?	+CTZR: <onoff> OK
Test command AT+CTZR=?	+CTZR: (0-1) i.e. list of supported <onoff>s OK

<onoff> integer type value indicating:

- 0: disable time zone change event reporting (default)
- 1: enable time zone change event reporting.

<tz>: integer value indicating the time zone.

5.19 Report mobile termination error +CMEE

Command syntax	Description
AT+CMEE=[<n>] Set command AT+CMEE=2	This set command enables or disables the use of 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 TA functionality. OK or +CME ERROR: <error>
Read command AT+CMEE?	+CMEE: <n> OK
Test command AT+CMEE=?	+CMEE: (0,1,2) i.e. list of supp.<n>s OK

<n> may be:

- 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



Note: in case of selected value +CMEE=2, meaning formatting the error result code as +CME ERROR: <error> with <error> as verbose value, the following convention is valid:

if the error result code is related to a parameter not covered by the GSM/ETSI or Teltonika specification the value <error>="operation not supported" shall be used

if the TA is in a state which not allow to perform the entered command, the value <error>="operation not allowed" shall be used

5.20 List all available AT commands +CLAC

Command syntax	Description
AT+CLAC	This execution command causes the MS to return one or more lines of AT commands that are available for the DTE user. Each line contains one AT command. The presentation of commands respects the order in the AT-manual.
Set command AT+CLAC	<AT command 1>[<CR><LF><AT command 2>[...]] OK or +CME ERROR: <error>
Test command AT+CLAC=?	+CMEE: (0,1,2) i.e. list of supp.<n>s OK

<AT command> defines the AT command including the prefix AT. The text does not contain the sequence 0<CR> or OK<CR>.



6 Call control commands

6.1 Select type of address +CSTA

Command syntax	Description
AT+CSTA=<type>	This set command selects the type of number for further dialling commands (D) according to GSM specifications. <i>Note: Because the type of address is automatically detected on the dial string of the D command, the +CSTA command has really no effect.</i>
Set command AT+CSTA=145	OK or +CME ERROR: <error>
Read command AT+CSTA?	+CSTA: <type> OK
Test command AT+CSTA=?	+CSTA: (129,145) OK

<type> may be:

- 145 when dialling string includes international access code character “+”
- 129 when the dial string begins with a digit

6.2 Dial command D

Command syntax	Description
ATD	The V.24ter dial command D lists characters that may be used in a dialling string for making a call or controlling supplementary services in accordance with GSM02.30 and initiates the indicated kind of call. No further commands may follow in the command line. The command is abortable by hit a key before establishment. OK or +CME ERROR: <error>

6.2.1 V.25ter dialling digits

They are:

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

Character D is allowed but ignored.

6.2.2 V.25ter or GSM modifier characters

- “,”, “T”, “P”, “I”, “W” or “@” are ignored
- “;” forces a voice call originated to the given address
- “>” allows direct dialling from phonebook
- “I” invocation restrict CLI presentation
- “I” suppression i.e. allows CLI presentation
- “G” or “g” control the CUG supplementary service information for this call (s.+CCUG)

6.2.3 Direct calling from phonebooks

D><str>[I][G][;] originate a call to phone number which corresponding alphanumeric field in the default phonebook is <str>.

D>mem<n>[I][G][;] originate a call to phone number in memory (one of the phonebooks) “mem” entry location <n>. “mem” may be for example “SM”, “FD” or “LD”.

D><n>[I][G][;] originate a call to phone number in entry location <n> of the default phonebook.

The semicolon character shall be added when a voice call is originated. CLIR and CUG per call modifiers can also be present.



6.2.4 Responses

Verbose	Numeric	Description
OK	0	Acknowledges successful execution of cmd.
CONNECT	1	A connection has been established
NO CARRIER	3	The connection has been terminated or the attempt to establish a connection failed
BUSY	7	Engaged (busy) signal detected
NO ANSWER	8	If no hang up is detected after a fixed network timeout
CONNECT<data rate>	9	Same as CONNECT but includes the data rate
CONNECT FAX	11	Same as CONNECT but includes the indication related to FAX call

6.3 Select tone dialling T

Command syntax	Description
ATD	This set command causes subsequent D command to assume that DTMF dialling is to be used. Because in GSM DTMF dialling is default, this command has no effect. OK or +CME ERROR: <error>

6.4 Select pulse dialling P

Command syntax	Description
ATP	This set command causes subsequent D command to assume that pulse dialling is to be used. Because in GSM DTMF dialling is default, this command has no effect. OK or +CME ERROR: <error>

6.5 Call answer A

Command syntax	Description
ATA	This command instructs the DCE to immediately connect to line and start the answer sequence as specified for the underlying DCE. Any additional command that appears after A on the same command line is ignored. The command is abortable. The user is informed that an incoming call is waiting, by the information result code RING or +CRING displayed on TE. OK or +CME ERROR: <error>



6.6 Hook control H

Command syntax	Description
ATH or ATH0	<p>This command is used to disconnect the remote user. In case of multiple calls, every call is released; the waiting calls are not released.</p> <p>If the module is GPRS context activated in On-Line Command mode(OLCM) the ATH command deactivates the context.</p> <p><i>NOTE: during the GPRS OLCM an incoming CSD call can be accepted with a ATA command. Subsequence ATH command releases the current CSD call while leaving the GPRS context activated. In this state a second ATH command deactivates the GPRS context too.</i></p> <p>OK or +CME ERROR: <error></p>

6.7 Monitor speaker loudness L

Command syntax	Description
ATL<value>	<p>This command controls the volume of the monitor speaker. It has no effect.</p> <p><value> is 0-3</p> <p>OK or +CME ERROR: <error></p>

6.8 Monitor speaker mode M

Command syntax	Description
ATM<value>	<p>This command controls when the monitor speaker is on. The command has no effect.</p> <p><value> is 0-2</p> <p>OK or +CME ERROR: <error></p>

6.9 Call mode +CMOD

Command syntax	Description
AT+CMOD=<mode>	<p>This set command selects the call mode of further dialling commands (D) or for next answering command (A).</p> <p>OK or +CME ERROR: <error></p>
Set command AT+CMOD=0	
Read command AT+CMOD?	+CMOD: <mode> OK
Test command AT+CMOD=?	+CMOD: (0-1) i.e. list of supported <mode>s OK

<mode> may be:

- 0 single mode
- 1 alternating voice/fax (teleservice 61)

Note: Bearer service 61 (<mode>=2) and Bearer service 81 (<mode>=3) are not supported.



6.10 Hangup call +CHUP

Command syntax	Description
AT+CHUP	This execution command causes the TA to hangup the current GSM call of the ME. OK or +CME ERROR: <error>
Test command AT+CHUP=?	OK

6.11 Extended error report +CEER

Command syntax	Description
AT+CHUP	This execution command causes the TA to return one or more lines of information text <report>, determined by the ME manufacturer, which offer an extended report of the reason for: <ul style="list-style-type: none"> – the failure in the last unsuccessful call setup or in-call modification – the last call release – the last unsuccessful GPRS attach or unsuccessful PDP context activation – the last GPRS detach or PDP context deactivation The displayed <report> text may contain only the numeric code if requested by the customer. +CEER: <report> OK
Test command AT+CEER=?	OK

<report>: the total number of characters, including line terminators, in the information text does not exceed 2041. The <report> text is the failure cause from GSM04.08 or a specific failure cause as specified in Appendices 18.3 and 18.4

6.12 Tone duration +VTD

Command syntax	Description
AT+VTD=<n>	This command refers to an integer <n> that defines the length of tones emitted as a result of the +VTS command. NOTE: In GSM the value of tone duration is preset and cannot be altered.
Set command AT+VTD=2	OK or +CME ERROR: <error>
Read command AT+VTD?	+VTD: <n> OK
Test command AT+VTD=?	+VTD: (0-255) i.e. list of supported <n>s OK

<n> is a integer in range of 0 to 255. A value different than zero causes a tone of duration <n>/10 seconds. The value 1 is default. If the value 0 is selected, the tone duration is set to 1/10 seconds.



6.13 DTMF and tone generation +VTS

Command syntax	Description
AT+VTS=<DTMF>[,<duration>]	This command allows the transmission of DTMF tones and arbitrary tones. These tones may be used e.g. when announcing the start of a recording period. In GSM this operates only in voice mode. If the optional parameter <duration> is left out, the tone duration is given by the setting +VTD (see +VTD description).
Set command AT+VTS=2 or AT+VTS=2,10	OK or +CME ERROR: <error>
Test command AT+VTS=?	+VTS: (0-9,#,*,A-D),(0-n x 10ms) OK

<DTMF> is a single ASCII character in the set 0-9, #, *, A-D.

<duration> integer in range 0-255, meaning 10ms multiples.

6.14 Redial last telephone number ATDL

Command syntax	Description
ATDL	This command is used to redial the last number used in the ATD command. This command is supported only for voice call and not for data call. This command is abortable.
	OK or +CME ERROR: <error>

6.15 Automatic answer S0

Command syntax	Description
ATS0=<value>	This S-parameter command controls the automatic answering feature of the DCE. If set to 0, automatic answering is disabled, otherwise it causes the DCE to answer when the incoming call indication (ring) has occurred the number of times indicated by the value.
Set command ATS0=2 Note: Automatic answer after 2 rings	OK or +CME ERROR: <error>
Read command ATS0?	S0: <value> OK

<value> is a integer in range 0-255.

Default setting: S0=0, meaning automatic answering is disabled.



7 Network service commands

7.1 Subscriber number +CNUM

Command syntax	Description
AT+CNUM Response syntax: +CNUM: [<alpha1>,<number1>,<type1> >,<speed>,<service>,<itc>]] [<CR><LF>+CNUM: [<alpha2>,<number2>,<type2> >,<speed>,<service>,<itc>]] [...]]	This action command returns the MSISDNs related to this subscriber. If the subscriber has different MSISDN for different services, each MSISDN is returned in a separate line. +CNUM: "Mario Rossi","+39320821708",145 +CNUM: "ABCD . AAA","123456789012",129 +CNUM: "","" OK or +CME ERROR: <error>
Test command AT+CNUM=?	OK

<alphax> optional alphanumeric string associated with <numberx>; used character set is selected by setting +CSCS

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

<typex> type of address octet in integer format (129 or 145)

<speed> corresponding to setting +CBST

<service> service related to phone number as follows:

- 0: asynchronous modem
- 1: synchronous modem
- 2: PAD access (asynchronous)
- 3: Packet access (synchronous)
- 4: voice
- 5: FAX

<itc> information transfer capability as follows:

- 0: 3.1 KHZ
- 1: UDI

7.2 Signal quality +CSQ

Command syntax	Description																					
AT+CSQ Response syntax: CSQ: <rss>,<ber>	This execution command returns signal strength indication <rss> and channel bit error rate <ber> from the ME. The radio signal strength <rss> will be also used to build and display the indicator "signal" i.e. signal quality in the response code +CIND and in the unsolicited result code +CIEV. The following mapping of "signal" to <rss> exists: <table style="margin-left: 40px;"> <tr> <td>"signal"</td> <td><rss></td> <td></td> </tr> <tr> <td>0</td> <td>< 4 or 99</td> <td>(< -107 dBm or unknown)</td> </tr> <tr> <td>1</td> <td>< 10</td> <td>(< -93 dBm)</td> </tr> <tr> <td>2</td> <td>< 16</td> <td>(< -71 dBm)</td> </tr> <tr> <td>3</td> <td>< 22</td> <td>(< -69 dBm)</td> </tr> <tr> <td>4</td> <td>< 28</td> <td>(< -57 dBm)</td> </tr> <tr> <td>5</td> <td>>=28</td> <td>(>= -57 dBm)</td> </tr> </table> +CSQ: 2,5 OK or +CME ERROR: <error>	"signal"	<rss>		0	< 4 or 99	(< -107 dBm or unknown)	1	< 10	(< -93 dBm)	2	< 16	(< -71 dBm)	3	< 22	(< -69 dBm)	4	< 28	(< -57 dBm)	5	>=28	(>= -57 dBm)
"signal"	<rss>																					
0	< 4 or 99	(< -107 dBm or unknown)																				
1	< 10	(< -93 dBm)																				
2	< 16	(< -71 dBm)																				
3	< 22	(< -69 dBm)																				
4	< 28	(< -57 dBm)																				
5	>=28	(>= -57 dBm)																				
Test command AT+CSQ=?	+CSQ: (0-31,99),(0-7,99) i.e. list of supported <rss>s and list of supported <ber>s OK																					



<rsqi> may be:

- 0 i.e. -113dBm or less
- 1 i.e. -111 dBm
- 2 ... 30 i.e -109 ... -53 dBm
- 31 -51 dBm or greater
- 99 i.e. not known or not detectable

<ber> bit error rate

- 0 ... 7 as RXQUAL values as described in GSM05.08 subclause 8.2.4
- 99 not known or not detectable.

7.3 Operator selection +COPS

Command syntax	Description
AT+COPS=[<mode>[,<format> >[,<oper>>]]] Set command AT+COPS=0,0	This command forces an attempt to select and register the GSM network operator. The command in the execution syntax is abortable hitting a key. The <format> and <oper> parameter are optionally only if the value of <mode> parameter is either 0 or 2 or 3 OK or +CME ERROR: <error>
Read command AT+COPS?	+COPS: <mode>[,<format>,<oper>] OK
Test command AT+COPS=?	+COPS: [list of supported (<stat>),long alphanumeric <oper>, short alphanumeric <oper>, numeric <oper>]s [,(list of supported <mode>s),(list of supported <format>s)] OK

<mode> is used to select whether the selection is done automatically by the ME or is forced by this command to operator <oper> given in the format <format> and may be:

- 0 automatic (<oper> field is ignored)
- 1 manual
- 2 deregister from network
- 3 set only <format>
- 4 manual / automatic (if manual selection fails, automatic mode is entered)
- if the parameter is not inserted, it is set to 0;

<format> may be:

- 0 long alphanumeric <oper> (default value)
- 1 short format alphanumeric <oper>
- 2 numeric <oper>
- this parameter is mandatory if <mode> value is either 1 or 4

<oper> string type given in format <format>; this field may be up to 16 character long for long alphanumeric format, up to 8 characters for short alphanumeric format and 5 characters long for numeric format (MCC/MNC codes); □ this parameter is mandatory if <mode> value is either 1 or 4;

<stat> may be:

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



7.4 Network registration +CREG

Command syntax	Description
AT+CREG=<n> Set command AT+CREG=1	This set command controls the presentation of an unsolicited result code +CREG: <stat> when <n>=1 and there is a change in the ME network registration status, or code +CREG: <stat>[,<lac>,<ci>] when <n>=2 and there is a change of the network cell. OK or +CME ERROR: <error>
Read command AT+CREG?	+CREG: <n>, <stat>[,<lac>,<ci>] OK
Test command AT+CREG=?	+CREG: (0-2) Note: i.e. list of the supported <n>s OK

<n> may be:

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

<stat> may be:

- 0 not registered, ME is not currently searching a new operator to register to
- 1 registered, home network
- 2 not registered, but ME 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 in hexadecimal format (e.g. "00C3")

<ci> string type; two byte cell ID in hexadecimal format (e.g. "A13F")

7.5 Preferred operator list +CPOL

Command syntax	Description
AT+CPOL=[<index>][,<format> >[,<oper>]] Response syntax: +CPOL: <index1>,<format>,<oper1> [<CR><LF>+CPOL: <index2>,<format>,<oper2> [...]] Set command AT+CPOL=2,0,"T-Mobil D"	This command is used to edit the SIM preferred list of networks and writes an entry in the SIM list of preferred operators, previously selected by the command +CPLS. If no list has been selected (e.g. because +CPLS command is not implemented), the default SIM file EF _{PLMNwAcT} is used. OK or +CME ERROR: <error>
Read command AT+CPOL?	+CPOL: 1,0,"F SFR" +CPOL: 2,0,"T-Mobil D" OK
Test command AT+CPOL=?	+CPOL: (1-30),(0-2) Note: i.e. (list of supported<index>s),(list of supported <format>s) OK

<index n> integer type; the order number of operator in the SIM preferred operator list

<format> may be (see also +COPS):

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

<oper n> string type in format indicated by <format>



7.6 Read operator names +COPN

Command syntax	Description
AT+COPN	<p>This execution command returns the list of operator names from the ME. Each operator code <numeric n> that has an alphanumeric equivalent <alpha n> in the ME memory shall be returned.</p> <p>+COPN: <numeric 1>,<alpha1> [<CR><LF>+COPN: <numeric2>,<alpha2> [...]] or +CME ERROR: <error></p>
Test command AT+COPN=?	OK

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

<alpha n> string type; operator in long alphanumeric format (see +COPS).



8 Security commands

8.1 Read operator names +COPN

Command syntax	Description
AT+CPIN=<pin>[,<newpin>] Set command AT+COPS=0 AT+CPIN="0933"	This set command sends to the ME a password which is necessary before it can be operated. If no PIN request is pending, no action is taken towards ME and a corresponding error code is returned. 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: Commands which interact with ME that are accepted when ME is pending SIM PIN, SIM PUK, or PH-SIM are: +CMUX, +CGMI, +CGMM, +CGMR, +CGSN, +CCID, D112, +CPAS, +CPWROFF, +CFUN, +CBC, +CIND, +CMER, +CMEE, +CHUP; +CREG, +CPIN, +CSSN, +CBST, +FCLASS, +CR, +CRC, +CRLP, AT&V, AT&Y, +TRACE, +XCALLSTAT, +XSIO, +NTGN, +NDAL, +NMGC, +NSGC, +NSTN, +NUBF, +NDBF, +NHFP, +CGREG, +CME ERROR: SIM PIN OK or +CME ERROR: <error> <i>If PIN is incorrect and CMEE=2</i> +CME ERROR: incorrect password <i>If PIN is incorrect and CMEE=0</i> ERROR
Read command AT+CPIN?	<i>Before PIN insertion</i> +CPIN: SIM PIN <i>After PIN insertion</i> +CPIN: <code> OK or +CME ERROR: <error>
Test command AT+CPIN=?	OK

<pin>, <newpin> are string type values.

<code> values may be:

- READY: ME is not pending for any password
- SIM PIN: ME is waiting SIM PIN to be given
- SIM PUK: ME is waiting SIM PUK to be given
- SIM PIN2: ME is waiting SIM PIN2 to be given
- SIM PUK2: ME is waiting SIM PUK2 to be given

Note: if PIN is not inserted the following situation can happen:

```
AT+CMEE=2
OK
AT+COPS=0
+CME ERROR: SIM PIN required
```

```
AT+CMEE=0
OK
AT+COPS=0
ERROR
```



8.2 Facility lock +CLCK

Command syntax	Description
AT+CLCK=<fac>,<mode>[,<passwd>[,<class>]]	This execution command is used to lock, unlock or interrogate a ME 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>. The command is abortable if network facilities are set or interrogated. For <fac> “PN”, “PU”, “PP”, “PC” only <mode> = 0 and <mode> = 2 (unlock and query status) is supported!
Set command AT+CLCK=”SC”,1,”0933”	OK Or +CLCK: <status>[,<class1> [<CR><LF>+CLCK: <status>[,<class1> [...]] +CME ERROR: <error>
Test command AT+CLCK=?	+CLCK: “SC”,“FD”,“PN”,“PU”,“PP”,“PC”,“AO”,“OI”,“OX”,“AI”,“IR”,“AB”,“AG”,“AC” OK

<fac> facility values:

- “SC” SIM (lock SIM card)
- “FD” SIM Fixed Dialling memory feature (if PIN2 authentication has not been done during the current session, PIN2 is required as <passwd>)
- “PN” Network Personalisation (refer GSM 02.22 [33])
- “PU” Network sUbset Personalisation (refer GSM 02.22 [33])
- “PP” Service Provider Personalisation (refer GSM 02.22 [33])
- “PC” Corporate Personalisation (refer GSM 02.22 [33])
- “AO” BAR (Bar All Outgoing Calls)
- “OI” BOIC (Bar Outgoing International Calls)
- “OX” BOIC-exHC (Bar Outgoing International Calls except to Home Country)
- “AI” BAIC (Bar All Incoming Calls)
- “IR” BIC-Roam (Bar Incoming Calls when Roaming outside the home country)
- “AB” All Barring services (applicable only for <mode>=0)
- “AG” All outGoing dialling barring services (applicable only for <mode>=0)
- “AC” All inComing dialling barring services (applicable only for <mode>=0)

<mode> may be:

- 0 unlock
- 1 lock
- 2 query status

<status> may be:

- 0 not active
- 1 active

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

<class x> is a sum of integers each representing a class of information (default 7) and may be:

- 1: voice;
- 2: data;
- 4: FAX;
- 8: short message service;
- 16: data circuit sync;
- 32: data circuit async;
- 64: dedicated packet access;
- 128: dedicated PAD access.



8.3 Change password +CPWD

Command syntax	Description
AT+CPWD=<fac>,<oldpwd>, <newpwd>	This action command sets a new password for the facility lock function defined by command +CLCK. The command is abortable by hit a key.
Set command AT+CPWD="SC", "0933", "0934"	OK or +CME ERROR: <error>
Test command AT+CPWD=?	+CPWD: ("SC",8),("P2",8),("PS",4),("PN",16),("PU",16),("PP",16),("PC",16),("AO",4),("OP",4),("OX",4),("AP",4),("IR",4),("AB",4),("AG",4),("AC",4) Note: list of supported (<fac>,<pwdlength>)s OK

<fac> "P2" and other values as defined for +CLCK except "PN", "PU", "PP", "PC"

<oldpwd> string type containing the old password

<newpwd> string type containing the new password

<pwdlength> length of password (digits).



9 Phonebook commands

9.1 Select phonebook memory storage +CPBS

Command syntax	Description
AT+CPBS=<storage>[,<password>] Set command AT+CPBS="SM" <i>Note: selection of SIM phonebook</i>	This command selects a phonebook memory storage for further usage in phonebook related commands. OK or +CME ERROR: <error>
Read command AT+CPBS=?	+CPBS: "SM",25,150 Note: used syntax +CPBS: <storage>[,<used>,<total>] OK
Test command AT+CPBS=?	+CPBS: "SM", "FD", "LD", "BN", "SN", "ON", "BL" Note: (list of supported <storages>s) OK

<storage> string type using following values:

- "SM": SIM phonebook
- "FD": SIM fix-dialling phonebook (only valid with PIN2)
- "LD": SIM last-dialling phonebook
- "BN": SIM barred-dialling-number phonebook (only valid with PIN2)
- "SN": SIM service-dialling-number phonebook
- "ON": Own number phone-book (read/write); content is also shown by +CNUM.
- "BL": Blacklist phonebook (delete only)

<password>: string type value representing the PIN2-code required when selecting PIN2-code <storage>s above (e.g. "FD")

<used> integer type value indicating the number of used locations in selected memory

<total> integer type value indicating the total number of locations in selected memory.

9.2 Read phonebook entries +CPBR

Command syntax	Description
AT+CPBR=<index1>[,<index2>] Response syntax: [+CPBR: <index1>,<number>,<type>,<text>[[...] <CR><LF>+CPBR: <index2>,<number>,<type>,<text>]] Set command AT+CPBR=1,3	This execution command returns phonebook entries in location number range <index1> ... <index2> from the current phonebook memory storage selected with +CPBS. If <index2> is left out, only location <index1> is returned. Note: Wildcard characters (*, ?) in the phone number of FDN (fixed number phonebook) are allowed. +CPBR: 1,"091137880",129,"Teltonika" +CPBR: 2,"09113788223",129,"MMI" +CPBR: 3""09113788328",129,"Test-ro" OK or +CME ERROR: <error>
Test command AT+CPBR=?	+CPBR: (1-100),20,18 i.e. +CPBR: (list of supported <index>s),[nlength],[tlength] OK

<index1>, <index2>, <index> integer type values in the range of location numbers of phonebook memory



10 Short messages commands

10.1 Parameter definition

<cdat>	TP-Command-Data in text mode responses
<ct>	TP-Command-Type in integer format (default 0)
<da>	Destination address
<dcs>	Data coding scheme
<dt>	Discharge time in string format “yy/MM/dd,hh:mm:ss+yy”
<fo>	First octet, default value 17 for SMS-SUBMIT
<index>	Place of storage in memory
<length>	number of characters in text mode length of TP data unit in PDU mode
<mem1>	Memory used to list, read and delete SMS
<mem2>	Memory used to write and send SMS
<mem3>	Memory to which received SMS are preferred stored (e.g. “BM”, “SM”)
<mid>	CBM message identifier
<mr>	Message reference
<oa>	Originator address
<pid>	Protocol identifier
<pdu>	Protocol data unit
<ra>	Recipient address
<sca>	Service center address
<scts>	Service center time stamp
<sn>	CBM serial number
<st>	Status of a SMS STATUS-REPORT
<stat>	Status of message in memory
<toda>	Type of address of <da>
<tooa>	Type of address of <oa>
<tora>	Type of address of <ra>
<tosca>	Type of address of <sca>
<total1>	Number of message locations in <mem1>
<total2>	Number of message locations in <mem2>
<total3>	Number of message locations in <mem3>
<used1>	Total number of messages in <mem1>
<used2>	Total number of messages in <mem2>
<used3>	Total number of messages in <mem3>
<vp>	Validity period of the SMS, default value 167

10.2 Select message service +CSMS

Command syntax	Description
AT+CSMS=<service>	This command selects message service <service>. It returns the types of messages supported by the ME: <mt> for mobile terminated messages, <mo> for mobile originated messages and <bm> for broadcast type messages.
Set command AT+CSMS=1	+CSMS:<mt>,<mo>,<bm> OK or +CMS ERROR: <error>
Read command AT+CSMS?	+CSMS: <service>,<mt>,<mo>,<bm> OK
Test command AT+CSMS=?	+CSMS: (list of supported <service>s) OK

<service> may be:



- 0: GSM03.40 and GSM03.41; the syntax of SMS AT commands is compatible with GSM07.05 Phase 2; phase 2+ features may be supported
- 1: GSM03.40 and GSM03.41; the syntax of SMS AT commands is compatible with GSM07.05 Phase 2+

<mt>, <mo>, <bm> may be:

- 0: type not supported
- 1: type supported.

10.3 Preferred message storage +CPMS

Command syntax	Description
AT+CPMS=<mem1>[,<mem2>[,<mem3>]] Set command AT+CPMS="SM","SM","BM"	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 (but is supported by the TA), final result code +CMS ERROR: <err> shall be returned. AT+CPMS: <used1>,total1>,<used2>,<total2>,<used3>,<total3> OK or +CMS ERROR: <error>
Read command AT+CPMS?	+CPMS: <mem1>,<used1>,total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> OK or +CMS ERROR: <error>
Test command AT+CPMS=?	+CPMS: (list of supported <mem1>s),(list of supported <mem2>s),(list of supported <mem3>s) OK

<mem1> may be:

- "BM" broadcast message storage
- "MT" any of the storages associated with ME;
- "ME" ME message storage;
- "SM" (U)SIM message storage

<mem2> may be:

- "MT" any of the storages associated with ME;
- "ME" ME message storage;
- "SM" (U)SIM message storage
-

<mem3> may be:

- "MT" any of the storages associated with ME;
- "ME" ME message storage;
- "SM" (U)SIM message storage

10.4 Preferred message format +CMGF

Command syntax	Description
AT+CMGF=[<mode>]	This set command indicates to TA which input and output format of messages shall be used.
Set command AT+CMGF=1	OK or +CME ERROR: <error>
Read command AT+CMGF?	+CMGF: <mode> OK
Test command AT+CMGF=?	+CMGF: (list of supported <mode>s) OK



<mode> indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from receiving SMS's. It can be:

- 0: PDU mode (default)
- 1: text mode

10.5 Save settings +CSAS

Command syntax	Description
AT+CSAS[=<profile>]	This execution command saves active message service settings to a non-volatile memory (NVRAM). In fact the settings related to +CSCA, +CSMP and +CSCB are stored in one profile. OK or +CMS ERROR: <error>
Test command AT+CSAS=?	+CSAS: (list of supported <profile>s) OK

<profile> may be:

- 0: indicates the specific profile number where settings are to be stored.

10.6 Restore Settings +CRES

Command syntax	Description
AT+CRES[=<profile>]	This command restores message service settings from a non-volatile memory (NVRAM) to active memory. The settings specified in the commands +CSCA, +CSMP and +CSCB are restored. Only one profile of stored settings is available. OK or +CMS ERROR: <error>
Test command AT+CRES=?	+CRES: (list of supported <profile>s) OK

<profile> may be:

- 0: specific profile number from where settings are to be restored.

10.7 Show text mode parameters +CSDH

Command syntax	Description
AT+CSDH=[<show>]	This set command controls whether detailed header information is shown in text mode result codes.
Set command AT+CSDH=1	OK or +CMS ERROR: <error>
Read command AT+CSDH?	+CSDH: <show> OK
Test command AT+CSDH=?	+CSDH: (list of supported <show>s) OK

<show> may be:

- 0: do not show header values defined in commands +CSCA, +CSMP (<sca>, <tosca>, <fo>, <vp>, <pid>, <dcs>) nor <length>, <toda> or <tooa> in +CMT, +CMGL, +CMGR result codes for SMS-DELIVERs and SMS-SUBMIT in text mode; for SMS-COMMAND in +CMGR result code, do not show <pid>, <mn>, <da>, <toda>, <length> or <cdata>
- 1: show the values in result codes.



10.8 New message indication +CNMI

Command syntax	Description
AT+CNMI=[<mode>[,<mt>[, ,<ds>[,<bfr>]]]]] Set command AT+CNMI=1,1	This set command selects the procedure, how receiving of new SMS from network is indicated to the TE when DTR-signal is ON. IF TE is inactive (DTR-signal OFF), message receiving should be done as specified in GSM03.38. All SMS classes are supported accordingly. <i>Note (proprietary feature): the SMS's class 0 which are normally displayed via MMI, can be also indicated on DTE via unsolicited result code +CMTI: "SM",0, wherein 0 represents a SMS without SIM-storage ("SM" indicates only that no other specific setting is needed in order to read the SMS via AT+CMGR=0).</i> OK or +CMS ERROR: <error>
Read command AT+CNMI?	+CNMI=<mode>,<mt>, ,<ds>,<bfr> OK
Test command AT+CNMI=?	+CNMI: (list of supported <mode>s),(list of supported <mt>s),(list of supported s),(list of supported <ds>s),(list of supported <bfr>s) OK

<mode> controls processing of unsolicited result codes specified with this command and may be:

- 0: buffer unsolicited result codes in the TA; if the TA buffer is full, the oldest indication may be discarded and replaced with the new received indications (ring buffer);
- 1: discard indication and reject new received message unsolicited result codes when TA-TE link is reserved; otherwise forward them directly to the TE;
- 2: buffer unsolicited result codes in the TA when the serial link is busy (e.g. data-transfer); otherwise forward them directly to the TE;

<mt> contains the rules for storing received SMS dependent on its <dc> and may be:

- 0: No SMS-DELIVER indications are routed to the TE
- 1: if SMS-DELIVER is stored in ME/TA, indication of the memory location is routed to the TE using unsolicited result code: +CMTI: <mem>,<index>
- 2: SMS-DELIVER (except class2 SMS) are routed directly to the TE using the unsolicited result code: +CMT: [<alpha>,<length><CR><LF><pdu> in PDU mode or +CMT: <oa>,<alpha>,<scts>,<tooa>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length>]<CR><LF>
 If ME has its own display device then class 0 SMS and SMS 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 SMSs and messages in the message waiting indication group (storage 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.

**
** contains the rules for storing CBMs and may be

- 0: No CBM indications to the TE
- 1: if CBM is stored in RAM/NVRAM by TA, an indication of memory location is routed to DTE unsolicited result code +CBMI: <mem>,<index>
- 2: new CBMs are routed directly to the TE using unsolicited result code: +CBM: <length><CR><LF><pdu> (when PDU-mode enabled) or +CBM: <sn>,<mid>,<dc>,<page>,<pages><CR><LF><data>
- 3: Class 3 CBMs are routed directly to TE using unsolicited result codes defined in
=2. If CBM storage is supported, messages of other classes result in indication as defined in
=1.

<ds> may be

- 0: No SMS-STATUS-REPORTs are routed to the TE
- 1: SMS-STATUS-REPORTs are routed to the TE using unsolicited result code: +CDS: <length><CR><LF><pdu> if PDU mode enabled or +CDS: <fo>,<mr>,<ra>,<tora>,>scts>,<dt>,<st> if text mode enabled
- 2: if SMS-STATUS-REPORT is stored into ME/TA, indication of the memory location is routed to the DTE using the unsolicited result code +CDSI: <mem>,<index>

<bfr> may be:



- 0: TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...3 is entered (OK response shall be given before flushing the codes).
- 1: TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered.

10.9 Read message +CMGR

Command syntax	Description
AT+CMGR=<index>	<p>This execution command returns message with location value <index> from message storage <mem1> to the TE.</p> <p><i>Note: The parameters <toa>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length> shall be displayed only when setting +CSDH=1 is.</i></p> <p><i>Note: The syntax AT+CMGR=0 allows to display a SMS class 0 if it is signaled to TA, because no classic MMI is available in the MS (s. also the note from command +CNMI).</i></p>
Set command AT+CMGR=3	<p>for SMS-DELIVER in text mode: +CMGR: <stat>,<oa>,[<alpha>],<scts>[,<toa>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length>]<CR><LF> <data></p> <p>for SMS-SUBMIT in text mode: +CMGR: <stat>,<da>,[<alpha>][<toa>,<fo>,<pid>,<dc>,[<vp>],<sca>,<tosca>,<length>]<CR> <LF><data></p> <p>for SMS-STATUS-REPORT in text mode: +CMGR: <stat>,<fo>,<mr>,[<ra>],[<tora>]<scts><dt>,<st></p> <p>for SMS-COMMAND in text mode: +CMGR: <stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toa>],<length>]</p> <p>for CBM storage in text mode: +CMGR: <stat>,<sn>,<mid>,<dc>,<page>,<pages><CR><LF><data></p> <p>in PDU mode: +CMGR: <stat>,[<alpha>],<length><CR><LF><pdu></p> <p>OK or +CMS ERROR: <error></p>
Test command AT+CMGR=?	OK

<index>: may be in range 0-400; value 0 is possible only if a SMS class 0 is received and previously the setting +CNMI=1,... was set

<stat> may be:

- 0 in PDU mode or "REC UNREAD" in text mode: received unread SMS
- 1 in PDU mode or "REC READ" in text mode: received read SMS
- 2 in PDU mode or "STO UNSENT" in text mode: stored unsent SMS
- 3 in PDU mode or "STO SENT" in text mode: stored sent SMS
- 4 in PDU mode or "ALL" in text mode: all SMS's



10.10 New Message Acknowledgement to ME/TA +CNMA

Command syntax	Description
if text mode (+CMGF=1 enabled) +CNMA if PDU mode (+CMGF=0 enabled) +CNMA[=<n>[,<length>[<CR> >PDU<ctrl-Z/ESC>]]]	<p>This execution command confirms correct reception of a new message (SMS-DELIVER or SMS-REPORT) which is routed directly to the TE. This acknowledgement command (causing ME to send RP-ACK to the network) shall be used when +CSMS parameter <service> equals 1. MS shall not send another +CMT or +CDS result code to TE before previous one is acknowledged.</p> <p>If the mobile does not get the acknowledgement within required time (network timeout), it must send RP-ERROR to the network. Both settings <mt> and <ds> of +CNMI command will be automatically set to zero.</p> <p>If the command +CNMA is received, but no acknowledgement is expected, or some other ME related errors occurs, a corresponding +CMS ERROR: <error> is returned..</p> <p>OK or +CMS ERROR: <error></p>
Test command AT+CNMA=?	OK

10.11 List message +CMGL

Command syntax	Description
AT+CMGL[=<stat>]	<p>This execution command returns SMS messages with status value <stat> from message storage <mem1> to the TE. Parameter in italics are displayed only when setting +CSDH=1 is. If status of the received message is “received unread”, status in the storage changes to “received read”.</p> <p>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>[...]]</p> <p>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> [...]]</p> <p>if text mode (+CMGF=1), command successful and SMS-COMMANDs: +CMGL: <index>,<stat>,<fo>,<ct>[<CR><LF> +CMGL: <index>,<stat>,<fo>,<ct>[...]]</p> <p>if text mode (+CMGF=1), command successful and CBM storage: +CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages> <CR><LF><data>[<CR><LF> +CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages> <CR><LF><data>[...]]</p> <p>OK or 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> [...]]</p> <p>or +CMS ERROR: <error></p>
Test command AT+CMGL=?	+CMGL: (list of supported <stat>s) OK



10.12 Send message +CMGS

Command syntax	Description
<p>(text mode): AT+CMGS=<da>[,<toda>]<CR> R><text><ctrl-Z/ESC></p> <p>(PDU mode): +CMGS=<length><CR>PDU is given<ctrl-Z/ESC></p> <p>Set command if text mode: AT+CMGS="0171112233"<CR> > "This is the text"<ctrl-Z></p> <p>if PDU mode (+CMGF=0): +CMGS=<length><CR>PDU is given<ctrl-Z/ESC></p>	<p>This 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.</p> <p><i>Note: the optional response field <scts> is not returned when +CSMS=1 (t.b.d.)</i></p> <p><CR> separates the parameter part from the text part of the edited SMS in text mode. <ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.</p> <p>if text mode: +CMGS: <mr>[,<scts>]</p> <p>if PDU mode (+CMGF=0): +CMGS: <mr>[,<ackpdu>] OK or +CMS ERROR: <error></p>
<p>Test command AT+CMGS=?</p>	OK

10.13 Write message to memory +CMGW

Command syntax	Description
<p>Command syntax in text mode: AT+CMGW[=<oa/da>[,<tooa/
/toda>[,<stat>]]]<CR><text><ctrl-Z/ESC></p> <p>Command syntax in PDU mode: AT+CMGW=<length>[,<stat>] <CR><PDU><Ctrl-Z/ESC></p> <p>Set command In text mode: AT+CMGW="091137880"<CR> > "This is the text"<Ctrl-Z></p> <p>if PDU mode: AT+CMGW=52,<CR><PDU> <Ctrl-Z></p>	<p>This execution command stores message (SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2>. Memory location <index> of the stored message is returned.</p> <p><CR> separates the parameter part from the text part of the edited SMS in text mode. <ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.</p> <p>+CMGW: <index> OK</p> <p>or +CMS ERROR: <error></p>
<p>Test command AT+CMGW=?</p>	OK



10.14 Send message from storage +CMSS

Command syntax	Description
AT+CMSS=<index>[,<da>[,<toda>]] Set command AT+CMSS=2	This execution command sends the message with location value <index> from the preferred message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND). If a new recipient address <da> is given for SMS-SUBMIT, it shall be used instead of the one stored with the message. Reference value <mr> is returned to the TE on successful message delivery. Note: the optional response field <scts> is not returned when +CSMS=1 (t.b.d.) If text mode: +CMSS: <mr>[,<scts>] OK or +CME ERROR: <error>
Test command AT+CMSS=?	OK

10.15 Set text mode parameters +CSMP

Command syntax	Description
AT+CSMP=<fo>[,<vp>[,<pid>[,<dc>]]] Set command AT+CSMP=17,167,0,0	This 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>. OK or +CME ERROR: <error>
Read command AT+CSMP?	+CSMP: <fo>,<vp>,<pid>,<dc> OK
Test command AT+CSMP=?	OK

10.16 Delete SMS +CMGD

Command syntax	Description
AT+CMGD=<index> Set command AT+CMGD=3	This execution command deletes message from preferred message storage <mem1> location <index>. OK or +CME ERROR: <error>
Test command AT+CMGD=?	OK



10.17 Service center address +CSCA

Command syntax	Description
AT+CSCA=<sca>[,<tosca>] Set command AT+CSCA="0170111000",129	This set command updates the SMSC address, through which mobile originated SMS's are transmitted. In text mode the setting is used by send and write commands. In PDU mode the setting is used by the same commands, but only when the length of SMSC address coded into <pdu> parameter equals zero. OK or +CME ERROR: <error>
Read command AT+CSCA?	+CSCA: <sca>,<tosca> OK
+CSCA: <sca>,<tosca> OK	OK

10.18 Select cell broadcast message types +CSCB

Command syntax	Description
AT+CSCB=[<mode>[,<mids>[,<dcss>]]]	This set command selects which types of CBM's are to be received by the ME.
Set command AT+CSCB=0,"1,5,10-11,40",""	OK or +CME ERROR: <error>
Read command AT+CSCB?	+CSCB=<mode>,<mids>,<dcss> OK
Test command AT+CSCB=?	+CSCB: (list of supported <mode>s) OK

<mode> may be:

- 0 message types specified in <mids> and <dcss> are accepted
- 1 message types specified in <mids> and <dcss> are not accepted

<mids> string type containing all possible combinations of CBM message identifiers (<mid>)

<dcss> string type containing all possible combinations of CBM data coding schemes (<dc>)

Note: if <mode>=0 and <mids> is an empty string, receiving of CB SMS is stopped.



11 Supplementary services commands

11.1 Call forwarding +CCFC	
Command syntax	Description
AT+CCFC=<reason>,<mode> [,<number>[,<type>[,<class>[, <subaddr>[,<satype>[,<time>]]]]]] Set command AT+CCFC=0,3,"01711234" <i>Note: Register call forwarding unconditional.</i>	This command allows the control of the call forwarding supplementary service according to GSM02.82. Registration, erasure, activation, deactivation and status query are supported. This command is abortable (proprietary feature). OK or when <mode>=2 +CCFC: <status>,<class1>[,<number>,<type>[,<subaddr>,<satype>[,<time>]]] [<CR><LF>+CCFC: <status>,<class1>[,<number>,<type>[,<subaddr>,<satype>[,<time>]]] [...]] +CME ERROR: <error>
Test command AT+CCFC=?	+CCFC: (list of supported <reason>s) OK

<reason> may be:

- 0 unconditional
- 1 mobile busy
- 2 no reply
- 3 not reachable
- 4 all call forwarding
- 5 all conditional call forwarding

<mode> may be:

- 0 disable
- 1 enable
- 2 query status
- 3 registration
- 4 erasure

<number> string type phone number of forwarding address in <type> format

<type> type of address in integer format; default 145 when dialling string includes "+", otherwise 129

<subaddr> string type subaddress; parameter currently ignored after syntax check

<satype> type of subaddress; default 128 (TON/NPI unknown); parameter currently ignored after syntax check

<class> is a sum of integers each representing a class of information (default 7 or interpreted by network if not explicitly entered) and may be:

- 1 voice
- 2 data
- 4 FAX
- 8 SMS
- 16 data circuit sync
- 32 data circuit async
- 64 dedicated packet access
- 128 dedicated PAD access

<time> time in seconds to wait before call is forwarded (default 20), but only when <reason>=2 (no reply) is enabled

<status> may be:

- 0 not active
- 1 active



11.2 Call waiting +CCWA

Command syntax	Description
AT+CCWA=[<n>[,<mode>[,<class>]]]	This command allows control of the Call Waiting supplementary service according to GSM02.83. Activation, deactivation and status query are supported. 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>. Status query is abortable by hit a key. If enabled by <n> an unsolicited result code is presented on TE when a call is signalled in following format: +CCWA: <number>,<type>,<class>,[<alpha>],[<CLI validity>],[<subaddr>,<satype>]]
Set command AT+CCWA=1,1,1	OK
Query command AT+CCWA=1,2	+CCWA: <status>,<class1> [<CR><LF>+CCWA: <status>,<class2> [...]] e.g. +CCWA: 1,1 OK or +CME ERROR: <error>
Read command AT+CCWA?	+CCWA: <n> OK
Test command AT+CCWA=?	+CCWA: (0-1) i.e. (list of supported <n>s) OK

<n> is used to enable/disable the presentation of an unsolicited result code +CCWA:

- 0: disable
- 1: enable

<mode> (if <mode> not given, network is not interrogated) may be:

- 0: disable
- 1: enable
- 2: query status

<class> is a sum of integers each representing a class of information (default 1)

- 1 voice
- 2: data;
- 4: FAX;
- 32: data circuit async; currently not supported

<status>

- 0: not active
- 1: active

<number> string type phone number of calling address in format specified by <type>

<type> type of address in integer format

<alpha> optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook

<CLI validity> may be:

- 0: CLI valid
- 1: CLI has been withheld by the originator
- 2: CLI is not available

<subaddr>: string type subaddress of format specified by <satype>

<satype>: type of subaddress octet in integer format (refer TS 24.008 [8] subclause 10.5.4.8)

To be noticed that the call waiting is not handled in uniform mode among all networks even if the GSM 02.04 describes all needed specification: "The applicability of call waiting refers to the telecommunication service of the active call and not of the waiting call. The incoming, waiting, call may be of any kind." Nevertheless, the actual implementation of the service on the networks is different.



11.3 Calling line identification restriction +CLIR

Command syntax	Description
AT+CLIR=[<n>] Set command AT+CLIR=2	This command allows to control the calling line identification restriction supplementary service (GSM02.81). This command is abortable (proprietary feature). OK or +CME ERROR: <error>
Read command AT+CLIR?	+CLIR: <n>,<m> OK
Test command AT+CLIR=?	+CLIR: (0-2) i.e. (list of supported <n>s) OK

<n> parameter sets the adjustment for outgoing calls and may be:

- 0: presentation indicator is used according to the subscription of the CLIR service
- 1: CLIR invocation
- 2: CLIR suppression

<m> parameter shows the subscriber CLIR status in the network and may be:

- 0: CLIR nor provisioned
- 1: CLIR provisioned in permanent mode
- 2: unknown
- 3: CLIR temporary mode presentation restricted
- 4: CLIR temporary mode presentation allowed

11.4 Calling line identification presentation +CLIP

Command syntax	Description
AT+CLIP=<n> Set command AT+CLIP=1	This command allows to control the calling line identification presentation supplementary service. When CLI is enabled, +CLI response is returned after every RING (or +CRING) result code. When the presentation of CLI at the TE is enabled, the following unsolicited result code is displayed after RING (or +CRING): +CLIP: <number>,<type>,[,<subaddr>,<satype>],[,<alpha>],[,<CLI validity>]]] This command is abortable (proprietary feature). OK or +CME ERROR: <error>
Read command AT+CLIP?	+CLIP: <n>,<m> OK
Test command AT+CLIP=?	+CLIP: (0-1) i.e. (list of supported <n>s) OK

<n> parameter sets/shows the result code presentation in the TA:

- 0: disable
- 1: enable

<m> parameter shows the subscriber CLIP service status in the network and may be:

- 0: CLIP not provisioned
- 1: CLIP provisioned
- 2: unknown

<number> string type phone number of calling address in format specified by <type>

<type> type of address in integer format

<subaddr> and <satype> are not used



<alpha> optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook
 <CLI validity> may be:

- 0: CLI valid
- 1: CLI has been withheld by the originator
- 2: CLI is not available

11.5 Connected line identification presentation +COLP

Command syntax	Description
AT+COLP=<n>	This command allows the control of the connected line identification presentation supplementary service, useful in case of call forwarding of the connected line. When enabled and call allowed the following intermediate result code is sent to TE before any +CR or V.25ter responses: +COLP: <number>,<type>[,<subaddr>,<satype>[,<alpha>]] This command is abortable (proprietary feature).
Set command AT+COLP=1	OK or +CME ERROR: <error>
Read command AT+COLP?	+COLP: <n>,<m> OK
Test command AT+COLP=?	+COLP: (0-1) i.e. (list of supported <n>s) OK

<n> parameter sets/shows the result code presentation status in the TA and may be:

- 0: disable
- 1: enable

<m> parameter shows the subscriber COLP service status in the network and may be:

- 0: COLP not provisioned
- 1: COLP provisioned
- 2: unknown

<number>, <type>, <subaddr>, <satype>, <alpha> refer to +CLIP

11.6 Connected line identification restriction +COLR

Command syntax	Description
AT+COLR?	The COLR supplementary service enables the connected party to prevent presentation of its line identity to the calling party. According to GSM02.81 the activation and deactivation of COLR is only a result of provision / withdrawal. The command +COLR allows only the interrogation of the current state of COLR service in the network. The set syntax is not allowed (+CME ERROR: operation not supported).
Read command AT+COLR?	+COLR: <status> OK
Test command AT+COLR=?	OK

<status> parameter shows the subscriber COLR service status in the network and may be:

- 0: COLR not provisioned
- 1: COLR provisioned
- 2: unknown



11.7 Advise of charge +CAOC

Command syntax	Description
AT+CAOC[=<mode>] Set command AT+CAOC=0	This command allows the subscriber to get the information about the call cost using the Advise of Charge supplementary service (GSM02.24 and GSM02.86). If enabled the following unsolicited result code is sent to TE periodically: +CCCM: <ccm> +CAOC: "000A02" OK or +CME ERROR: <error>
Read command AT+CAOC?	+CAOC: <mode> OK
Test command AT+CAOC=?	+CAOC: (0-2) i.e. (list of supported <mode>s) OK

<mode> may be:

- 0: query the CCM value
- 1: deactivate the unsolicited reporting of CCM value
- 2: activate the unsolicited reporting of CCM value

<ccm> current call meter may is indicated as a string in hexadecimal format

11.8 Accumulated call meter +CACM

Command syntax	Description
AT+CACM=<passwd> Set command AT+CACM="0933"	This command resets the Advice of charge related accumulated call meter value in SIM file EF-ACM. ACM contains the total number of home units for both the current and preceding calls. SIM PIN2 is required to reset the value. OK or +CME ERROR: <error>
Read command AT+CACM?	+CACM: <acm> OK
Test command AT+CACM=?	OK

<passwd> SIM PIN2 as string type

<acm> accumulated call meter value similarly coded as <ccm> under +CAOC as string type

11.9 Accumulated call meter maximum +CAMM

Command syntax	Description
AT+CAMM=<acmmax>,<passwd> Set command AT+CACM="0933"	This command sets the Advise of Charge related accumulated call meter maximum value in the SIM file EF-ACMmax. ACMmax contains the maximum number of home units allowed to be consumed by the subscriber. When ACM reaches ACMmax, calls are prohibited. SIM PIN2 is required to set the value. OK or +CME ERROR: <error>
Read command AT+CAMM?	+CAMM: <acmmax> OK
Test command AT+CAMM=?	OK



<acmmx> string type containing the accumulated call meter maximum value similarly coded as <ccm> under +CAOC; value zero disables ACMmax feature

<passwd> SIM PIN2

11.10 Price per unit and currency table +CPUC

Command syntax	Description
AT+CPUC=<currency>,<ppu> [<passwd>]	This set command sets the parameters of Advise of Charge related price per unit and currency table in SIM file EF-PUCT. PUCT information can be used to convert the home units into currency units. SIM PIN2 is required to set the parameters.
Set command AT+CPUC="USD",0.20,"0933"	OK or +CME ERROR: <error>
Read command AT+CPUC?	+CPUC: <currency>,<ppu> OK
Test command AT+CPUC=?	OK

<currency> string type containing the three-character currency code (e.g. "GBP","EUR")

<ppu> string type containing the price per unit; dot is used as a decimal separator

<passwd> string type containing the SIM PIN2

11.11 Call related supplementary services +CHLD

Command syntax	Description
AT+CHLD=[<n>]	This command allows to manage call hold and multiparty conversation (conference call). Calls can be put on hold, recovered, released or added to conversation.
Set command AT+CHLD=2	OK or +CME ERROR: <error>
Test command AT+CHLD=?	+CHLD: (0,1,1x,2,2x,3,4,4*,6,7,8) i.e. (list of supported <n>s) OK

<n> may be:

- 0: release all held calls or set User Determined User Busy for a waiting call; if both exists then only the waiting call will be rejected;
- 1: release all active calls and accepts the other (held or waiting);
- 1x: release a specific call (x specific call number as indicated by +CCLC);
- 2: place all active calls (if exist) on hold and accepts the other call (held or waiting);
- 2x: place all active calls on hold except call x with which communication is supported;
- 3: adds a held call to the conversation;
- 4: connects the two calls and disconnects the subscriber from both calls (Explicit Call Transfer);
- 4*: call deflection (proprietary feature);
- 5: call completion of busy subscriber; this command syntax will be interpreted as an activation request, if the network has previously offered the possibility to activate this function, which will be indicated to the user by the unsolicited result code +XCCBS: 1 (CCBS is possible);
- 6: puts an active call on hold or an held call to active, while another call is waiting;
- 7: disconnect users in multiparty without accepting incoming call;
- 8: release all calls (active and held).



11.12 Call deflection +CTFR

Command syntax	Description
AT+CTFR=<number>[,<type>[,<subaddr>[,<satype>]]]	This command allows the DTE user to respond to an incoming call offered by the network by requesting call deflection, i.e. redirection of this call to another number specified in the response. The call deflection is a supplementary service applicable only to voice calls (teleservice 11).
Set command AT+CTFR=""09113788""	OK or +CME ERROR: <error>
Test command AT+CTFR=?	OK

<number> is the string type phone number of format specified by <type>

<subaddr> is the string type subaddress of format specified by <satype>

11.13 List current calls +CLCC

Command syntax	Description
AT+CLCC	This command returns the list of current calls of ME. If command succeeds but no calls are available, no information response is sent to TE. Response syntax: [+CLCC: <id1>,<dir>,<stat>,<mode>,<mpty>[,<number>,<type>[,<alpha>]] [<CR><LF>+CLCC: <id2>,<dir>,<stat>,<mode>,<mpty>[,<number>,<type>[,<alpha>]] [...]] +CLCC: 1,0,0,0,0,""0913137880"",129 OK or OK (if no calls) or +CME ERROR: <error>
Test command AT+CLCC=?	OK

<idx> integer type indicating the call identification (s.+CHLD x)

<dir> direction and may be:

- 0: mobile originated (MO)
- 1: mobile terminated (MT)

<stat> state of the call and may be

- 0: active
- 1: held
- 2: dialling (MO call)
- 3: alerting (MO cal)
- 4: incoming (MT call)
- 5: waiting (MT call)

<mode> teleservice and may be:

- 0: voice
- 1: data
- 2: FAX
- 9: unknown

<mpty> may be

- 0: cal is not one of multiparty (conference) call parties
- 1: call is one of multiparty cal parties

<number> string type indicating the phone number in format specified by <type>



<type> type of address octet (phone number) in integer format

<alpha> optional string alphanumeric representation of <number> corresponding to the entry found in phonebook

11.14 Supplementary service notifications +CSSN

Command syntax	Description
AT+CSSN=[<n>[,<m>]]	<p>This command refers to supplementary service related network initiated notifications.</p> <p>When <n>=1 and a supplementary service notification is received after a mobile originated call setup, intermediate result code +CSSI: <code1> is sent before any other MO call setup result codes.</p> <p>When <m>=1 and a supplementary service notification is received during a call, unsolicited result code +CSSU: <code2> is sent.</p> <p>Response syntax: +CSSI: <code1>[,<index>] +CSSU: <code2>[<index>[,<number>,<type>[,<subaddr>,<stype>]]]</p>
Set command AT+CSSN=1,1	<p>OK or +CME ERROR: <error></p>
Read command AT+CSSN?	<p>+CSSN: <n>,<m> OK</p>
Test command AT+CSSN=?	<p>+CSSN: (list of supported <n>s),(list of supported <m>s) OK</p>

<n> this parameter sets/shows the +CSSI result code presentation status in the TA and may be:

- 0: disable
- 1: enable

<m> this parameter sets/shows the +CSSU result code presentation status in the TA and may be:

- 0: disable
- 1: enable

<code1> may be:

- 0: unconditional call forwarding is active
- 1: some of the conditional call forwardings are active
- 2: call has been forwarded
- 3: call is waiting
- 4: this is a CUG call (also <index> present)
- 5: outgoing calls are barred
- 6: incoming calls are barred
- 7: CLIR suppression rejected
- 8: calls has been deflected

<index> refer +CCUG

<code2> may be:

- 0: this is a forwarded call (MT call setup)
- 1: this is a CUG call (<index> present) (MT call setup)
- 2: call has been put on hold (during a voice call)
- 3: call has been retrieved (during a voice call)
- 4: multiparty call entered (during a voice call)
- 5: cal on hold has been released – not a SS notification – (during a voice call)
- 6: forward check SS message received (can be received whenever)
- 7: call is being connected (alerting) with the remote party in alerting state in explicit call transfer operation (during a voice call)
- 8: call has been connected with the other remote party in explicit call transfer operation (during a voice call or MT call setup)



- 9: this is a deflected call (MT call setup)
- 10: additional incoming call forwarded

<number> string type phone of format specified by <type>

<type> type of address octet in integer format

<subaddr>, <satype> not used

11.15 Unstructured supplementary service data +CUSD

Command syntax	Description
AT+CUSD=[<n>[,<str>[,<dcs>]]]	This command allows control of the Unstructured Supplementary Service Data (USSD) according to GSM02.90. Both network and mobile initiated operations are supported. Parameter <n> is used to disable/enable the presentation of an unsolicited result code +CUSD: <m>[,<str>,<dcs>] to the TE. Value <n>=2 is used to cancel an ongoing USSD session. This command is abortable (proprietary feature). When <str> is given, a mobile initiated USSD-string or a response USSD-string to a network initiated operation is sent to the network. The response USSD-string from the network is returned in the unsolicited +CUSD result code indicated above.
Set command AT+CUSD=1,"*100#",15	+CUSD: 2,"Residual credit: 7,87 Euro",15 OK or +CME ERROR: <error>
Read command AT+CUSD?	+CUSD: <n> OK
Test command AT+CUSD=?	+CUSD: (list of supported <n>s) OK

<n> may be:

- 0: disable the result code presentation in the TA
- 1: enable the result code presentation in the TA
- 2: cancel session (not applicable to read command response)

<str> sting type USSD-string converted in the selected character set

<dcs> data coding scheme

<m> may be:

- 0: no further user action required
- 1: further user action required
- 2: USSD termination by network
- 4: operation not supported
- 5: network time out

11.16 Closed user group +CCUG

Command syntax	Description
AT+CCUG=<n>[,<index>[,<info>]]	This command enables subscribers to form closed user groups to and from which access is restricted (GSM02.85). The command can be used to: <ul style="list-style-type: none"> - activate/deactivate the control of the CUG information for all following calls - select a CUG index - suppress the outgoing access (OA). The OA allows a member of a CUG to place calls outside the CUG - suppress the preferential CUG.
Set command AT+CCUG=1,2,1	OK or +CME ERROR: <error>



Read command AT+CCUG?	+CCUG: <n>,<index>,<info> OK
Test command AT+CCUG=?	OK

<n> may be:

- 0: disable CUG temporary
- 1: enable CUG temporary

<index> may be:

- 0 ... 9 CUG index
- 10 no index (preferred CUG taken from subscriber data)

<info> may be:

- 0: no information
- 1: suppress OA
- 2: suppress preferential CUG
- 3: suppress OA and preferential CUG

11.17 Calling name presentation +CNAP

Command syntax	Description
AT+CNAP=[<n>]	This command allows to control the name identification supplementary service (s. GSM02.96). When the presentation of CNAP at the TE is enabled, the following unsolicited result code is displayed: +CNAP: <calling_name> [, <CNAP validity>] This command is abortable (proprietary feature).
Set command AT+CNAP=1	OK or +CME ERROR: <error>
Read command AT+CNAP?	+CNAP: <n>, <m> OK
Test command AT+CNAP=?	+CNAP: (0-1) i.e. (list of supported <n>s) OK

<n> parameter sets the result code presentation in the TA:

- 0: disable
- 1: enable

<m> parameter shows the subscriber CNAP service status in the network and may be:

- 0: CNAP not provisioned
- 1: CNAP provisioned
- 2: unknown

<calling_name> string type containing the calling party name.

<CNAP validity>] may be:

- 0: name presentation allowed
- 1: presentation restricted
- 2: name unavailable
- 3: name presentation restricted



12 Data commands

12.1 Select bearer service type +CBST

Command syntax	Description
AT+CBST=[<speed>,<name> [<ce>]] Set command AT+CBST=5,0,1	This set command selects the bearer service <name> with data rate <speed>, and the connection element <ce> to be used when data calls are originated. OK or +CME ERROR: <error>
Read command AT+CBST?	+CBST: <speed>,<name>,<ce> OK
Test command AT+CBST=?	+CBST: (list of supported <speed>s),(list of supported <name>s),(list of supported <ce>s) OK

<speed> data rate may be:

- 0: autobauding
- 4: 2400 bps (V.22bis)
- 5: 2400 bps (V.26ter)
- 6: 4800 bps (V.32)
- 7: 9600 bps (V.34)
- 68: 2400 bps (V110 or X.31 flag stuffing)
- 70: 4800 bps (V110 or X.31 flag stuffing)
- 71: 9600 bps (V110 or X.31 flag stuffing)

<name> bearer service may be:

- 0: data circuit asynchronous (UDI or 3.1 kHz modem)

<ce> connection element may be:

- 0: transparent
- 1: non-transparent
- 2: both, transparent preferred
- 3: both, non-transparent preferred

12.2 Service class selection and identification +FCLASS

Command syntax	Description
AT+FCLASS=<class> Set command AT+FCLASS=2.0	This command puts the MS into a particular mode of operation (voice, data or FAX). OK or +CME ERROR: <error>
Read command AT+FCLASS?	<n> OK
Test command AT+FCLASS=?	List of supported <class>s OK

<class> may be:

- 0: data
- 2.0: FAX (service class 2)
- 8: voice



12.3 Service reporting control +CR

Command syntax	Description
AT+CR=<mode>	This set command controls whether or not intermediate result code +CR: <serv> is returned from the TA to the TE. If enabled, the intermediate result code is transmitted at the point during connect negotiation at which the TA has determined which speed and quality of service will be used, before any error control or data compression reports are transmitted and before the intermediate result code CONNECT is transmitted.
Set command AT+CR=1	OK or +CME ERROR: <error>
Read command AT+CR?	+CR: <mode> OK
Test command AT+CR=?	+CR: (list of supported <mode>s) OK

<mode> may be:

- 0: disables reporting
- 1: enables reporting

<serv> may be:

- ASYNC : asynchronous transparent
- SYNC: synchronous transparent
- REL ASYNC: asynchronous non-transparent
- GPRS [<L2P>]: GPRS

12.4 Cellular result codes +CRC

Command syntax	Description
AT+CRC=<mode>	This command enables a more detailed ring indication, in case of incoming call. Instead of RING a unsolicited result code +CRING: <type> is displayed on TE.
Set command AT+CRC=1	OK or +CME ERROR: <error>
Read command AT+CRC?	+CRC: <mode> OK
Test command AT+CRC=?	+CRC: (list of supported <mode>s) OK

<mode> may be:

- 0: disables extended format
- 1: enables extended format

<type> may be:

- ASYNC: asynchronous transparent
- SYNC: synchronous transparent
- REL ASYNC: asynchronous non-transparent
- REL SYNC: synchronous non-transparent
- FAX: facsimile (TS62)
- VOICE: normal voice (TS11)
- ALT VOICE / FAX: alternating voice/FAX, voice first (TS61)
- ALT FAX / VOICE alternating voice/FAX, FAX first (TS61)
- GPRS <PDP_type>,<PDP_addr>[,<L2P>][,<APN>]: GPRS network request for PDP context activation



12.5 Radio link protocol +CRLP

Command syntax	Description
AT+CRLP=[<iws>[,<mws>[,<T1>[,<N2>]]]] Set command AT+CRLP=61,61,48,6	This command is used to change the radio link protocol (RLP) parameters used when non-transparent data-calls are originated. OK or +CME ERROR: <error>
Read command AT+CRLP?	+CRLP: <iws>,<mws>,<T1>,<N2> OK
Test command AT+CRLP=?	+CRLP: (0-61),(0-61),(39-255)(1-255) i.e. lists of supported <iws>, <mws>, <T1>, <N2> OK

<iws> IWF to MS window size
 <mws> MS to IWF window size
 <T1> acknowledgement timer T1
 <N2> retransmission attempts



13 FAX class 2 commands

13.1 Transmit Data +FDT

Command syntax	Description
AT+FDT	This action command prefixes data transmission. It requests the DCE to transmit a phase C page. It is issued at the beginning of each page in phase B or D.

13.2 Receive data +FDR

Command syntax	Description
AT+FDR	This action command initiates data reception.

13.3 Initialize facsimile parameters +FIP

Command syntax	Description
AT+FIP[=<value>]	This action command causes the DCE to initialize all Service Class Facsimile Parameters to the manufacturer determined default settings. It does not change the setting +FCLASS.

<value> indicates the profile; only one profile is possible for <value>=0

13.4 Session termination +FKS, +FK

Command syntax	Description
AT+FKS or AT+FK	This action command causes the DCE to terminate the session in an orderly manner. It will send a DCN message at the next opportunity and hang up.

13.5 Adaptive answer +FAA

Command syntax	Description
AT+FAA=<value>	This command allows a adaptive answer of DCE depending on the parameter <value>.

<value>

- 0: the DCE shall answer only as a Class 2 facsimile device
- 1: the DCE can answer and automatically determine whether to answer as a facsimile DCE or as a data modem. If a data modem is detected, the DCE shall operate as described in T.32 8.3.2.4.

13.6 Address & polling capabilities +FAP

Command syntax	Description
AT+FAP=<sub>,<sep>,<pwd> >	This command indicates the remote station the address and polling capabilities and also control the reporting of those frames if received.

<sub> subaddressing; default value: 0

<sep> selective polling; default value: 0

<pwd> password; default value: 0



13.7 Buffer size +FBS

Command syntax	Description
AT+FBS?	This command allows the DCE to report the size of its data buffers. Response syntax: <tbs>,<rbs>

<tbs> transmit buffer size

<rbs> receive buffer size

13.8 Data bit order +FBO

Command syntax	Description
AT+FBO=<value>	This set command controls the mapping between PSTN facsimile data and the DTE-DCE link. There are two choices: Direct: the first bit transferred of each octet on the DTE-DCE link is the first bit transferred on the GSTN data carrier Reversed: the last bit transferred of each octet on the DTE-DCE link is the first bit transferred on the GSTN data carrier.

<value> has the range: 0-3.

13.9 HDLC frame reporting +FBU

Command syntax	Description
AT+FBU=<value>	This command enables/disables the DCE to report the contents of phase B and phase D HDLC frames to the DTE, as they are sent and received, in addition to other responses.

<value> is in range 0-1.

13.10 DS capabilities parameters +FCC

Command syntax	Description
AT+FCC=<vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp> (or AT+DCC=.)	This command allows the DTE to sense and constrain the capabilities of the facsimile DCE, from the choices defined in table 2/T.30. When +FCC is modified by the DTE, the DCE shall copy +FCC into +FIS.

<vr> resolution in range 0-1

 bit rate in range 0-3

<wd> page width in pixels; only 0 value

<ln> page length in range 0-2

<df> data compression format; only 0 value

<ec> error correction; only 0 value

<bf> file transfer; only 0 value

<st> scan time/line in range 0-7

<jp> JPEG for colour and B&W; only 0 value.

13.11 Copy quality checking +FCQ

Command syntax	Description
AT+FCQ=<rq>,<tq>	This command allows to control copy quality checking and correction by a facsimile DCE.

<rq> controls copy quality checking and correction of data received from the remote station and delivered to DTE

<tq> controls copy quality checking and correction of image data received from the DTE and sent to the remote station.



13.12 Capability to receive data +FCR

Command syntax	Description
AT+FCR=<value>	This command sets the capability to receive message data.

<value> only value 1 allowed; it means that the DCE can receive message data. Bit 10 in the DIS or DTC frame will be set.

13.13 Current session results +FCS

Command syntax	Description
AT+FCS?	This command allows to display the current session results, either as response to the read syntax or spontaneously during execution of +FDR. Response syntax: <vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp>

See +FCC.

13.14 DTE phase C response timeout +FCT

Command syntax	Description
AT+FCT=<value>	This command determines how long the DCE will wait for a command after having transmitted all available phase C data.

<value> is in range 0-FFH, meaning 1 second units. Default value: 1EH (30) sec.

13.15 Phase C received EOL alignment +FEA

Command syntax	Description
AT+FEA=<value>	This command enables optional octet-alignment of EOL markers in received T.4 data stream. It does not apply to T.6 data, or to any form of data.

<value> may be:

0: determines that T.4 EOL patterns are bit aligned (as received)

1: determines that the last received bits of T.4 EOL patterns are octet aligned by the DCE, with necessary zero fill bits inserted.

13.16 Format conversion +FFC

Command syntax	Description
AT+FFC=<vrc>,<dfv>,<inc>,<wdc>	This command determines the DCE response to mismatches between the phase C data delivered after the +FDT command and the data format parameters negotiated for the facsimile session.

<vrc> vertical resolution format codes may be:

- 0: ignored
- 1: enabled
- 2: enabled for 1-D data
- 3: enabled for 2-D data

<dfc> data format codes may be:

- 0: ignored
- 1: checking enabled
- 2: conversion



<inc> page length format codes may be:

- 0: ignored
- 1: checking enabled
- 2: conversion for 1-D data
- 3: conversion enabled for 2-D data

<wdc> page with format codes may be:

- 0: ignored
- 1: checking enabled
- 2: conversion enabled

13.17 Call termination status +FHS

Command syntax	Description
AT+FHS? (read syntax only)	This command indicates the cause of a hang-up +FHS is set by the DS at the conclusion of a FAX session. The DCE resets this value to 0 at the beginning of phase A. Response syntax: <value>

<value> may be in range 0-FFH

13.18 Procedure interrupt enable +FIE

Command syntax	Description
AT+FIE=<value>	This command allows either station to initiate interrupts; the other station may ignore or accept the requests.

<value> only value 0 is allowed; it means that the procedure interrupt requests from the remote station are ignored and not reported to DTE.

13.19 Current session parameters +FIS

Command syntax	Description
AT+FIS=<vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp>	This command allows the DTE to sense and constrain the capabilities used for the current session.

See +FCC.

13.20 Inactivity timeout +FIT

Command syntax	Description
AT+FIT=[<time>,<action>]	This command allows to provide an inactivity timer which allows the DS to break away from an unsuccessful connection attempt at any stage of a facsimile transfer.

<time> valid time in range 0-255

<action> only value 0 possible and means: upon timeout the DCE shall go on-hook, executing an implied ATH command, then reset to +FCLASS=0.

13.21 Local ID string +FLI

Command syntax	Description
AT+FLI=<local ID string>	This command determines that DCE sends the ID frame if +FLI is not a zero-string.

<local ID string> 20 digit string; valid values are 0x20...0x7E.



13.22 Set flow control +FLO

Command syntax	Description
AT+FLO=<value>	This command allows to set the flow control for communication via V.24 interface.

<value> indicates the kind of flow control:

- 0: DTE-DCE flow control is disabled
- 1: DTE-DCE flow control is DC1/DC3 (SW)
- 2: DTE-DCE flow control is RTC/CTS (HW)

13.23 Indicate document to poll +FLP

Command syntax	Description
AT+FLP=[<value>]	This command indicates document to poll. By default DTE has no document to poll.

<value> only value 0 is allowed.

13.24 Request manufacturer identification +FMI

Command syntax	Description
AT+FMI	This command gives the manufacturer identification. <manufacturer> OK or +CME ERROR: <error>
Test command AT+FMI=?	OK

13.25 Request model identification +FMM

Command syntax	Description
AT+FMM	This command gives the model identification. <model> OK or +CME ERROR: <error>
Test command AT+FMM=?	OK

13.26 Request revision identification +FMR

Command syntax	Description
AT+FMR	This command gives the revised version of the mobile station. <revision> OK or +CME ERROR: <error>
Test command AT+FMR=?	OK



13.27 Minimum phase C speed +FMS

Command syntax	Description
AT+FMS=[<value>]	This command limits the lowest negotiable speed for a session.

<value> may be in range 0-3 (2400 bps to 9600 bps)

13.28 Negotiation reporting +FNR

Command syntax	Description
AT+FNR=[<rpr>[,<tp>[,<idr>[,<nsr>]]]]	This command controls the reporting of messages generated during T.30 phase B negotiations.

<rpr> receiver parameters reporting 0-1 (no-yes)

<tp> transmitter parameters reporting 0-1 (no-yes)

<idr> ID strings reporting 0-1 (no-yes)

<nsr> non-standard frames reporting 0-1 (no-yes)

13.29 Non-standard frame FIF octet string +FNS

Command syntax	Description
AT+FNS=<string of hexadecimal coded octets>	This command allows to send the corresponding non-standard facilities frame.

Valid is only the null string.

13.30 NSF message data indication +FND

Command syntax	Description
AT+FND=[<value>]	This command has no effect.

<value> may be in range 0-1

13.31 Selective polling address +FPA

Command syntax	Description
AT+FPA=<selective polling address string>	This command sets the selective polling address. The DCE sends the numeric string contained in the +FPA at the times specified in T.30, if the corresponding parameter is not zero string.

<selective polling address string> 20 digit string; valid values 0-9, *, #, space

13.32 Local polling ID string +FPI

Command syntax	Description
AT+FLI=<local polling ID string>	This command allows the DCE to send the ID frame if +FPI is not a zero string. Polling is not supported.

<local polling ID string> only zero string; polling is not supported.



13.33 Packet protocol control +FPP

Command syntax	Description
AT+FPP=[<value>]	This command allows to control the packet protocol. The packet protocol is not supported.

<value> only value 0 allowed.

13.34 Page status +FPS

Command syntax	Description
AT+FPS=[<value>]	This parameter contains a value representing the post age response, including copy quality and related end-of-page status

<value> may be:

- 1: MCF, page good
- 2: RTN, page bad; retrain requested
- 3: RTP, page good; retrain requested
- 4: PIN, page bad; interrupt requested
- 5: PIP, page good; interrupt requested

13.35 Password parameter +FPW

Command syntax	Description
AT+FPW=<password string>	This parameter sets the password. The DCE sends the numeric string contained in +FPW at the times specified in T.30, if the corresponding parameter is not zero string.

<password string> valid values: 0-9, *, #, space

13.36 Receive quality thresholds +FRQ

Command syntax	Description
AT+FRQ=<pgl>,<cbl>	This command allows to make the “Copy Quality OK” decision using the command parameter. The command has no effect.

<pgl> in range 0-64H

<cbl> in range 0-FFH

13.37 Error correction mode retry count +FRY

Command syntax	Description
AT+FRY=[<value>]	This command has no effect.

<value> in range 0-FFH

13.38 SubAddress parameter +FSA

Command syntax	Description
AT+FSA=<destination SubAddress string>	This command sets the Subaddress. The DCE sends the numeric string contained in +FSA at the times specified in T.30, if the corresponding parameter is not zero string.

<destination SubAddress string> 20 digit string; allowed values: 0-9, *, #, space



13.39 SubAddress parameter +FSA

Command syntax	Description
AT+FSP=[<value>]	This command indicates whether or not the DTE wants to poll. The command has no effect.

<value> 0



14 V24 control and V25ter commands

14.1 Reset to default configuration Z

Command syntax	Description
ATZ[<value>]	<p>This command loads in the Active Profile the command parameters stored in the corresponding NVRAM-profile, indicated by the <value>. The current session Active Profile parameters are runtime modified. See also AT&V command.</p> <p>OK or +CME ERROR: <error></p>

<value> indicates NVRAM profile; possible values 0 or 1.

14.2 Set to factory defined configuration &F

Command syntax	Description
AT&F	<p>This command reset to factory defined default values the parameters of the commands included in the Active Profile. The current session Active Profile parameters are runtime modified. See also AT&V command.</p> <p>OK or +CME ERROR: <error></p>

14.3 Circuit 109 behavior &C

Command syntax	Description
AT&C[<value>]	<p>This command determines how the state of circuit 109 relates to the detection of received line signal from the remote end.</p> <p>OK or +CME ERROR: <error></p>

<value> indicates the behaviour of circuit 109 as follows:

- 0: the DCE always presents the ON condition on circuit 109
- 1: circuit 109 changes in accordance with the underlying DCE, which may include functions other than the physical layer functions

If the parameter is not inserted, the value is set to 0.



14.4 Circuit 108/2 behavior &D

Command syntax	Description
AT&D[<value>]	This command determines how the DCE responds when circuit 108/2 is changed from ON to OFF condition during on-line data state. This behaviour is provided for the CSD data calls in conformance to the V25-ter spec[20]. Please note that for a GPRS data transfer session with a context activated and a PPP L2 protocol, when circuit 108/2 is changed from ON to OFF condition, the data transfer is terminated and the context is deactivated.
AT&D1	OK or +CME ERROR: <error>

<value> may be:

- 0: the DCE ignores circuit 108/2
- 1: upon an ON-to-OFF transition of circuit 108/2, the DCE enters online command state and issues an OK result code
- 2: upon an ON-to-OFF transition of circuit 108/2, the DCE instructs the underlying DCE to perform an orderly cleardown of the call. Automatic answer is disabled while circuit 108/2 remains OFF.

If the parameter is not inserted, the value is set to 0.

14.5 ~+++ behaviour in GPRS &D

A special meaning of the &D value is provided for the ~+++ sequence during a GPRS data transfer (this is outside the V25-ter specification scope). The ~+++ lead to a context deactivation during a GPRS data transfer session for the AT&D0, AT&D1 values (please note that the +++ return to on-line command mode is provided for each &D value during a CSD data call [20]).

A different implementation for the ~+++ is done with the &D2 value: GPRS data transfer is escaped and system returns in the on-line command state. The ATO command is used to resume the GPRS data transfer session.

During the on-line command mode different AT commands can be sent but some limitations are present:

- data calls in GPRS on-line command mode cannot be granted (please activate the AT+CRC=1 mode in order to identify the kind of call and reject data incoming calls if GPRS is in the on-line command mode);
- if provided, the MUX functionalities cannot be used in cooperation with the GPRS on-line command mode (please note that the MUX is a specific feature, not available in all the platforms)

14.6 Circuit 108/2, +++ behaviour for the different &D: summarizing table

	CSD		GPRS	
	+++	DTR On to Off in data state	~+++	DTR On to Off in data state
&D0	Command mode	Data state	Context deactivation	Context deactivation
&D1	Command mode	Command mode	Context deactivation	Context deactivation
&D2	Command mode	Cleardown call	Command mode (with limitations)	Context deactivation



14.7 DSR override &S

Command syntax	Description
AT&S[<value>] AT&S	This command selects how the modem will control DSR (V.24 control line 107). OK or +CME ERROR: <error>

<value> indicates the behaviour as follows:

- 0: sets the DSR line to ON
- 1: sets the DSR line to OFF

14.8 Flow control &K

Command syntax	Description
AT&S[<value>] AT&K3	This command controls the flow control mechanism. OK or +CME ERROR: <error>

<value> may be:

- 0: disable DTE flow control
- 3: enable RTS/CTS DTE flow control (default for data modems)
- 4: enable XON/XOFF DTE flow control
- 5: enable XON/XOFF DTE flow control
- 6: enable XON/XOFF DTE flow control

If the parameter is not inserted, the value is set to 0.

14.9 Store current configuration &W (Please look at example)

Command syntax	Description
AT&W[<value>]	<p>This command stores the current active configuration into one of the two user profiles in NVRAM as denoted by the parameter value. The profile is stored for the terminal where the storing is requested. This command must be used together with AT+CPWROFF, please look at example.</p> <p>The AT commands with the related parameters that are stored in the user profiles are reported in the following:</p> <ul style="list-style-type: none"> - AT&C: Circuit 109 behavior; - AT&D: Circuit 108 behavior; - AT&K: Flow control; - ATE: Echo mode; - ATQ: Response Suppression Mode; - ATV: Response Formatting Mode; - ATX: Call Progress Monitoring Control; - ATS0: Automatic answer; - ATS2: Escape character; - ATS3: Command line termination character; - ATS4: Response formatting character; - ATS5: Command line editing character;



Set command AT&W<value>	<ul style="list-style-type: none"> - AT+S7: Connection completion timeout; - AT+CBST: Data Rate, Bearer Service, Connection Element; - AT+CRLP: RlpIws (IWF to MS window size), RlpMws (MS to IWF window size), Rlp96T1 (acknowledgement timer T1), RlpN2 (retransmission attempts N2); - AT+CR: Service Report Control Mode; - AT+CRC: Cellular Result Mode; - +BR (+IPR saved value): Baud Rate; - AT+COPS: Cops mode, Cops PLMN to Register; - AT+NMGC: Microphone Gain Control; - AT+NSGC: Speaker Gain Control; - AT+NSTN: Sidetone; - AT+NUBF: Uplink Biquad Filters; - AT+NDBF: Downlink Biquad Filters; - AT+NHFP: Hand Free Parameters; - AT+ICF: DTE-DCE character framing; AT+NPSV: Power saving control.
	OK or +CME ERROR: <error>

<value> may be:

- 0: selects profile 0
- 1: selects profile 1

If the parameter is not inserted, the value is set to 0.

Example:

1. AT+IPR=9600
2. AT&W
3. AT+CPWROFF (Two last commands command must be used to store settings)

14.10 Display current configuration &V

Command syntax	Description
AT&V	This command reports the current configuration and the stored user profiles. ACTIVE PROFILE: &C1, &D1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:013, S04:010, S05:008, S07:060, +CBST:007, 000, 001, +CRLP:061, 061, 048, 006, +CR:000, +CRC:000, +BR:57600, +COPS:2, FFFFF STORED PROFILE 0: &C1, &D1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:013, S04:010, S05:008, S07:060, +CBST:007, 000, 001, +CRLP:061, 061, 048, 006, +CR:000, +CRC:000, +BR:115200, +COPS:2, FFFFF STORED PROFILE 1: &C1, &D1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:013, S04:010, S05:008, S07:060, +CBST:007, 000, 001, +CRLP:061, 061, 048, 006, +CR:000, +CRC:000, +BR:115200, +COPS:2, FFFFF OK or +CME ERROR: <error>



The last field of the profiles indicates the value of <oper> parameter (in MCC/MNC codes) of +COPS command. This field assumes valid value in the case that <mode> parameter of +COPS command is saved with value equal 1 (in the case that the network is requested); in the case that this parameter is set to 0 (automatic search) or 2 (deregister from network) then the parameter will be saved with FFFFF

Audio parameters are stored in the profiles but are not reported by AT&V command.

Audio parameters in the active profile can be reported by dedicated test commands:

AT+NMGC?	Microphone Gain Control
AT+NSGC?	Speaker Gain Control
AT+NSTN?	Sidetone
AT+NUBF?	Uplink Biquad Filters
AT+NDBF?	Downlink Biquad Filters
AT+NHFP?	Hand Free Parameters

14.11 Designate a default reset profile &Y

Command syntax	Description
AT&Y[<value>]	This command selects which user profile will be used after hardware reset. The settings which may be changed are described in the chapter related to the &V command.
AT&Y1	OK or +CME ERROR: <error>

<value> may be:

- 0: selects profile 0
- 1: selects profile 1
- 2: selects the default factory settings.

If the parameter is not inserted, the value is set to 0.

14.12 Request identification information I

Command syntax	Description
ATI[<value>]	This action command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, followed by a final result code.
ATI3	Manufacturer 3 OK or +CME ERROR: <error>

<value> may be in range 0-9; for each value an other text provided by the manufacturer will be displayed.

14.13 Request manufacturer Identification +GMI

Command syntax	Description
AT+GMI	This action command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, which allows to identify the manufacturer. <manufacturer> OK or +CME ERROR: <error>
Test command AT+GMI=?	OK



14.14 Request model identification +GMM

Command syntax	Description
AT+GMM	This command gives the model identification. <model> OK or +CME ERROR: <error>
Test command AT+GMM=?	OK

14.15 Request revision identification +GMR

Command syntax	Description
AT+GMR	This command gives the revised version of the mobile station. <revision> OK or +CME ERROR: <error>
Test command AT+GMR=?	OK

14.16 Request product serial number identification +GSN

Command syntax	Description
AT+GSN	This command gets the product serial number, known as IMEI (International Mobile Equipment Identity) of the MS. <IMEI> OK or +CME ERROR: <error>
Test command AT+GSN=?	OK



14.17 DTE-DCE character framing +ICF

Command syntax	Description
AT+ICF=[<format>[,<parity>]]	This command sets the local serial port start-stop (asynchronous) character framing which is used in the information interchange between DCE and DTE. The value 0 is correspondent to the auto-detect case. Please note: <ul style="list-style-type: none"> – due to hardware characteristics the frame recognition can be present in conjunction with the autobauding recognition only i.e. the AT+ICF command is effective if AT+IPR is set to 0 only. In this case the AT+ICF returns the 0 value; – outside the autobauding conditions the AT+ICF=0 answers OK but it does not switch the system to automatically frame recognition and it doesn't take actions. In this scenario the AT+ICF? command will return the current value of the frame format. The AT+IPR=0 command instead force the AT+ICF to be 0; – under the autobauding conditions, the AT+ICF command provided with a value different than 0 will answer ERROR since is not possible to force a frame type in those automatically conditions; – if a data frame format refers to a frame without parity (ex. format 3), the parity value returned by the AT+ICF? command has no meaning; – - the stop bit number cannot be automatically recognized i.e. if the system is switched from the 8N2 to the autodetect feature and a 1 stop bit frame is provided at the serial port, unpredictable behaviour of the system can occur;
Set command AT+ICF=3,1	OK or +CME ERROR: <error>
Read command AT+ICF?	+ICF: <format>,<parity> OK
Test command AT+ICF=?	+ICF: (0-3,5),(0-1) i.e. lists of supported <format> and <parity> OK

<format> may be:

- 0: auto detect
- 1: 8 data 2 stop
- 2: 8 data 1 parity 1 stop
- 3: 8 data 1 stop
- 5: 7 data 1 parity 1 stop

<parity> may be:

- 0: odd
- 1: even



14.18 DTE-DCE local flow control +IFC

Command syntax	Description
AT+IFC=[<DCE_by_DTE>[, <DTE_by_DCE>]] Set command AT+IFC=2,2	This command controls the operation of local flow control between DTE and DCE used when data are sent or received. OK or +CME ERROR: <error>
Read command AT+IFC?	+IFC: <DCE_by_DTE>,<DTE_by_DCE> OK
Test command AT+IFC=?	+IFC: (0-2),(0-2) i.e. lists of supported <DCE_by_DTE> and <DTE_by_DCE> OK

<DCE_by_DTE> may be:

- 0: none
- 1: DC1/DC3 on circuit 103 (XON/XOFF)
- 2: circuit 133 (RTS)

<DTE_by_DCE> may be:

- 0: none
- 1: DC1/DC3 on circuit 104 (XON/XOFF)
- 2: circuit 106 (CTS)

14.19 Set flow control \Q

Command syntax	Description
AT\Q[<value>] Set command AT\Q3	This command controls the operation of local flow control between DTE and DCE used when data are sent or received. OK or +CME ERROR: <error>

<value> may be:

- 0: no flow control
- 1: DC1/DC3 on circuit 103 and 104 (XON/XOFF)
- 2: DTE_by_DCE on circuit 106 (CTS)
- 3: DCE_by_DTE on circuit 133 (RTS and DTE_by_DCE on circuit 106 (CTS)



14.20 Fixed DTE rate +IPR

Command syntax	Description
AT+IPR=<rate>	<p>This command specifies the data rate at which the DCE will accept commands. The full range of data rate values may be reduced dependent on HW or other criteria.</p> <p>The data rate 0 means autobauding feature i.e the baud rate is recognized by the system in the Offline Command State only when the "at" or "AT" sequence is provided.</p> <p>Please note:</p> <ul style="list-style-type: none"> - System can start in autobauding (necessary to program the EEP with the baudrate parameter set to 0) or the autobauding can be enabled with the AT+IPR=0 command if the EEP is programmed for the fixed rate 115200 bps (as usual till now); - If the system starts in autobauding (i.e. the IPR is 0) the first at sequence provided to the module is used to detect the baudrate. For example the first command sent from the DTE at any rate can be: AT+CPIN="1234"; - Chars different than AT are ignored during the baud rate detection since the hardware detection sequence is triggered on the "AT" chars (both small and capital a and t letters i.e. at or AT but not aT or At); - The autobaud detection is "one shot" i.e. after the recognition system will continue with the detected baud rate; - In order to start the autobauding again, the command AT+IPR=0 can be provided. After that, the autobauding starts and the next at command can be provided at any rate by the DTE; - Only the UART0 supports the autobauding feature. If the UART1 is set as at commands interface the AT+IPR=0 command return error; - The data rate 0 affects the AT+ICF command too which value is automatically switched to the 0 value. The AT+ICF is used to change the character frame type regarding the number of the frame bits and the parity. The autobauding feature can identify both the baud rate, the bit number and the parity. <p>Please read carefully the description of the AT+ICF command for further limitations.</p>
Set command AT+IPR=9600	OK or +CME ERROR: <error>
Read command AT+IPR?	+IPR: 9600 OK
Test command AT+IPR=?	+IPR: (list of supported autodetectable <rate> values)[,(list of fixed only <rate> values)] OK

<rate> may be 0, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps.

14.21 Return to on-line data state O

Command syntax	Description
ATO	<p>This action command causes the DCE to return to online data state and issue a CONNECT or CONNECT <text> result code on TE.</p>
MS is in state data transfer +++ (return to online command mode) MS is in online command mode ATO	OK or +CME ERROR: <error>



14.22 Escape character S2

Command syntax	Description
<p>ATS2=<value></p> <p>Set command ATS2=43</p>	<p>This command controls the decimal value of the ASCII character used as the escape character. The default value corresponds to an ASCII '+'. A value over 127 disables the escape process, i.e. no escape character will be recognized. The escape sequence contains three escape characters e.g. "+++".</p> <p>OK or +CME ERROR: <error></p>
<p>Read command ATS2?</p>	<p>043 OK</p>

14.23 Command line termination character S3

Command syntax	Description
<p>ATS3=<value></p> <p>Set command ATS3=13</p>	<p>This command sets a value which represents the decimal IRA5 value of the character recognized by the DCE from the DTE to terminate the incoming command line. It is also generated by the DCE as part of the header, trailer and terminator for result codes and information text, along with the S4 setting.</p> <p>OK or +CME ERROR: <error></p>
<p>Read command ATS3?</p>	<p>013 OK</p>

<value> is in range 0 to 127; mandatory default is 13 carriage return character (CR, IRA5 0/13).

14.24 Response formatting character S4

Command syntax	Description
<p>ATS4=[<value>]</p> <p>Set command ATS4=10</p>	<p>This command sets a value which represents the decimal IRA5 value of the character generated by the DCE as part of the header, trailer and terminator for result codes and information text, along with the S3 setting.</p> <p>OK or +CME ERROR: <error></p>
<p>Read command ATS4?</p>	<p>010 OK</p>

<value> is in range 0 to 127; mandatory default is 10 line feed character (LF, IRA5 0/10).



14.25 Command line editing character S5

Command syntax	Description
ATS5=[<value>] Set command ATS5=8	This command sets a value representing the decimal IRA5 character recognized by the DCE as a request to delete from the command line the immediately preceding character. OK or +CME ERROR: <error>
Read command ATS5?	008 OK

<value> is in range 0-127; mandatory default value is 8 backspace character (BS, IRA5 0/8).

14.26 Pause before blind dialling S6

Command syntax	Description
ATS6=[<value>] Set command ATS6=2	This command specifies the amount of time in seconds, that the DCE waits between connecting to the line and dialling, when dial tone is not implemented or enabled. The command has no effect. OK or +CME ERROR: <error>
Read command ATS6?	002 OK

<value> is in range 2-10.

14.27 Connection completion timeout S7

Command syntax	Description
ATS7=[<value>] Set command ATS7=30	This command specifies the amount of time in seconds, that the DCE shall allow between either answering a call or completion of dialling and establishment of a connection with a remote site. OK or +CME ERROR: <error>
Read command ATS7?	030 OK

<value> is in range 1-255.



14.28 Command dial modifier time S8

Command syntax	Description
AT S8=[<value>] Set command AT S8=4	This command specifies the amount of time in seconds, that the DCE shall pause, during dialling, when a “;” dial modifier is encountered in a dial string. The command has no effect. OK or +CME ERROR: <error>
Read command AT S8?	004 OK

<value> is in range 0-255.

14.29 Automatic disconnect delay S10

Command syntax	Description
AT S10=[<value>] Set command AT S10=30	This command specifies the amount of time in tenth of a second, that the DCE will remain connected to the line after the DCE has indicated the absence of received line signal. The command has no effect. OK or +CME ERROR: <error>
Read command AT S10?	030 OK

<value> is in range 1-254

14.30 Escape prompt delay (EPD) S12

Command syntax	Description
AT S12=[<value>] Set command AT S12=80	This command defines the maximum period, in fiftieths of a second, allowed between receipt of the last character of the three escape character sequence from the DTE and sending of the OK result code to the DTE. If any characters are detected during this time, the OK will not be sent. OK or +CME ERROR: <error>
Read command AT S12?	080 OK

<value> is in range 0-255 1/50 of a second; default: 50 (1 second).



14.31 Command echo E

Command syntax	Description
ATE[<value>] Set command ATE1	This command controls whether or not the TA echoes characters received from the DTE during command state. OK or +CME ERROR: <error>

<value> may be:

- 0: echo off
- 1: echo on

If the parameter is not inserted, the value is set to 0.

14.32 Result code suppression Q

Command syntax	Description
ATQ[<value>] Set command ATQ1	This command determines whether or not the DCE transmits result codes to the DTE. When result codes are being suppressed, no portion of any intermediate, final or unsolicited result code is transmitted. Information text transmitted in response to commands is not affected by this setting. OK or +CME ERROR: <error>

<value> may be:

- 0: DCE transmits result codes
- 1: Result codes are suppressed and not transmitted

If the parameter is not inserted, the value is set to 0.

14.33 DCE response format V

Command syntax	Description
ATV[<value>] Set command ATV1	This command allows to control the contents of the header and trailer transmitted with result codes and information responses. It also determines whether result codes are transmitted in a numeric form or an alphabetic (or verbose) form. The text portion of information responses is not affected by this setting. The effect of V setting on response formats is described below: in case of information responses the format is: <ul style="list-style-type: none"> - for V0: <text><CR><LF> - for V1: <CR><LF><text><CR><LF> in case of result codes the format is: <ul style="list-style-type: none"> - for V0: <numeric code><CR> for V1: <CR><LF><verbose code><CR><LF> OK or +CME ERROR: <error>



<value> may be:

- 0: DCE transmits limited headers and trailers and numeric text
- 1: DCE transmits full headers and trailers and verbose response text (default)

If the parameter is not inserted, the value is set to 0.

14.34 Result code selection and call progress monitoring control X

Command syntax	Description
ATX[<value>]	This command determines whether or not the DCE transmits particular result codes to the DTE. It also controls whether or not the DCE verifies the presence of dial tone when it first goes off-hook to begin dialling and whether or not engaged tone (busy signal) detection is enabled.
Set command ATX1	OK or +CME ERROR: <error>

<value> may be:

- 0: CONNECT result code is given upon entering online data state; dial tone and busy detection are disabled;
- 1: CONNECT <text> result code is given upon entering online data state; dial tone and busy detection are disabled;
- 2: CONNECT <text> result code is given upon entering online data state; dial tone detection is enabled and busy detection is disabled;
- 3: CONNECT <text> result code is given upon entering online data state; dial tone detection is disabled and busy detection is enabled;
- 4: CONNECT <text> result code is given upon entering online data state; dial tone and busy detection are both enabled.

If the parameter is not inserted, the value is set to 0.



15 Specific AT commands

15.1 Production test command

Command syntax	Description
AT#<string>	This command allows to enter a test command string, which is transparently passed to the corresponding production test SW (proprietary command, only for production test).
Set command AT#<string>	OK or +CME ERROR: <error>

<string> string type containing the test command sequence, according to the production test specification.

15.2 GPRS cell environment description +CGED

Command syntax	Description
AT+CGED=[<mode>]	<p>This command returns a dump of the cell environment, either as a one shot dump or as a periodic refreshed dump (each 5 seconds), dependent on the command parameter <mode>. The neighbour information depends from the network and can be incomplete (especially for CI fields).</p> <p>+CGED :</p> <p>Service-Cell: <MCC>,<MNC>,<LAC>,<CI>,<BSIC>, Equivalent PLMNs : <MCC>,<MNC> <MCC>,<MNC> <arfcn>,<RxLevServ>,<RfChannels>,<Arfcn_ded>, <RxLevFull>,<RxLevSub>,<RxQualFull>,<RxQualSub>,<ciphering> <ms_txpwr>,<rx_acc_min>,<cbq>,<cba>,<cs_valid>,<cr_offset>, <tmp_offset>,<penalty_t>,<c1>,<c2>,<ch_type>,<ch_mode>, <txpwr>,<dtx_used>,<t3212>,<acc>,<t_adv>,<bs_pa_mfrms>, dsc>,<rll></p> <p>Neighbour Cell <n>: <MCC>,<MNC>,<LAC>,<CI>,<BSIC>,<arfcn>,<RxLev> <C1_nc>,<C2_nc></p> <p>Note : the neighbour cell content may be repeated up to 6 times.</p> <p>GPRS-Parameters: <GPRS_sup>,<RAC>,<Split_Pg_Cycle>,<NCO>,<NOM>,<T3192>, <Acc_Burst_type>,<DRX_Timer_Max>,<PBCCH>,<Ext_Measure_Order> <PSI1_r_per>,<Count_LR>,<Count_HR>,<C_R_Hyst>,<C1>,<C2>,<C31>,<C32>, <Prior_Acc_Thr></p>
Set command AT+CGED=0	<p>+CGED:</p> <p>Service Cell: MCC:222, MNC: 1, LAC:d5bd, CI:5251, BSIC:10, Equivalent PLMNs: MCC:222, MNC: 1 Arfcn:00061 ,RxLevServ:031, RfChannels:000, Arfcn_ded:INVALID_ARFCN, RxLevFull:255, RxLevSub:255, RxQualFull:255, RxQualSub:255, Ciphering:OFF, ms_txpwr:005, rx_acc_min:002, cbq:00, cba:00, c2_valid:True, cr_offset:000, tmp_offset:000, penalty_t:00, c1:00029, c2:00029, ch_type:ff, ch_mode:ff, txpwr:255, dtx_used:True, t3212:00240, acc:0000, t_adv:255, bs_pa_mfrms:004, dsc:000, rll:255</p>



	Neighbour Cell 1: MCC:222, MNC: 1, LAC:d5bd, CI:ffff, BSIC:10, Arfcn:00059, RxLev:035, C1_nc:00033, C2_nc:00033, Neighbour Cell 2: MCC:222, MNC: 1, LAC:d5bd, CI:ffff, BSIC:14, Arfcn:00049, RxLev:027, C1_nc:00025, C2_nc:00025, Neighbour Cell 3: MCC:222, MNC: 1, LAC:d5bd, CI:ffff, BSIC:17, Arfcn:00011, RxLev:020, C1_nc:00018, C2_nc:00018, Neighbour Cell 4: MCC:1665, MNC:165, LAC:0000, CI:ffff, BSIC:ff, Arfcn:00014, RxLev:019, C1_nc:00000, C2_nc:00000, Neighbour Cell 5: MCC:1665, MNC:165, LAC:0000, CI:ffff, BSIC:ff, Arfcn:00062, RxLev:019, C1_nc:00000, C2_nc:- Neighbour Cell 6: MCC:1665, MNC:165, LAC:0000, CI:ffff, BSIC:18, Arfcn:00027, RxLev:018, C1_nc:00000, C2_nc:- GPRS-Parameters: GPRS_sup:True, RAC:00, SplitPg:False, NCO:00000, NOM:002, T3192:01f4, Acc_Burst_type:00015, DRX_Timer_Max:07, PBCCH:False, Ext_Measure_Order:00000, PSI1_r_per:00, Count_LR:00, Count_HR:01, C_R_Hyst:06, C31:000-1, C32:00029, Prior_Acc_Thr:06 OK
Read command AT+CGED?	+CGED: <mode> OK
Test command AT+CGED=?	+CGED: (0-2) i.e. (list of supported <mode>s) OK

<mode> may be:

- 0: one shot dump
- 1: periodic refreshed dump
- 2: stop periodic dump

Service-Cell:

<MCC>: Mobile country code, range 0-999 (3 digits); default value: 1665 (not to be considered);

<MNC>: Mobile network code, range 0-99 (2 digits); default value: 165 (not to be considered);

<LAC>: Location area code, range 0h-FFFFh (2 octets); default value: 0000;

<CI>: Cell Identity, range 0h-FFFFh (2 octets); default value: 0000;

<BSIC>: Base Station Identify Code, range 0h-3Fh (6bits)

<arfcn>: absolute radio frequency channel number, range 0-1023

<RxLevFull>: Received signal strength on serving cell, measured on all slots;
0h-3Fh; 10.5.2.20 GSM04.08

<RxLevSub>: Received signal strength on serving cell, measured on all slots;
0h-3Fh; 10.5.2.20 GSM04.08

<RxQualFull>: Received signal quality on serving cell, measured on all slots;
range 0-7; 10.5.2.20 GSM04.08

<RxQualSub>: Received signal qual. on serving cell, measured on a subset of
slots, range 0-7; 10.5.2.20 GSM04.08

<ms_txpwr>: Maximum TX power level an MS may use when accessing the
system until otherwise commanded, range 0-31; 10.5.2.4 GSM08.08

<rx_acc_min>: RXLEV-ACCESS-MIN, range 0-63; 10.5.2.4 GSM04.08

<cbq>: CELL_BAR_QUALIFY, range 0-1; 10.5.2.34 GSM04.08

<cba>: CELL_BAR_ACCESS, range 0-1; 10.5.2.29 GSM04.08

<cs_valid>: True if all parameter for calculation of c2 are available; boolean

<cr_offset>: CELL_RESELECT_OFFSET, range 0-63 (6 bit); 10.5.2.34 GSM04.08

<tmp_offset>: TEMPORARY_OFFSET, range 0-7 mapped to 0-70; 10.5.2.34 GSM04.08



- <penalty_t>**: Penalty time, range 0-31; 10.5.2.34 GSM04.08
- <c1>**: Value of c1; 6.4 GSM04.08
- <c2>**: Value of c2; 6.4 GSM04.08
- <ch_type>**: Channel type of the current connection as follows (10.5.2.5 GSM04.08)
see type T_CHANNEL_MODE):
- 0: INVALID_CHN_TYPE
 - 1: TCH_F
 - 2: TCH_F
 - 3: SDCCH_4
 - 4: SDCCH_8
 - 5: TCH_H_H
 - 6: TCH_F_M
- <ch_mode>**: Channel mode of current connection (10.5.2.6 GSM04.08), range 0-255 mapped to an internal value:
- 0: MODE_SIG_ONLY
 - 1: MODE_SPEECH_F
 - 2: MODE_SPEECH_H
 - 3: MODE_DATA_96_F
 - 4: MODE_DATA_48_F
 - 5: MODE_DATA_48_H
 - 6: MODE_DATA_24_F
 - 7: MODE_DATA_24_H
 - 8: MODE_SPEECH_F_V2
 - 9: MODE_SPEECH_F_V3
 - 10: MODE_SPEECH_H_V2
 - 11: MODE_SPEECH_H_V3
 - 12: MODE_DATA_144_F
- <txpwr>**: Transmit power level of the current connection, range 0-31 (5 bits); 10.5.2.4 GSM04.08
- <dtx_used>**: DTX used, range 0-1; 10.5.2.4 GSM04.08
- <t3212>**: T3212. The T3212 timeout value field is coded as the binary representation of the timeout value for periodic updating in decihours; range 0-255 (8 bits); 10.5.2.11 GSM04.08
- <acc>**: Access control class (RACH Control Parameters), range 0-65535 (2 octets); 10.5.2.29 GSM04.08
- <t_adv>**: Timing Advance, not used, always FFh
- <bs_pa_mfrms>**: BS_PA_MFRMS (multiframe period for transmission of PAGING REQUEST), range 0-7 mapped to 2-9; 10.5.2.11 GSM04.08

GPRS-Parameters:

- <GPRS_sup>**: GPRS supported (in serving cell); range 0-255 (8 bits); 10.5.2.37b GSM04.08
- <RAC>**: Routing Area Code, range 0-1 (1 bit); 10.5.2.37b GSM04.08
- <Split_Pg_Cycle>**SPGC_CCH_SUP split pg_cycle on ccch by network, range 0-1 (2 bits); 10.5.2.37b GSM04.08
- <NCO>**: NETWORK_CONTROL_ORDER (GPRS_Cell_Options), range 0-3 (2 bits); 10.5.2.37b GSM04.08
- <NOM>**NETWORK OPERATION MODE (GPRS_Cell_Options), range 0-3 (2 bits); 10.5.2.37b GSM04.08
- <T3192>**T3192 (Wait for Release of the TBF after reception of the final block), range 0-7 mapped to 0-1500 msec (3 bits); 12.24 GSM04.60:
- 500 msec
 - 1000 msec
 - 1500 msec
 - 0 msec



- 80 msec
- 120 msec
- 200 msec

<Acc_Burst_type>: ACCESS_BURST_TYPE (Literal AB_8 and AB_11),
range 0-1 mapped to 8,11 (1 bit); 12.24 GSM04.60

<DRX_Timer_Max>DRX_TIMER_MAX, range 0-7 (3 bits); 12.24 GSM04.60

<PBCCH>: PBCCH present, boolean; 11.2.25 GSM04.60

<Ext_Measure_Order>: EXT_MEASUREMENT_ORDER, range 0-3 (2 bits);
11.2.23 GSM04.60

<PSI1_r_per>: PSI1_REPEAT_PERIOD, range 0-15 mapped to 1-16 (4 bits);
11.2.18 GSM04.60

<Count_LR>: PSI_COUNT_LR, range 0-63 (4 bits); 11.2.18 GSM04.60

<Count_HR>PSI_COUNT_HR, range 0-15 mapped to 1-16 (4 bits);
11.2.18 GSM04.60

<C_R_Hyst>: CELL-RESELECT-HYSTERESIS, range 0-7 (3 bits);
10.5.2.4 GSM04.08

<C1>: Value of c1, integer

<C2> Value of c2, integer

<C31>: Value of c31, integer

<C32>: Value of c32, integer

<Prior_Acc_Thr>: Priority_ACCESS_THR, range 0-7 (3 bits);10.5.2.37b GSM04.08

15.3 Switch trace ON/OFF +TRACE

Command syntax	Description
AT+TRACE	This command controls the trace; it allows to select the trace mode, method and the trace data transfer rate (proprietary command, for debugging purpose only). This command is for internal test purpose only.

15.4 Select Band +XBANDSEL

Command syntax	Description
AT+XBANDSEL=<band_1>[,<band_2>[,<band_3>[,<band_4>]]]	This command allows to switch from automatic band selection to selection of one or more (up to four) bands from the following: <ul style="list-style-type: none"> - 850 MHz; - 900 MHz; - 1800 MHz; - 1900 MHz.
Set command AT+XBANDSEL=900	OK or +CME ERROR: <error>
Read command AT+XBANDSEL?	+XBANDSEL: <band_1>[,<band_2>[,<band_3>[,<band_4>]]] OK
Test command AT+XBANDSEL=?	+XBANDSEL: (0,850,900,1800,1900) i.e. (list of supported bands) OK

<band_1> or <band_2> or <band_3> or <band_4> may be:

- 0: automatic band selection (entering every time possible, display improbable)
- 850: selection of 850 MHz band
- 900: selection of 900 MHz band
- 1800: selection of 1800 MHz band
- 1900: selection of 1900 MHz band



15.5 Set reporting call status +XCALLSTAT

Command syntax	Description
AT+XCALLSTAT=<enable> Set command AT+XCALLSTAT=1	This command allows to enable / disable the reporting voice call status on DTE using an unsolicited result code +XCALLSTAT: <call_id><stat>. This code may be repeated so that for each call one line is displayed on DTE (e.g. one call is active and one call is waiting, or up to 6 calls are active in a multiparty session). OK or +CME ERROR: <error>
Read command AT+XCALLSTAT?	+XCALLSTAT: <enable> OK
Test command AT+XCALLSTAT=?	+XCALLSTAT: (list of supported <enable>'s) OK

<enable> may be:

- 0: reporting disabled
- 1: reporting enabled

<call_id> indicates the call identification (GSM02.30 4.5.5.1)

<stat> indicates the voice call status as follows:

- 0: active
- 1: hold
- 2: dialling (MO call)
- 3: alerting (MO call; ringing for the remote party)
- 4: ringing (MT call)
- 5: waiting (MT call)
- 6: disconnected

15.6 Display generation and SW version +XGENDATA

Command syntax	Description
AT+XGENDATA	This command requests the SW version and generation data. +XGENDATA: <project name> <version number> OK or +CME ERROR: <error>

<project name>: name of the project;

<version number>: indicates the software release installed on the product.



15.7 Read counters of sent or received GPRS data +XGCNTRD

Command syntax	Description
AT+CGCNTRD	<p>The command AT+XGCNTRD allows to read the counters for total sent/received bytes for each defined context and indicates these to DTE using the result code(s) +XGCNTRD: <cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes>. For each active <cid> one result code line +XGCNTRD: ... is displayed on DTE.</p> <p>+XGCNTRD: <cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes> <CR><LF> [... +XGCNTRD: <cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes> <CR><LF>] OK or +CME ERROR: <error></p>
Test command AT+XGCNTRD=?	OK

<cid>: integer containing the local PDP context identifier in range of 0-255;

<sent_sess_bytes>: long integer containing the number of sent GPRS session bytes in range 0-2147483646;

<received_sess_bytes>: long integer containing the number of received GPRS session bytes in range 0-2147483646;

<sent_total_bytes>: long integer containing total number of sent bytes in range 0-2147483646;

<received_total_bytes>: long integer containing the number of total received bytes in range 0-2147483646.

15.8 Set/reset counter of sent or received GPRS data +XGCNTSET

Command syntax	Description
AT+XGCNTSET=<cid>,[<total_bytes_sent_offset>,<total_bytes_received_offset>]	<p>The command AT+XGCNTSET allows to set the counter for total sent/received bytes for each defined context to zero or any other offset value. Whenever the total counter for a <cid> is set (to zero or a certain value), the session counter for this <cid> will be set to zero. If the <cid> equals zero than the total counter for every defined context is set to zero. Given offset parameters are ignored in this case.</p>
Set command AT+XGCNTSET=1,20,20	<p>OK or +CME ERROR: <error></p>
Test command AT+XGCNTSET=?	<p>+XGCNTSET: (0-255),(0-2147483646),(0-2147483646) i.e. (range of <cid>s),(range of <total_bytes_sent_offset>),(range of <total_bytes_received_offset>) OK</p>

<cid>: integer containing the local PDP context identifier in range of 0-255;

<total_bytes_sent_offset>: long integer containing the offset of total sent bytes used for counting in range 0-2147483646;

<total_bytes_received_offset>: long integer containing the offset of total received bytes used for counting in range 0-2147483646.



15.9 Configuration trace and modem (AT) interfaces +XSIO

Command syntax	Description
AT+XSIO=<requested>	This command allows the configuration of the modem-interface (AT), trace-interface, IrDA-interface, and MUX-interface by setting the variant number. The set variant number becomes active only after a reset. The read command allows to see which is the current variant and which is the requested variant; a star marks the active variant. An overview about the possible variants is delivered by the test syntax and customizable. Note: After variant change via this command, the user has to wait some seconds since the NVRAM is only updated in the power saving period. Then reset the phone and the new device/protocol settings are active.
Set command AT+XSIO=1	OK or +CME ERROR: <error>
Read command AT+XSIO?	+XSIO: <requested>,*<active> OK
Test command AT+XSIO=?	+XSIO: Variant=<requested>: [AT=<AT-interface>;] [Trace=<Trace-interface>;] [MUX=<MUX-interface>;] [IrDA=<IrDA-interface>] <CR><LF>+XSIO: Variant=<requested>: [AT=<AT-interface>;] [Trace=<Trace-interface>;] [MUX=<MUX-interface>;] [IrDA=<IrDA-interface>] (more display rows are possible) OK

<requested> requested variant, which may be in range 0-255

<active> currently active variant, which may be in range 0-255

<AT-interface>: NULL, UART0, ..., UARTn

<Trace>: NULL, UART0, ..., UARTn

<MUX>: 1-x

<IrDA>: NULL, UART0, ..., UARTn

15.10 ADC read command +NADC

Command syntax	Description
AT+NADC=<adc_id>	This command reads the current value of the specified ADC, given in milliVolts. The syntax and the parameters range is shown in the response to the test command.
Set command AT+NADC=0	+NADC:<adc_id>,<adc_val> OK or +CME ERROR: <error>
Test command AT+NADC=?	+NADC: (0-adc_max_num)<CR><LF> OK

<adc_id> = ADC identifier, whose range (0-adc_max_num) depends on the specific platform (normally 2)

<adc_val> = Current ADC value (0-2000 for ADC1, 0-2500 for ADC2 due to different ranges)

15.11 GPIO select configuration command +NGPIOC

Command syntax	Description
AT+NGPIOC=<gpio_id>,<gpio_mode>[,<gpio_def>]	This command allows the user to select the configuration of the available GPIOs, which can be set in either input or output mode. The user may also select the default value when the GPIO is configured in output. The syntax and the parameters range is shown in the response to the test command.
Set command AT+NGPIOC=3,0,1	OK or +CME ERROR: <error>
Test command AT+NGPIOC=?	+NGPIOC: (0-gpio_max_num),(0-1)[,(0-1)]<CR><LF> OK



<gpio_id> = GPIO identifier, whose range (0-gpio_max_num) depends on the specific platform (normally either 6 or 12)
 <gpio_mode> = GPIO mode, 0=output, 1=input
 <gpio_def> = GPIO default value (0-1) for output configuration only

15.12 GPIO read command +NGPIOR

Command syntax	Description
AT+NGPIOR=<gpio_id>	This command reads the current value of the specified GPIO, no matter whether it is configured as input or output. The syntax and the parameters range is shown in the response to the test command.
Set command AT+NGPIOR=4	+NGPIOR:<gpio_id>,<gpio_val> OK or +CME ERROR: <error>
Test command AT+NGPIOR=?	+NGPIOR: (0-gpio_max_num)<CR><LF> OK

<gpio_id> = GPIO identifier, whose range (0-gpio_max_num) depends on the specific platform (normally either 6 or 12)
 <gpio_val> = Current GPIO value (0-1)

15.13 GPIO set command +NGPIOW

Command syntax	Description
AT+NGPIOW=<gpio_id>,<gpio_val>	This command sets (“writes”) the output of the specified GPIO, but only if it is configured in output mode. The syntax and the parameters range is shown in the response to the test command.
Set command AT+NGPIOW=2,1	OK or +CME ERROR: <error>
Test command AT+NGPIOW=?	+NGPIOW: (0-gpio_max_num),(0-1)<CR><LF> OK

<gpio_id> = GPIO identifier, whose range (0-gpio_max_num) depends on the specific platform (normally either 6 or 12)
 <gpio_val> = New GPIO value (0-1)

15.14 Power saving control +NPSV (Power SaVing)

Command syntax	Description
AT+ NPSV=<mode>	This command is used to enable and disable power saving; when enabled the module goes in sleep mode automatically whenever possible, when disabled this does never occur.
Set command AT+ NPSV=0	OK or +CME ERROR: <error>
Read command AT+ NPSV?	+ NPSV: <mode> OK
Test command AT+ NPSV=?	+ NPSV: (0-1) OK

<mode> may be:

- 0 disabled
- 1 enabled



15.15 Set hands free mode +XHANDSFREE

Command syntax	Description
AT+XHANDSFREE=<n> Set command AT+XHANDSFREE=1	This command allows to set and get the hands free mode, i.e. switch from loudspeaker to earphone. OK or +CME ERROR: <error>
Read command AT+XHANDSFREE?	+XHANDSFREE: <n> OK
Test command AT+XHANDSFREE=?	+XHANDSFREE: (0-1) i.e. (list of supported <n>s) OK

In case of the read syntax, the response indicates also whether the user has switched from “not hands free mode” to a “hands free mode” using another AT command.

<n> may be:

- 0: hands free not active
- 1: hands free active

15.16 Ringer select command +NRNG

Command syntax	Description
AT+NRNG=<rng_id> Set command AT+NRNG=5	This command allows the user to select one out of a set of available ringers. OK or +CME ERROR: <error>
Read command AT+NRNG?	+NRNG: <rng_id> <CR><LF> OK
Test command AT+NRNG=?	+NRNG: <CR><LF> 0 - <rng_name_1><CR><LF> 1 - <rng_name_2><CR><LF> ... rng_max_num - <rng_name_n><CR><LF> OK

<rng_id> = Ringer identifier currently selected, whose range (0-rng_max_num) depends on the specific SW release.

15.17 Tone generator +NTGN (Tone GeNerator)

Command syntax	Description
AT+NTGN=<freq>,<duration> ,<volume> Set command AT+NTGN=1000,2000,100	This command starts/stops a tone on the DSP tone generator. OK or +CME ERROR: <error>
Test command AT+NTGN=?	+NTGN: (300-3400; range of supported frequency in Hz),(0-8000; range of supported durations in msec),(1-100 range of supported volumes) OK

<freq>: this is the frequency of the sinus waveform in Hz for the tone generator.

<duration>: this is the duration of the tone in msec.

<volume>: is the volume for the tone generator. Allowed values are 1-100; volume 1 means muted. Increasing step is 0.25dB.



15.18 SMS Alert sound mode +NMSM (Message Sound Muting)

Command syntax	Description
AT+ NMSM=<mode> Set command AT+NMSM=0	This command is used to mute the signalling sound of SMS on the ME. OK or +CME ERROR: <error>
Read command AT+NMSM?	+NMSM: <mode> OK
Test command AT+NMSM=?	+NMSM: (0-1) OK

<mode> may be:

- 0 normal mode
- 1 silent mode

15.19 Digital Audio Interface setting +NDAI

Command syntax	Description
AT+NDAI=<DAI_mode> Set command AT+NDAI=2	This command sets the Digital Audio Interface test mode. For an easy connection of module to a GSM system simulator (complying with GSM specification 11.10-1), the I2S interface can be set into a dedicated DAI-mode. The DAI mode is used during system test for bit-exact verification of speech coder/decoder and for performance test of the analogue and acoustic devices in the handset. The particular test modes can be set up with this AT command. OK or +CME ERROR: <error>
Read command AT+NDAI?	+NDAI: <DAI_mode>
Test command AT+NDAI=?	+NDAI: (0-3) OK

<DAI_mode>: specifies the Digital Audio Interface mode:

0 Normal Mode

This is the normal operational mode (DAI is off). During a voice call the samples computed by uplink path are written to speech encoder. The samples are copied out of the speech decoder the downlink path. No sample is written or read form the DAI.

1 Vocoder Test

DAI is connected to the vocoder. The audio scheduler reads the sample from the DAI-Rx register and transfers it to the speech encoder. It reads samples from the speech decoder and writes the sample to the DAI-Tx register. The microphone signal is looped back to the loudspeaker. (near end speaker will hear a loop).

2 Acoustic Test

DAI is connected to the audio front end (microphone and speaker).The audio scheduler reads the sample from the DAI-Rx register and transfers it to downlink path (speaker). It reads a voice sample from the uplink path (mic) and writes the sample to the DAI-Tx register. The speech decoder output is looped back to the encoder input (far end speaker will hear a loop) .

3 Voiceband Test

The output of the speech decoder is copied into the input of the speech encoder so the downlink signal is looped back to the uplink (far end speaker will hear a loop). The microphone signal is looped back to the loudspeaker (near end speaker will also hear a loop). No sample is written or read form the DAI.

After command is received, DAI wait for external reset from the test set (WAO_DAI signal low) to activate the new modality. If the command changes to Normal mode, the DAI is switched off immediately, without waiting for the reset signal.



15.20 Path mode setting +NSPM (Set Path Mode)

Command syntax	Description
AT+NSPM = <main_uplink>, <main_downlink>, <alert_sound>, <headset_indication> Set command AT+NSPM=1,1,0,0	This command sets the audio Path Mode. The audio path mode defines which uplink and downlink audio path is used for speech during a call, if the loudspeaker is enabled for alert sounds and if the headset should be detected or not when inserted. OK or +CME ERROR: <error>
Read command AT+NSPM?	+NSPM= <main_uplink>, <main_downlink>, <alert_sound>, <headset_indication>
Test command AT+NSPM=?	+NSPM: (0-2),(0,1,3,4),(0-1),(0-1) OK

<main_uplink>: specifies the audio uplink path used for speech:

- 0 Handset microphone;
- 1 Headset microphone;
- 2 I2S RX.

Note: Some path can be not supported on a specific platform. Look for allowed main_uplink in the test command response.

<main_downlink> specifies the audio downlink path used for speech:

- 0 Normal earpiece;
- 1 Mono headset;
- 2 Stereo headset;
- 3 Loudspeaker;
- 4 I2S TX.

Note: Some path can be not supported on a specific platform. Look for allowed main_downlink in the test command response.

<alert_sound>

specifies if the alert sounds in idle are played on the main downlink path or on loudspeaker:

- 0 Main downlink path;
- 1 Loudspeaker.

<headset_indication>

specifies if the speech path is switched on headset or not when the headset is inserted:

- 0 Headset indication not considered;
- 1 Headset indication considered.

Some path mode combinations are not allowed. If headset is set as main uplink or main downlink, the headset indication field has to be set to 0. When the loudspeaker is selected as main downlink path, the alert_sound has to be set to 0. When the I2S is selected, it has to be selected for both uplink and downlink; in this case the alert_sound and the headset_indication have to be set to 0.



15.21 Play audio resource +NPAR (Play Audio Resource)

Command syntax	Description
AT+NPAR = <audio_resource>, <tone_id>, <nof_repeats>	This command starts the playback of the pre-defined tone of the selected audio resource.
Set command AT+NPAR=1,1,0	OK or +CME ERROR: <error>
Test command AT+NPAR=?	+NPAR: (0-1),(0-255),(0-255) OK

<audio_resource>

specifies the audio resource:

- 0 DSP tone generator;
- 1 midi player.

<tone_id>

specifies the pre-defined tone id to be played

Note: The tone identifiers depend on the selected resource. Different tones can be defined on different platforms. Look for allowed tone_id in the test command response.

<nof_repeats>

specifies the number of repeats:

- 0 infinite loop;
- 1..n n repeats.

15.22 Stop audio resource +NSAR (Stop Audio Resource)

Command syntax	Description
AT+NSAR = <audio_resource>	This command stops the playback of the selected audio resource.
Set command AT+NSAR=1	OK or +CME ERROR: <error>
Test command AT+NSAR=?	+NSAR: (0-1) OK

<audio_resource>

specifies the audio resource:

- 0 DSP tone generator;
- 1 midi player.



16 Audio parameters tuning commands

The audio driver acts switching uplink and downlink audio paths. For example uplink path can be switched from handset microphone to headset microphone and downlink path can be switched from handset earpiece to loudspeaker. Every path includes a set of parameters that are loaded by the audio driver in the voiceband processing system; for example the uplink path can include the gain of the microphone that can be different for handset or headset microphone path.

For every audio path, the parameters can be changed by specific AT commands:

- AT+NMGC: Microphone Gain Control;
- AT+NSGC: Speaker Gain Control;
- AT+NSTN: Sidetone;
- AT+NUBF: Uplink Biquad Filters;
- AT+NDBF: Downlink Biquad Filters;
- AT+NHFP: Hand Free Parameters.

Audio parameters configuration for all the audio paths can be stored in the user profiles in NVRAM (refer to AT&W command description).

Audio parameters in the user profiles in NVRAM are managed by commands AT&W (it saves in profile 0 or profile 1), AT&F (it resets to factory profile), AT&Y (it selects user profile to be used after a hardware reset), ATZ (it reloads user profile).

AT&V command does not display audio parameters. Audio parameters can be displayed by the corresponding read command, for example AT+NMGC?

Paragraphs below explain each audio parameters tuning command in detail.

Further explanation on meaning of audio parameters and on their position in the voiceband processing system can be found in the separate document “Audio driver presentation”.

Audio parameters in the factory profile are stored in static NVRAM and can not be changed by the user ;

They can be changed only by the manufacturer. (For details on procedure and tool needed, refer to document “EEP audio parameters update presentation”.)

16.1 Microphone Gain +NMGC (Microphone Gain Control)

Command syntax	Description
AT+NMGC=<uplink_path_num>,<analog_gain>,<digital_gain> > Set command AT+NMGC=1,12,16000	This command changes the uplink path gain. <i>See note 16.6.1 for impact on echo canceller.</i> OK or +CME ERROR: <error>
Read command AT+NMGC?	+NMGC: Path <uplink_path_num>: <analog_gain>,<digital_gain> [...] (for all the supported path)
Test command AT+NMGC=?	+NMGC: (0-1),(0-14),(0-32767) OK

<uplink_path_num>

- 0: handset_mic;
- 1: headset_mic;
- 2: I2S_rx.

Note: Some path can be not supported on a specific platform or SW version. Check for allowed uplink_path_num in the test command response.

<analog_gain>: Gain for analog audio front end amplifier:

range: 0 – 14 (0=0 dB; 14=42dB; 3dB/step).



<digital_gain>: Gain for Scal_mic digital amplifier:
range: 0 – 32767 (8192 = 0dB; 32767=12dB; linear)

16.2 Speaker Gain +NSGC (Speaker Gain Control)

Command syntax	Description
AT+NSGC=<downlink_path_num>,<analog_gain_epp1_epn1>,<analog_gain_eppa1_eppa2>,<scal_rec>,<Mix_afe>,<Gain_out> Set command AT+NSGC=0,6,6,16000,16000,2,2000	This command changes the downlink path gain. <i>See 16.6.1 note for impact on echo canceller.</i> OK or +CME ERROR: <error>
Read command AT+NSGC?	+NSGC: Path<downlink_path_num>: <analog_gain_epp1_epn1>,<analog_gain_eppa1_eppa2>,<scal_rec>,<Mix_afe>,<Gain_Out> [...] (for all the supported path)
Test command AT+NSGC=?	+ NSGC: (0-4),(0-6),(0-6),(0-32767),(0-32767),(0-32767) OK

<downlinkpath_num>: specifies the downlink path that should change the gains:

- 0: normal_earpiece;
- 1: mono_headset;
- 2: stereo_headset;
- 3: backspeaker;
- 4: I2S_TX.

Note: Some path can be not supported on a specific platform or SW version. Check for allowed uplink_path_num in the test command response.

<analog_gain_epp1_epn1>: gain for the analog audio amplifier Epp1-Epn1:
range: 0 – 6 : (-3db/step 0=0 dB 6= -18dB)

<analog_gain_eppa1_eppa2>: gain for the analog audio amplifier Eppa1-Eppa2:
range: 0 – 6 : (-3db/step 0=0 dB to 6= -18dB)

<scal_rec>: gain for the digital amplifier Scal_rec (speech and Tone Generator):
range: 0 – 32767 (8192 = 0dB; 32767=12dB; linear)

<Mix_afe>: gains for the digital amplifier Mix_afe (synthesizers):
range: 0 – 32767 (16384 = 0dB; 32767=6dB; linear)

<Gain_out>: gain for the digital amplifier Gain_Out (speech):
range: 0 – 32767 (8192 = 0dB; 32767=12dB; linear)



16.3 Sidetone +NSTN (SideToNe)

Command syntax	Description
AT+NSTN=<downlink_path_num>,<sidetone_gain> Set command AT+NSTN=1,1000	This command changes the sidetone gain for a specific path. OK or +CME ERROR: <error>
Read command AT+NSTN?	+NSTN: Path<downlink_path_num>: <sidetone_gain > [...] (all the supported path)
Test command AT+NSTN=?	+NSTN: (0-4),(0-32767) OK

<downlinkpath_num>: specifies the downlink path that should change the sidetone:

- 0: normal_earpiece;
- 1: mono_headset;
- 2: stereo_headset;
- 3: backspeaker;
- 4: I2S_TX.

Note: Some path can be not supported on a specific platform or SW version. Check for allowed uplink_path_num in the test command response.

<sidetone_gain>: gain for Side_Tone digital amplifier:

- range: 0 – 32767 (16384 = 0dB; 32767=6dB; linear).

16.4 Uplink Digital Filters +NUBF (Uplink Biquad Filters)

Command syntax	Description
AT+NUBF=<uplinkpath_num>,<filter_number>,<a1>,<b1>,<a2>,<b2>,<a0> Set command AT+NUBF=0,1, -13915,2249,4377, -325,23450	This command change the digital audio filters parameters for a specific uplink path. OK or +CME ERROR: <error>
Read command AT+NUBF?	+NUBF: Path =<uplinkpath_num>: Filter1: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter2: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> [...] (all the supported path)
Test command AT+NUBF=?	+NUBF: (0-1),(1-2),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767) OK

<uplink_path_num>

- 0: handset_mic;
- 1: headset_mic;
- 2: I2S_rx.

Note: Some path can be not supported on a specific platform or SW version. Check for allowed uplink_path_num in the test command response.

<filter_number>



Two digital filters in cascade are available for each uplink path (Filter1, Filter2)

<a1>,<b1>,<a2>,<b2>,<a0>

range: -32768 : 32767

These parameters are the biquad filter coefficient. The biquad filter transfer function is

$$H(z) = \frac{A_0 + 2A_1z^{-1} + A_2z^{-2}}{1 + 2B_1z^{-1} + B_2z^{-2}}$$

with coefficients A0,A1,A2,B1,B2 in the range -1:1

In the command they are scaled in the range -32768 : 32767

For example:

Set both headset microphone filters to all pass:

In this case the biquad filter transfer function is

$H(z)=1$

Then the coefficients are

$A0=1$ $a0=32767*A0$

$A1=A2=B1=B2=0$ $a1=a2=b1=b2=0$

Commands are:

AT+NUBF=1,1, 0,0,0,0, 32767

AT+NUBF=1,2, 0,0,0,0, 32767

16.5 Downlink Digital Filters +NDBF (Downlink Biquad Filters)

Command syntax	Description
AT+NDBF=<downlinkpath_num>,<filter_number>,<a1>,<b1>,<a2>,<b2>,<a0> Set command AT+NDBF=0,1,-13915,2249,4377,-325,23450	This command change the digital audio filters parameters for a specific downlink path. OK or +CME ERROR: <error>
Read command AT+NDBF?	+NDBF: Path =<downlinkpath_num>: Filter1: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter2: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> [...] (all the supported path)
Test command AT+NDBF=?	+NDBF: (0,1,3),(1-2),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767) OK

<downlinkpath_num>

specifies the downlink path that should change the sidetone

- 0: normal_earpiece;
- 1: mono_headset;
- 2: stereo_headset;
- 3: backspeaker;
- 4: I2S_TX.

Note: Some path can be not supported on a specific platform or SW version. Check for allowed uplink_path_num in the test command response.

<filter_number>

Two digital filters in cascade are available for each uplink path (Filter1, Filter2)

<a1>,<b1>,<a2>,<b2>,<a0>

range: -32768 : 32767



These parameters are the biquad filter coefficient. The biquad filter transfer function is

$$H(z) = \frac{A_0 + 2A_1z^{-1} + A_2z^{-2}}{1 + 2B_1z^{-1} + B_2z^{-2}}$$

with coefficients A0,A1,A2,B1,B2 in the range -1:1
 In the command they are scaled in the range -32768 : 32767.

For example:

Set both loudspeaker filters to all pass:

In this case the biquad filter transfer function is

$$H(z)=1$$

Then the coefficients are

$$A0=1 \quad a0=32767*A0$$

$$A1=A2=B1=B2=0 \quad a1=a2=b1=b2=0$$

Commands are:

AT+NDBF=3,1,0,0,0,0, 32767

AT+NDBF=3,2,0,0,0,0, 32767

16.6 Hand Free Parameters + NHFP (Hand Free Parameters)

Command syntax	Description
AT+NHFP=<uplink_path_num>,<hf_algorithm_init>,<hf_algorithm_restart>,<step_width>,<lms_length>,<lms_offset>,<block_length>,<rxtx_relation>,<add_atten>,<min_atten>,<max_atten>,<nr_sw_2>,<nr_u_fak_0>,<nr_u_fak>	This command changes the parameters that control the Hand Free audio application for a specific uplink path. Handsfree application consists distinct operating parts: <ul style="list-style-type: none"> - Echo Canceller (EC); - Automatic Gain Control (AGC); Noise Suppressor.
Set command AT+NHFP=1,0x01FD,0x016E,2200,250,3,5,150,0,0,500,4096,16384,16384	OK or +CME ERROR: <error>
Read command AT+NHFP?	+NHFP: Path <uplink_path_num>: HF_algorithm_init:<hf_algorithm_init>, HF_Algorithm_Restart:<hf_algorithm_restart>, Step_Width:<step_width>, LMS_Length:<lms_length>,LMS_Offset:<lms_offset>, Block_Length:<block_length>, RXTX_Relation:<rxtx_relation>, Add_Atten:<add_atten>, Min_Atten:<min_atten>, Max_Atten:<max_atten>, NR_sw_2:<nr_sw_2>,NR_u_fak_0:<nr_u_fak_0>, NR_u_fak:<nr_u_fak> [...] (all the supported path) OK
Test command AT+NHFP=?	+NHFP: (0-1),(0x0000-0x01FF),(0x0000-0x01FF),(0:32767),(2:400),(0:400), (2,4,5,8),(-960:+960),(0:960),(0:960),(0:960),(0:32767),(0:16384),(0:16384)

<uplink_path_num>

- 0: handset_mic;
- 1: headset_mic;
- 2: I2S_rx.

Note: Some path can be not supported on a specific platform or SW version. Check for allowed uplink_path_num in the test command response.

<hf_algorithm_init>

The SWITCH parameter controls the activity and initialization of the EC,AGC,NR blocks

Bit #0 set: Echo Canceller (EC) initialization



Bit #1 set: EC restart (without coefficient initialization)
 Bit #2 set: EC on
 Bit #3 set: EC adaptation on
 Bit #4 set: Noise reduction initialization
 Bit #5 set: Noise reduction on
 Bit #6 set: Noise reduction works with additional AGC
 Bit #7 set: Automatic Gain Control (AGC) initialization
 Bit #8 set: AGC on

Setting the bits is not mutually exclusive; more than one bit can be set at the same time.

Examples:

SWITCH =0x01FD =bin 00011111101 means EC initialized and on, EC adaptation on, Noise reduction initialized and on, Automatic Gain Control initialized and on, used with NR.

<hf_algorithm_restart>

This bit mask allow to restart the activity of the EC,AGC,NR blocks without initialization. For bit map refer to <hf_algorithm_init>. This is used when the algorithm is restarted automatically by the driver (i.e. after and handover)

Example

SWITCH =0x016E =bin 000101101110 means EC on, EC adaptation on, EC restart Noise reduction on ,Automatic Gain Control on and working with NR.

<step_width>

The higher this value, the faster the echo characteristic gets adapted.

Limit: STEP_WIDTH *BLOCK_LENGTH<=2*32767

<lms_length>

This is the maximum impulsive response of the FIR filter considered by the adaptive LMS algorithm, in samples. (Max time length: 400*Ts=50ms)

Limitat: 2<= LMS_LENGTH+ LMS_OFFSET<=400 (DSP memory limit)

<lms_offset>

This parameter is used by the LMS adaptation algorithm and indicates the expected delay of the echo after the RX signal , in samples. Example of calculation:

Sample period T= 1/8000 s= 125us Loudspeaker to mic distance on a phone: L= 10 cm
 sound velocity V=340 m/s Delay of echo D =L/V = 0.1/ 340 = 294us
 Number of samples=D/T= 2.35 → LMS_OFFSET =2

<block_length>

LMS □ommand□ent adaptation block I. The higher this number, the slower but more accurate the adaptation converge.

<rxtx_relation>

This parameters checks the power relation between Rx (loudspeaker) and Tx (microphone) signals in order to recognize the double talk condition from the echo condition. The system is considered to be in double talk condition when the TX power (mic signal) is higher that the maximum expected echo power:

$T_x(\text{dB}) > R_x(\text{dB}) - R_x T_x(\text{dB})$ with $R_x T_x(\text{dB}) = RXTX_RELATION * 3/32$

This is the most critical parameter in handfree. Values typical for handset are in range 50 to 150. For backspeaker: -100 to -400.

When in double talk, adaptation of FIR and AGC are suspended.

<add_atten>

When AGC decides to attenuate, ADD_ATTEN is added to the calculated attenuation.

<min_atten>

Minimal attenuation of the mic signal by the AGC.

Level(dB)=3/32* HF_MIN_ATTEN

<max_atten>

Maximal attenuation of the mic signal by the AGC.

Level(dB)=3/32* HF_MAX_ATTEN

**<nr_sw_2>**

Max attenuation. Linear ; 0x7FFF means 1 (0dB)

Ex. 0x4000= 0.5 = -6dB

<nr_u_fak_0>

Factor of NR in the band 0 (0Hz-250 Hz).

Linear ; 0x4000 means 1 (0 db)

<nr_u_fak>

Factor of NR in the bands 1 to 7 (250Hz -3750Hz).

Linear ; 0x4000 means 1 (0 dB)

A factor lower than 1 causes a better NR but also speech distortion and lowering of SLR.

16.6.1 Note

Any change in the gain on uplink or downlink path impacts on the amount of echo fed back from the speaker to the microphone . If any gain is changed on uplink or downlink path, the audio driver calculates the offset of the overall gain with respect to the overall gain in the factory profile. This offset is used to compensate the rxtx_relation parameter of the Echo Canceller, that is supposed to be tuned in the factory profile.

If the offset of gain is too high this compensation could be not effective.

In this case the overall gain in the uplink-downlink path or the rxtx_relation parameter of Echo Canceller should be lowered .Since factory audio parameters are used as reference for the offset calculation, they also impact on compensation possibilities.



17 SIM toolkit

The commands in this section are only working if they have been activated by the terminal equipment. This is required, since an unanswered SIM-toolkit command (without terminal response sent back to the SIM) would block the SIM-toolkit processing. This activation is done by sending AT+CFUN=6

17.1 SIM-APPL-TK proactive commands +STKPRO

Command syntax	Description
AT+STKPRO=?	This command displays the list of supported proactive commands. Only the test command syntax is allowed. In addition there is an unsolicited result code +STKPRO: <proactive_cmd>, ... provided defined as: +STKPRO: 01,<type> +STKPRO: 05,<event list> +STKPRO: 16,<number>,<subaddr>,<type>,<alpha_1>,<icon_id1>,<alpha_2>,<icon_id2> +STKPRO: 17,<ss_data>,<alpha>,<icon_id>,<ref_number> +STKPRO: 18,<dcs>,<hex_string>,<alpha>,<icon_id>,<ref_number> +STKPRO: 19,<alpha>,<icon_id>,<ref_number> +STKPRO: 20,<alpha>,<icon_id> +STKPRO: 21,<URL>,<alpha>,<icon_id> +STKPRO: 32,<tone>,<unit>,<interval>,<alpha>,<icon_id> +STKPRO: 33,<type>,<dcs>,<hex string>,<icon_id>,<imm_resp> +STKPRO: 34,<type>,<dcs>,<hex string>,<icon_id> +STKPRO: 35,<type>,<dcs>,<hex string>,<max rsp len>,<min rsp len>,<default text>,<icon_id> +STKPRO: 36,<alpha>,<item_id>,<total items>,<item_text>,<next_action>,<default_item> +STKPRO: 37,<alpha>,<item id>,<total items>,<item_text>,<next_action> +STKPRO: 38,<type> +STKPRO: 40,<dcs>,<hex string>,<icon_id> +STKPRO: 53,<language>
Test command AT+STKPRO=?	+STKPRO=01,05,16,17,18,19,20,21,32,33,34,35,36,37,38,40,53 OK

<alpha>,<alpha_1>,<alpha_2>,<item_text>,<default text>: text string

<dcs> data coding scheme

<default_item> default item (s. item_id)

<event list> may be:

- 04: User activity event
- 05: Idle screen available event
- 07: Language selection
- 08: Browser Termination event

<hex_string> sting containing data in hexadecimal format

<icon_id>,<icon_id1>,<icon_id2>

<interval> time duration in number of units

<item_id> item identifier (Identifier of item chosen s. GSM11.14)

<language> 2 bytes string indicating the language

<max rsp len> maximum response length

<min rsp len> minimum response length

<next_action> next action

<number> called party number

<proactive_cmd> may be:

- 01: refresh
- 05: set up event list
- 16: set up call
- 17: send SS



- 18: send USSD
- 19: send SMS
- 20: send DTMF
- 21: launch browser
- 32: play tone
- 33: display text
- 34: get inkey
- 35: get input
- 36: select item
- 37: set up menu
- 38: language setting
- 40: set up idle mode text
- 53: language notification

<ref_number> reference number

<subaddr> called party subaddr.

<ss_data> data string

<type> integer as command qualifier; possible value 4 meaning "language"

<tone> tone may be:

- 01: dial tone
- 02: call subscriber busy
- 03: congestion
- 04: radio path acknowledge
- 05: radio path not available
- 06: error / special information
- 07: call waiting tone
- 08: ringing tone
- 10: general beep
- 11: positive acknowledgement tone
- 12: negative acknowledgement or error tone

<total items> total items

<unit> may be:

- 0: minutes
- 1: seconds
- 2: tenth of seconds

<URL> URL that shall be loaded

17.2 SIM-APPL-TK terminal response +STKTR

Command syntax	Description
AT+STKTR=<proactive_cmd> [,<type>],[<result>,<add_result> >[,<reference_number>],[<last_ cmd>],[<dcs>],[<hex string>]]	This action command allows entering the response to a SIM-APPL-TK proactive command which was displayed by the unsolicited result code +STKPRO.
Set command AT+STKTR=1,0	OK or +CME ERROR: <error>
Test command AT+STKTR=?	+STKTR=01,05,16,17,18,19,20,21,32,33,34,35,36,37,38,40,53 OK

<add_result> additional result

<dcs> data coding scheme

<hex_string> string in hexadecimal format



<last_cmd> last command

<proactive_cmd> decimal code indicates the command (refer +STKPRO)

<reference_number> integer containing the indicated reference number; this parameter can be used only in case of

<proactive_cmd> related to SMS, SS, USSD

<result> may be (decimal code indicated):

- 0: command performed successfully
- 1: command performed with partial comprehension
- 2: command performed with missing information
- 3: REFRESH performed with additional Efs read
- 4: command performed successfully, but requested icon could not be displayed
- 5: command performed but modified by call control by SIM
- 6: command performed successfully, limited service
- 7: command performed with modification
- 16: proactive SIM session terminated by the user
- 17: backward move in the proactive SIM session requested by the user
- 18: no response from user
- 19: help information required by the user
- 20: USSD or SS transaction terminated by the user
- 32: ME currently unable to process command
- 33: network currently unable to process the command
- 34: user did not accept call set-up request
- 35: user cleared down call before connection or network release
- 36: action in contradiction with the current timer state
- 37: interaction with call control by SIM, temporary problem
- 38: launch browser generic error code
- 48: command beyond ME's capabilities
- 49: command type not understood by ME
- 50: command data not understood by ME
- 51: command number not known by ME
- 52: SS return error
- 53: SMS RP-ERROR
- 54: error, required values are missing
- 55: USSD return error
- 56: MultipleCard commands error, if class "a" is supported
- 57: interaction with call control by SIM or MO short message control by SIM, permanent problem
- 58: bearer independent protocol error (if class "e" is supported)

<type> command qualifier (usage in case of <proactive_cmd>=38)



17.3 SIM-APPL-TK envelope +STKENV

Command syntax	Description
AT+STKENV=<envelope_cmd>,<optional_ENV_data> AT+STKENV=214,7,<language> > AT+STKENV=214,8,<cause > AT+STKENV=211,<item_id>,<help_requested>	This action command allows to send a SIM-APPL-TK envelope command to MS.
Set command AT+STKENV=211,01	OK or +CME ERROR: <error>
Test command AT+STKENV=?	+STKENV: OK

<cause> may be:

- 00: User Termination
- 01: Error Termination

<envelope_cmd> supported envelope commands:

code 211 (hexa D3): menu selection (needs <item identifier>)

code 214 (hexa D6): Event download (only one event can be included in the <event_list>)

<item_id> item identification

<help_requested> indicates help requested and may be:

- 1: help is requested
- 0: help is not requested

<language> currently used language in the DTE (coding see 11.14)

<optional_ENV_data> indicates command code related parameters as follows:

- for code 211 (hexa D3): <item identifier>
- for code 214 (hexa D6): <event list>

17.4 SIM-APPL-TK envelope +STKPROF

Command syntax	Description
AT+STKPROF=<length>,<data> a>	This command allows reading and changing the terminal profile data. The terminal profile sent by an external STK client states the facilities relevant to SIM Application Toolkit that are supported.
Set command AT+STKPROF=2,"1F7F"	OK or +CME ERROR: <error>
Read command AT+STKPROF?	+STKPROF: <length>,<data> e.g. +STKPROF=2,"1F7F" OK
Test command AT+STKPROF=?	OK

<length>: integer type value; length in bytes that are sent to TE in <data>

Note: <length> set to 0 forces a reset to the default terminal profile stored in the ME.

<data>: terminal profile data coded in hex format



17.5 SIM-APPL-TK call control commands +STKCC

Command syntax	Description
<pre>+STKCC: 1,<res_val>,<alpha>,<number> +STKCC: 2,<res_val>,<alpha>,<ss_code > +STKCC: 3,<res_val>,<alpha>,<ussd_cod e> +STKCC: 4,<res_val>,<alpha>,<ton_npi >,<sc_addr>,<ton_npi>,<dest_ addr></pre>	<p>The SIMAP call control status is displayed using the unsolicited result code +STKCC: <cc_comand>,... defined as:</p>

<cc_command> may be:

- 1: set up call
- 2: send SS
- 3: send USSD
- 4: send SM

<res_val> call control result value

<alpha> text string

<number> called party number

<ton_npi> type of number and numbering plan

<sc_addr> service centre address

<dest_addr> destination address

17.6 SIM-APPL-TK proactive session status +STKCNF

Command syntax	Description
<pre>+STKCNF: <proactive_cmd>,<result>,<ad d_result>,<sw1></pre>	<p>The SIMAP proactive session status is displayed using the unsolicited result code</p>

<proactive_cmd> decimal code indicates the command that was finished (refer +STKPRO)

<result> general result code

<add_result> additional result code

<sw1> status of the last response may be:

0: command to SIM was suppressed because of multiple terminal response or wrong client other responses see GSM 11.11



18 GPRS commands

This paragraph describes the messages exchanged between an external application and the TM2 GSM/GPRS mobile station based on AT commands related to GPRS. The commands described here shall be understood as completion of the main AT commands described in the document “Main AT Commands”

18.1 Parameter Definition

<APN> Access Point Name is 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. An optional special code placed at the beginning of <APN> indicates the kind of the authentication handling MS/network and may be:

- CHAP: challenge handshake authentication protocol
- PAP: personal authentication protocol
- NONE: authentication protocol not used
- code omitted: authentication protocol not used

An example for the usage of <APN> is: +CGDCONT=1,"IP","CHAP: internet.t-d1.de",0,0

<cid> PDP context identifier meaning a numeric parameter, which specifies a particular PDP context definition. This parameter is valid only locally on the interface TE-MT.

<d_comp> is a numeric parameter that controls PDP data compression and can have the values:

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

<delay> is a numeric parameter which specifies the delay class

<h_comp> is a numeric parameter that controls PDP header compression. The range may be:

- 0: off (default value is omitted)
- 1: on (manufacturer preferred compression); this value leads to implicitly usage of RFC1144 t.b.d.
- 2: RFC1144 (applicable for SMDCP only)

<L2P> is a string parameter that indicates the layer 2 protocol to be used between the TE and MT; only the values “PPP”, “M-HEX” and “M-RAW-IP” are supported.

<mean> is a numeric parameter which specifies the mean throughput class

<peak> is a numeric parameter which specifies the peak throughput class

<PDP_address> is a string parameter that identifies the MT in the address space applicable to the PDP. If the 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. Readable with AT-command +CGPADDR.

<PDP_type> Packet Data Protocol type is a string parameter which specifies the type of packet data protocol:

- X25 (not allowed)
- IP Internet Protocol (IETF STD 5)
- OSPIH (not allowed)
- PPP (not allowed)

<pd1>,...<pdN> zero to N string parameters whose meanings are specific to the

<PDP_type>. For PDP type OSP:�HOSS the following parameters are allowed:

- <pd1> = <host>
- <pd2> = <port>
- <pd3> = <protocol>

<precedence> is a numeric parameter which specifies the precedence class as:

- 0: network subscribed
- 1: high priority
- 2: normal priority
- 3: low priority

<reliability> is a numeric parameter which specifies the reliability class

<state> indicates the state of GPRS attachment

- 0 detached
- 1 attached

<status> indicates the state of PDP context activation



- 0 deactivated
- 1 activated

18.2 Define PDP context +CGDCONT

Command syntax	Description
AT+CGDCONT=<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<d_comp>[,<h_comp>[,<pd1>[,...[,<pdN>]]]]]]]]] Set command AT+CGDCONT=1,"IP","name",,"1.2.3.4",0,0	This command allows to specify specific PDP context parameter values for a PDP context, identified by the local context identification parameter <cid>. If the command is used only with the one parameter <cid>, it means that the corresponding PDP context becomes undefined. OK or +CME ERROR: <error>
Read command AT+CGDCONT?	+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[<pd1>[,...[,<pdN>]]] [<CR><LF>+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[<pd1>[,...[,<pdN>]]] [...]] OK
Test command AT+CGDCONT=?	+CGDCONT: (1-255),"IP",,(0),(0) i.e. +CGDCONT: (range of <cid>s),<PDP_type>,,(list of supported <d_comp>s)(list of supported <h_comp>s)[,(list of supported <pd1>s)[,(list of supported <pdN>s)]] [<CR><LF>+CGDCONT: (range of <cid>s),<PDP_type>,,(list of supported <d_comp>s)(list of supported <h_comp>s)[,(list of supported <pd1>s)[,(list of supported <pdN>s)]] [...]] OK

18.3 GPRS event reporting +CGEREP

Command syntax	Description
AT+CGEREP=[<mode>[,<bfr>]]	This set command enables or disables sending of unsolicited result codes +CGEV: XXX from MT to the TE in case of certain events occurring in the GPRS MT or the network. The following unsolicited result codes are defined: <ul style="list-style-type: none"> - +CGEV: REJECT <PDP_type>,<PDP_addr> means that a network request for PDP context activation occurred when the MT was unable to report it to the TE with a +CRING unsolicited result code and was automatically rejected - +CGEV: NW REACT <PDP_type>,<PDP_addr>,<cid> means that the network has requested a context activation - +CGEV: NW DEACT <PDP_type>,<PDP_addr>,<cid> means that the network has forced a context deactivation - +CGEV: ME DEACT <PDP_type>,<PDP_addr>,<cid> means that the mobile equipment has forced a context deactivation - +CGEV: NW DETACH means that the network has forced a GPRS detach - +CGEV: ME DETACH means that the mobile equipment has forced a GPRS detach - +CGEV: NW CLASS <class> means that the network has forced a change of MS class; the highest available class is reported +CGEV:ME CLASS <class> means that the mobile equipment has forced a change of MS class; the highest available class is reported.
Set command AT+CGEREP=1,1	OK or +CME ERROR: <error>



Read command AT+CGEREP?	+CGEREP: <mode>,<bfr> OK
Test command AT+CGEREP=?	+CGEREP: (list of supported <mode>s),(list of supported <bfr>s) OK

<mode> controls the processing of unsolicited result codes specified within this command; it may be:

- 0: buffer unsolicited result codes in the MT; if buffer full the oldest ones will be discarded
- 1: discard unsolicited result codes when V.24 link is reserved (online); otherwise forward them directly to the TE
- 2: buffer unsolicited result codes in the MT when link reserved (online) and flush them to the TE when the link becomes available; otherwise forward them directly to the TE

<bfr> controls the effect on buffered codes when <mode> 1 or 2 is entered; it may be:

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

18.4 Quality of service profile (requested) +CGQREQ

Command syntax	Description
Set command AT+CGDCONT is needed previously AT+CGQREQ=1,1,1,1,1,1	This command allows the TE to specify a quality of service profile that is used when the MT sends an activate PDP context request message to the network. The set command specifies a profile for the context identified by the <cid> (local context identification parameter). The QoS profile consists of a number of parameters, each of which may be set to a separate value. The syntax form used only with parameter <cid>, causes the requested profile for the indicated context number 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, the parameter value ranges for each PDP type are returned on a separate line.
Read command AT+CGQREQ?	+CGQREQ: 1,1,1,1,1,1 i.e. +CGQREQ: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean> [<CR><LF>+CGQREQ: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean> [...]] OK
Test command AT+CGQREQ=?	+CGQREQ: "IP",(0-3),(0-4),(0-5),(0-9),(0-18,31) i.e. +CGQREQ: <PDP_type>,(list of supported <precedence>s),(list of supported <delay>s),(list of supported <reliability>s),(list of supported <peak>s),(list of supported <mean>s) <CR><LF>+CGQREQ: <PDP_type>,(list of supported <precedence>s),(list of supported <delay>s),(list of supported <reliability>s),(list of supported <peak>s),(list of supported <mean>s) [...]] OK

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT command);

<precedence>: a numeric parameter which specifies the precedence class; the defined values goes from 0 to 3; for more details on this parameter refer to 3GPP TS 03.60 [11];

<delay>: a numeric parameter which specifies the delay class; the defined values goes from 0 to 4; for more details on this parameter refer to 3GPP TS 03.60 [11];

<reliability>: a numeric parameter which specifies the reliability class; the defined values goes from 0 to 5; for more details on this parameter refer to 3GPP TS 03.60 [11];



<peak>: a numeric parameter which specifies the peak throughput class; the defined values goes from 0 to 9; for more details on this parameter refer to 3GPP TS 03.60 [11];

<mean>: a numeric parameter which specifies the mean throughput class; the defined values goes from 0 to 18 and 31; for more details on this parameter refer to 3GPP TS 03.60 [11];

If a value is omitted for a particular class then the value is considered to be unspecified.

18.5 Quality of service profile (minimum acceptable) +CGQMIN

Command syntax	Description
AT+CGQMIN=<cid>[,<prece dence>[,<delay>[,<reliability>[, <peak>[,<mean>]]]]]] Set command AT+CGDCONT is needed previously AT+CGQMIN=1,1,1,1,1,1	This command allows the TE to specify a QoS (Quality of Service) minimum acceptable profile which is checked by the MT against the negotiated profile returned in the activate PDP context accept message. The profile is identified by the <cid> parameter. The set command specifies a profile for the context identified by <cid> context identification parameter. The QoS profile consists of a number of parameters each of which may be set to a separate value. A special form of the set command, +CGQMIN=<cid> causes the minimum acceptable profile for the context number <cid> to become undefined. In this case no check is made against the negotiated profile. 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, the parameter value ranges for each PDP type are returned on a separate line. OK or +CME ERROR: <error>
Read command AT+CGQMIN?	+CGQMIN: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean> OK
Test command AT+CGQMIN=?	+CGQMIN: "IP", (0-3), (0-4), (0-5), (0-9), (0-18,31) i.e. +CGQMIN: <PDP-type>,(list of supported <precedence>s),(list of supported <delays>s),(list of supported <reliability>s),(list of supported <peak>s),(list of supported <mean>s) [+CGQMIN: <PDP-type>,(list of supported <precedence>s),(list of supported <delays>s),(list of supported <reliability>s),(list of supported <peak>s),(list of supported <mean>s) [...]] OK

<cid>: a numeric parameter which specifies a particular PDP context definition (see the +CGDCONT command);

<precedence>: a numeric parameter which specifies the precedence class; the defined values goes from 0 to 3; for more details on this parameter refer to 3GPP TS 03.60 [11];

<delay>: a numeric parameter which specifies the delay class; the defined values goes from 0 to 4; for more details on this parameter refer to 3GPP TS 03.60 [11];

<reliability>: a numeric parameter which specifies the reliability class; the defined values goes from 0 to 5; for more details on this parameter refer to 3GPP TS 03.60 [11];

<peak>: a numeric parameter which specifies the peak throughput class; the defined values goes from 0 to 9; for more details on this parameter refer to 3GPP TS 03.60 [11];

<mean>: a numeric parameter which specifies the mean throughput class; the defined values goes from 0 to 18 and 31; for more details on this parameter refer to 3GPP TS 03.60 [11];

If a value is omitted for a particular class then the value is considered is not checked.



18.6 GPRS attach or detach +CGATT

Command syntax	Description
AT+CGATT=<state> Set command AT+CGATT=1	This execution command is used to attach the MT to, or detach the MT from the GPRS service. After this command the MT remains in command state. If the MT is already in the requested state, the command is ignored and OK is returned to TE. If the requested state can not be reached, an ERROR is returned. The command is abortable by hit a key; in this case a detach is performed (aborting is a proprietary feature). Any active PDP context will be automatically deactivated when the attachment state changes to detached. OK or +CME ERROR: <error>
Read command AT+CGATT?	+CGATT: <state> OK
Test command AT+CGATT=?	+CGATT: (0-1) e.g. +CGATT: (list of supported <state>s) OK

18.7 PDP context activate or deactivate +CGACT

Command syntax	Description
AT+CGACT=<status>,[<cid>], ... Set command AT+CGACT=1,1	This execution command is used to activate or deactivate the specified PDP context(s). After this command the MT remains in the command state. If any context is already in the requested state, the state for the context remains unchanged. If the requested state can not be achieved, an ERROR is returned. If the MT is not GPRS attached when the activation form of the command is executed, the MT first performs a GPRS attach and then attempts to activate the specified contexts. The command is abortable by hit a key; in this case a deactivation is performed (aborting is a proprietary feature). OK or +CME ERROR: <error>
Read command AT+CGACT?	If no context is activated: OK If a context is activated: +CGACT: <cid>,<status> OK
Test command AT+CGACT=?	+CGACT: (0-1) i.e. +CGACT: (list of supported <status>s) OK



18.8 Enter data state +CGDATA

Command syntax	Description
AT+CGDATA=<L2P>,<cid>[,<cid>[,...]]	This execution command causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more GPRS PDP types. This may include performing a GPRS attach and one or more PDP context activations. If the parameters are accepted, MT displays the intermediate result code CONNECT on TE and enters the online data state; thereafter data transfer may proceed. No other commands following +CGDATA in the command line will be processed. After data transfer is complete, the MT re-enters the command state and the final result code is displayed on TE. In error case the final result code NO CARRIER or +CME ERROR: <error> is displayed. Note: Although a list of <cid>'s is possible (future usage), the MS does not support more than one <cid> and in this cases an error is returned.
Set command AT+CGDATA="PPP",1	OK or +CME ERROR: <error>
Test command AT+CGDATA=?	+CGDATA: "PPP" i.e. +CGDATA: (list of supported <L2P>s) OK

Note: Possible are protocols: "PPP", "M-HEX", "M-RAW-IP". After entering of the L2 hex protocol with AT+CGDATA="M-HEX",1

the protocol can be used as follows:

Syntax: <int: counter> <int: length[1-1500]> <hex-sequence>[0-9-fA-F]

Examples:

- 1 200<CR> - send 1 packet with 200 0x2B (fill character)
- 5 1000<CR> - send 5 packets with 1000 0x2B (fill character)
- 1 5 31 32 33 34 35<CR> - send 1 packet with the given contents
- 1 10 31<q><CR> - send 1 packet with 10 0x31

Either a packet is sent

- if the length field is terminated with <CR>

- or the length value is equal to # chars of hex-sequence

- or the input is terminated with a character not equal to a hex digit or <CR>.

The session is terminated by default with +++, the context is deactivated.

If ct108 (AT&D) is equal to 2 and the selected L2 protocol is "M-HEX", the channel is switched back to idle mode but the context remains activated. Leave the layer 2 packet protocol by typing of +++.

18.9 Show PDP address +CGPADDR

Command syntax	Description
AT+CGPADDR=[<cid>,<cid> >[,...]]	This execution command returns a list of PDP addresses for the specified context identifiers. +CGPADDR: 1,"1.2.3.4" i.e. +CGPADDR: <cid>, <PDP_addr> [<CR><LF>+CGPADDR: <cid>, <PDP_addr> [...]] OK or +CME ERROR: <error>
Test command AT+CGPADDR=?	+CGPADDR: (list of defined <cid>s) OK



18.10 GPRS mobile station class +CGCLASS

Command syntax	Description
AT+CGCLASS=<class> Set command AT+CGCLASS="B"	This set command allows to set the MT to operate according to the specified GPRS mobile class. OK or +CME ERROR: <error>
Read command AT+CGCLASS?	+CGCLASS: <class> OK
Test command AT+CGCLASS=?	+CGCLASS: (list of supported <class>s) OK

<class> is a string parameter indicating the GPRS mobile class; it may be (in descending order of functionality):

- A: not supported
- B: class B
- CG: class C in GPRS mode
- CC: class C in circuit switched mode

18.11 GPRS network registration status +CGREG

Command syntax	Description
AT+CGREG=<n> Set command AT+CGREG=1	This 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, or code +CGREG: <stat>[,<lac>,<ci>] when <n>=2 and there is a change in the network cell. OK or +CME ERROR: <error>
Read command AT+CGREG?	+CGREG: <n>,<stat>[,<lac>,<ci>] OK
Test command AT+CGREG=?	+CGREG: (list of supported <n>s) OK

<n> may be:

- 0: disable network registration unsolicited result code
- 1: enable network registration unsolicited result code
- 2: enable network registration information unsolicited result code +CGREG: <stat>[,<lac>,<ci>]

<stat> may be:

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

<lac> string type containing two byte location area in hexadecimal format

<ci> string type containing two byte cell ID in hexadecimal format



18.12 Select service for MO SMS messages +CGSMS

Command syntax	Description
AT+CGSMS=[<service>] Set command AT+CGSMS=1	This set command is used to specify the service or service preference that the MT will use to send MO SMS messages. OK or +CME ERROR: <error>
Read command AT+CGSMS?	+CGSMS: <service> OK
Test command AT+CGSMS=?	+CGSMS: (list of currently available <service>s) OK

<service> numeric parameter indicating the service or service preference to be used and may be:

- 0: GPRS
- 1: circuit switched
- 2: GPRS preferred (use circuit switched if GPRS not available)
- 3: circuit switched preferred (use GPRS if circuit switched not available)



19 TCP/IP AT Commands

19.1 Introduction

Teltonika provides access to TCP/IP services by means of few but rich proprietary AT commands based on the philosophy of keeping a strict separation between the control plane (DCM) and the user plane (BSD). Thus the user must first define a connection profile (either GPRS or CSD) with all the related parameters and activate the connection and next start using sockets. Since there is no intrinsic association between bearers (CSD and GPRS) and data channels (TCP sockets) a great flexibility is ensured: several sockets can be managed independently and simultaneously over the same bearer and it's easy to associate services and connections. AT commands for both reading and writing data on sockets are provided and unsolicited indications notify the external application of incoming data and transmission result, thus avoiding the need for polling.

19.2 Packet Switched Data +NPSD

Command syntax	Description
AT+NPSD=<profile_id>[,<param_tag>[,<param_val>]]	This command is used to set the specified parameter for the specified GPRS profile, or to get the current value for the specified parameter, or to return the current value of all the parameters for the specified GPRS profile, one per line. The profile parameter values specified with this command are all volatile, but may be stored in NVM and later on retrieved from NVM by issuing the AT+NPSDA command with the action parameter equal to store.
Set command AT+CGSMS=1	OK or CME ERROR: <error>
Get command AT+NPSD=0,1	+NPSD: 0,1,"apn.provider.com" (Used syntax: +NPSD: <profile_id>,<param_tag>,<param_val>) OK or CME ERROR: <error>
Get All command AT+NPSD=0	+NPSD: 0,0,0 +NPSD: 0,1,"apn.provider.com" +NPSD: 0,2,"username" +NPSD: 0,4,"0.0.0.0" ... +NPSD: 0,19,0 (Used syntax: +NPSD: <profile_id>,0,<param_val0> <CR><LF>+NPSD: <profile_id>,1,<param_val1> <CR><LF>+NPSD: <profile_id>,2,<param_val2> <CR><LF>+NPSD: <profile_id>,4,<param_val4> ... <CR><LF>+NPSD: <profile_id>,19,<param_val19>) OK or CME ERROR: <error>

<profile_id> is the GPRS profile identifier, in range 0-6.

<param_tag> may be:

- 0: Protocol type.
The only allowed value for <param_val> is:
 - 0: (Ipv4);
 - 1: (Ipv6) is just reserved for future use.
- 1: APN.
<param_val> is defined by a text string, such as "apn.provider.com".



- 2: Username.
<param_val> is the user name text string for the authentication phase.
- 3: Password.
<param_val> is the password text string for the authentication phase.
Note: the AT+NPSD Get command with <param_tag> = 3 is not allowed
- 4: DNS1.
<param_val> is the text string of the primary DNS address.
- 5: DNS2.
<param_val> is the text string of the secondary DNS address.
- 6: Authentication.
<param_val> selects the authentication type:
 - 0: none;
 - 1: PAP;
 - 2: CHAP (that is currently RFU).
- 7: IP address.
<param_val> is the text string of the static IP address given by the ISP (“0.0.0.0” means dynamic IP address assigned during context activation).
- 8: Data compression.
<param_val> enables/disables (1/0) data compression.
- 9: Header compression.
<param_val> enables/disables (1/0) header compression.
- 10: QoS precedence.
<param_val> selects the quality of service:
 - 0: subscribe;
 - 1: high;
 - 2: normal;
 - 3: low.
- 11: QoS delay.
<param_val> selects the delay class:
 - 0: subscribe;
 - 1: class 1;
 - 2: class 2;
 - 3: class 3;
 - 4: best effort.
- 12: QoS reliability
<param_val> selects the reliability class:
 - 0: subscribe;
 - 1: class 1 (GTP Ack, LLC Ack and Protected, RLC Ack);
 - 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack);
 - 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack);
 - 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack);
 - 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack).
- 13: QoS peak rate.
<param_val> selects the peak throughput in range 0-9.
- 14: QoS mean rate.
<param_val> selects the mean throughput in range 0-18, 31.
- 15: Minimum QoS precedence.
<param_val> selects the acceptable value for the quality of service:
 - 0: subscribe;
 - 1: high;
 - 2: normal;
 - 3: low.
- 16: Minimum QoS delay.
<param_val> selects the acceptable value for the delay class:
 - 0: subscribe;
 - 1: class 1;



- 2: class 2;
- 3: class 3;
- 4: best effort.
- 17: Minimum QoS reliability.
<param_val> selects the minimum acceptable value for the reliability class:
 - 0: subscribe;
 - 1: class 1 (GTP Ack, LLC Ack and Protected, RLC Ack);
 - 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack);
 - 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack);
 - 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack);
 - 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack).
- 18: Minimum QoS peak rate.
<param_val> selects the acceptable value for the peak throughput in range 0-9
- 19: Minimum QoS mean rate.
<param_val> selects the acceptable value for the mean throughput in range 0-18, 31.

19.3 Packet Switched Data Action +NPSDA

Command syntax	Description
AT+ NPSDA=<profile_id>,<action> Set command AT+NPSDA=2,1	This command performs the requested action for the specified GPRS profile. OK or +CME ERROR: <error>

<profile_id> is the GPRS profile identifier, in range 0-6.

<action> is the requested action. May be:

- 0: Reset: clears the specified profile resetting all parameter to their default values;
- 1: Store: saves all the parameters of the specified profile in NVM for future retrieval;
- 2: Load: reads all the parameters of the specified profile from NVM;
- 3: Activate: activates the specified profile, using the pre-defined parameters.

Note 1: Only one profile at a time can be activated.

Note 2: In case of remote deactivation of GPRS profile the unsolicited indication

+NUPSDD: <profile_id>

is sent to the TE to notify the user.

- 4: Deactivate: deactivates the specified profile.

19.4 Packet Switched Network Assigned Data +NPSND

Command syntax	Description
AT+NPSND=<profile_id>,<pa ram_tag> Set command AT+NPSND=2,0	This command returns the current Network-assigned (dynamic) value of the specified parameter for the specified GPRS profile. +NPSND: 2,0,"151.9.78.170" (Used syntax: +NPSND: <profile_id>,<param_tag>,<dynamic_param_val>) OK or +CME ERROR: <error>

<profile_id> is the GPRS profile identifier, in range 0-6.

<param_tag> may be:

- 0: IP address: dynamic IP address assigned during context activation;
- 1: DNS1: dynamic primary DNS address (only for future implementation);



- 2: DNS2: dynamic secondary DNS address (only for future implementation);
- 3: QoS precedence: network assigned precedence value of the QoS;
- 4: QoS delay: network assigned delay value of the QoS;
- 5: QoS reliability: network assigned reliability value of the QoS;
- 6: QoS peak rate: network assigned peak rate value of the QoS;
- 7: QoS mean rate: network assigned mean rate value of the QoS.

19.5 Circuit Switched Data +NCSD

Command syntax	Description
AT+NCSD=<profile_id>[,<param_tag>[,<param_val>]]	This command is used to set the specified parameter for the specified GSM profile, or to get the current value for the specified parameter, or to return the current value of all the parameters for the specified GSM profile, one per line. The profile parameter values specified with this command are all volatile, but may be stored in NVM and later on retrieved from NVM by issuing the AT+NCSDA command with the action parameter equal to store.
Set command AT+NCSD=2,1,0	OK or CME ERROR: <error>
Get command AT+NCSD=2,1	+NCSD: 2,1,0 (Used syntax: +NCSD: <profile_id>,<param_tag>,<param_val>) OK or CME ERROR: <error>
Get All command AT+NCSD=2	+NCSD: 2,0,"3290208668" +NCSD: 2,1,0 +NCSD: 2,2,"username" +NCSD: 2,4,"0.0.0.0" ... +NCSD: 0,6,0 (Used syntax: +NCSD: <profile_id>,0,<param_val0> <CR><LF>+NCSD: <profile_id>,1,<param_val1> <CR><LF>+NCSD: <profile_id>,2,<param_val2> <CR><LF>+NCSD: <profile_id>,4,<param_val4> ... <CR><LF>+NCSD: <profile_id>,6,<param_val6>) OK or CME ERROR: <error>

<profile_id> is the GSM profile identifier, in range 0-6.

<param_tag> may be:

- 0: Phone number.
<param_val> is defined by a text string, such as "+39123456".
- 1: Call type.
<param_val> may be:
 - 0: Analog;
 - 1: ISDN.
- 2: Username.
<param_val> is the user name text string for the authentication phase.



- 3: Password.
<param_val> is the password text string for the authentication phase.
Note: the AT+NCSDA Get command with <param_tag> = 3 is not allowed.
- 4: DNS1.
<param_val> is the text string of the primary DNS address.
- 5: DNS2.
<param_val> is the text string of the secondary DNS address.
- 6: Timeout.
<param_val> represents the linger time: if there is no data transfer for the given time-out, the call is hang-up).
Note: currently it is not implemented (RFU).

19.6 Circuit Switched Data Action +NCSDA

Command syntax	Description
AT+NCSDA=<profile_id>,<action> > Set command AT+NCSDA=3,0	This command performs the requested action for the specified CSD profile. OK or +CME ERROR: <error>

<profile_id> is the GSM profile identifier, in range 0-6.

<action> is the requested action. May be:

- 0: Reset: clears the specified profile resetting all parameter to their default values;
- 1: Store: saves all the parameters of the specified profile in NVM for future retrieval;
- 2: Load: reads all the parameters of the specified profile from NVM;
- 3: Activate: activates the specified profile, using the pre-defined parameters.

Note 1: Only one profile at a time can be activated.

Note 2: In case of remote disconnection of CSD profile the unsolicited indication

+NUCSDD: <profile_id>

is sent to the TE to notify the user.

- 4: Deactivate: deactivates the specified profile.

19.7 Circuit Switched Network Assigned Data +NCSND

Command syntax	Description
AT+NCSND=<profile_id>,<param_tag> Set command AT+NCSND=2,0	This command returns the current Network-assigned (dynamic) value of the specified parameter for the specified GSM profile. +NCSND: 2,0,"151.9.78.170" (Used syntax: +NCSND: <profile_id>,<param_tag>,<dynamic_param_val>) OK or +CME ERROR: <error>

<profile_id> is the CSD profile identifier, in range 0-6.

<param_tag> may be:

- 0: IP address: dynamic IP address assigned during context activation;
- 1: DNS1: dynamic primary DNS address;
- 2: DNS2: dynamic secondary DNS address.



19.8 Create Socket +NSOCR

Command syntax	Description
AT+NSOCR=<protocol> Set command AT+NSOCR=6	This command creates a socket and associates it to the specified protocol (TCP), returning an integer that represents the socket handle to be used for any future operation on that socket. Such command corresponds to the BSD socket routine. +NSOCR: 2 (Used syntax: +NSOCR: <socket>) OK or +CME ERROR: <error>

<protocol> may be:

- 6: TCP;
- 17: UDP.

19.9 Set Socket Option +NSOSO

Command syntax	Description
AT+NSOSO=<socket>,<level>,<opt_name>,<opt_val>[,<opt_name2>,<opt_val2>] Set command AT+NSOSO=2,6,1,1	This command sets the specified standard option (type of service, local address re-use, linger time, time-to-live, etc) for the specified socket, like the BSD setsockopt routine. OK or +CME ERROR: <error>

<socket> is the socket identifier, in range 0-15.

<level> may be:

- 0: IP Protocol.
 <opt_name> for IP Protocol level may be:
 - 1: Type of service.
 <opt_val>: integer type value for the type of service.
 - 2: Time-to-live.
 <opt_val>: integer type value for the time-to-live option.
- 6: TCP Protocol.
 <opt_name> for TCP protocol level may be:
 - 1: No delay option: don't delay send to coalesce packets.
 <opt_val>: integer type value to enable/disable "no delay" option.
 - 2: Keepalive option: send keepalive probes when idle for <opt_val> milliseconds.
 <opt_val>: integer type value representing the milliseconds for "keepalive" option.
- 65535: Socket.
 <opt_name> for Socket level options may be:
 - 4: Local address re-use.
 <opt_val>: integer type value to enable/disable "local address re-use" option.
 - 8: Keep connections alive.
 <opt_val>: integer type value to enable/disable "keep connections alive" option.
 - 32: Sending of broadcast messages.
 <opt_val>: integer type value to enable/disable "sending of broadcast messages" option.



- 128: Linger on close if data present.
 <opt_val>: integer type to set on/off “linger” option.
 <opt_val2>: integer type value for linger time.
- 512: Local address and port re-use.
 <opt_val>: integer type value to enable/disable “local address and port re-use” option.

19.10 Get Socket Option +NSOGO

Command syntax	Description
AT+NSOGO=<socket>,<level>,<opt_name> Set command AT+NSOGO=2,6,1	This command retrieves the specified standard option (type of service, local address re-use, linger time, time-to-live, etc) for the specified socket, like the BSD getsockopt routine. +NSOGO: 1 (Used syntax: +NSOGO: <opt_val>[,<opt_val2>]) OK or +CME ERROR: <error>

<socket> is the socket identifier, in range 0-15.

<level> may be:

- 0: IP Protocol.
 <opt_name> for IP Protocol level may be:
 - 1: Type of service.
 - 2: Time-to-live.
- 6: TCP Protocol.
 <opt_name> for TCP protocol level may be:
 - 1: No delay option: don't delay send to coalesce packets.
 - 2: Keepalive option: send keepalive probes when idle for <opt_val> milliseconds.
- 65535: Socket.
 <opt_name> for Socket level options may be:
 - 4: Local address re-use.
 - 8: Keep connections alive.
 - 32: Sending of broadcast messages.
 - 128: Linger on close if data present.
 - 512: Local address and port re-use.

19.11 Close Socket +NSOCL

Command syntax	Description
AT+NSOCL=<socket> Set command AT+NSOCL=2	This command closes the specified socket, like the BSD close routine. Remote socket closure is notified via the +NUSOCL: <socket> unsolicited indication, carrying the closed socket identifier. OK or +CME ERROR: <error>

<socket> is the socket identifier, in range 0-15.



19.12 Get Socket Error +NSOER

Command syntax	Description
AT+NSOER Set command AT+NSOER	This command retrieves the last error occurred in a socket operation, stored in the BSD standard variable error. +NSOER: 104 OK

19.13 Set Listening Socket +NSOLI

Command syntax	Description
AT+NSOLI=<socket>,<port> Set command AT+NSOLI=2,1200	This command sets the specified socket in listening mode on the specified port of service, waiting for incoming connections that are automatically accepted and notified via the +NUSOLI: <socket>,<ip_address>,<port> unsolicited indication, carrying the connected socket identifier, the remote IP address and port. This command corresponds to the bind, listen and accept BSD routines and it can be applied to TCP sockets only. OK or +CME ERROR: <error> +NUSOLI: 3,"151.63.16.7",1203

<socket> is the socket identifier, in range 0-15.

<port> integer type value of port of service.

19.14 Connect Socket +NSOCO

Command syntax	Description
AT+NSOCO=<socket>,<remote_addr>,<remote_port> Set command AT+NSOCO=3,"151.63.16.9",1200	This command establishes a peer-to-peer connection to the specified remote end, like the BSD connect routine. The 3-way handshake is managed for a TCP socket. For an UDP socket this function declares the remote host address and port in order to deploy an active UDP session. A Write Socket operation will follow, in [1] is described the logical usage of the Connect procedure and UDP active sockets. OK or +CME ERROR: <error>

<socket> is the socket identifier, in range 0-15.

<remote_addr> is the text string of remote end IP address.

<remote_port> integer type value of remote end port.



19.15 Write Socket Data +NSOWR

Command syntax	Description
Base syntax AT+NSOWR=<socket>,<length>,<data> Binary syntax AT+NSOWR=<socket>,<length>,<h>	This command writes the specified amount of data to the specified socket, like the BSD write routine, and returns the number of bytes of data actually written. It can be applied to UDP sockets too, after a Connect Socket command There are two kinds of syntax: <ul style="list-style-type: none"> - base syntax: useful for writing simple strings to the socket with the limitation that a set of chars are forbidden; - binary extended: mandatory for writing any char in the ASCII range [0x00, 0xFF], it can be useful for sending protocol data bytes.
Set base command AT+NSOWR=3,16,"16 bytes of data"	+NSOWR: 3,16 (Used syntax: +NSOWR: <socket>,<length>) OK or CME ERROR: <error>
Set binary command AT+NSOWR=3,16	@ (When this prompt appears, data are provided by the user, all the bytes in the range [0x00,0xFF] can be accepted. After the specified <length> has been reached the response can be: +NSOWR: 3,16 (Used syntax: +NSOWR: <socket>,<length>) OK or CME ERROR: <error>

For base syntax

<socket> is the socket identifier, in range 0-15.

<length> integer type value to specify amount of data to write, in range 0-512.

<data> string type of the data bytes to be written. Please note that not all of the ASCII charset can be used. Allowed ASCII chars are:

0x20 (space), 0x21 and from 0x23 to 0xFF. Substantially all of the alphanumeric set, symbols and extended ASCII charset from 0x80 to 0xFF.

The control chars from 0x00 to 0x1F (included) are forbidden.

The 0x22 char, quotation marks ("), is forbidden too.

Note: the value of <length> and the actual length of <data> should match.

For binary syntax

<socket> is the socket identifier, in range 0-15.

<length> integer type value to specify amount of data to write, in range 0-1024 (an extension, for the base syntax it was 512).

After the command is provided, user waits for the @ prompt. When it appears the stream of bytes can be provided. After the specified amount of bytes has been provided, system returns with OK (or ERROR). The feed process cannot be interrupted i.e. the return in the command mode can be effective when the number of bytes provided is the declared one. Please note: that specific feature of byte delivery is the only way for the system to accept control chars as data; for the AT command specifications [2,3], chars like <CR>, <CTRL-Z>, quotation marks, etc. have a specific meaning and they cannot be used like data in the command itself. The command is so extended with a specific acceptance state identified by the @ prompt.

Note: this powerful feature can be successfully used when there is need to send a byte stream which belongs to a protocol that has any kind of chars in the ASCII range [0x00,0xFF].



19.16 Read Socket Data +NSORD

Command syntax	Description
AT+NSORD=<socket>,<length> h>	<p>This command reads the specified amount of data from the specified socket, like the BSD read routine. The unsolicited indication +NUSORD: <socket>,<length> notifies that new data is available for reading, either when new data arrives or after a partial read by the user for the TCP socket type. This command can be applied to UDP active sockets too with the follow exceptions. Please note that the UDP is a connectionless protocol i.e. in an UDP active connection, data can be received after (and only after) an UDP packet is sent to a remote server: in this case the remote server replies to the local port and the local stack gets the response. This means that a Read Socket operation will always follow a Write Socket operation. If Write Socket operation (after a Connect operation) is not performed, data cannot be received by the stack (and the remote peer will receive an ICMP error type 3 code 3, destination port unreachable). Furthermore data reading from an UDP socket should be done in 'one shot' only: if a read attempt specifies less bytes than the value reported in the unsolicited indication, the number of the bytes specified are returned but there is not possible to read the remained part of the UDP datagram incame. This kind of behaviour is in conformance with UDP socket architecture in [1].</p>
Set command AT+NSORD=3,16	<p>+NUSORD: 3,16</p> <p>+NSORD: 3,16,"16 bytes of data"<CR><LF> (Used syntax: +NSORD: <socket>,<length>,<data in the ASCII [0x00,0xFF] range>) OK or +CME ERROR: <error></p>

<socket> is the socket identifier, in range 0-15.

<length> integer type value to specify amount of data to read, in range 0-1024.

<data> data read

The returned data may have any kind of ASCII char in the range [0x00,0xFF] i.e. control chars too. The starting quotation marks shall not be taken into account like data, the first byte of data starts after the first quotation marks. Then the other chars are provided for a <length> amount. At the end of the length byte stream, another quotation marks followed by <CR><LF> are provided for user convenience and visualization purposes. Note: a smart remote application which deals with TM2 AT commands should rely on the <length> info to count the received number of chars (after the starting quotation marks) especially if any protocol control chars are expected.

If an application deals with letter and number chars only i.e all of the expected chars are outside the [0x00, 0x1F] range and are not quotation marks, the AT+NSORD response quotation marks can be assumed to identify the start and the end of the received data packet, anyway the <length> field usage to identify the valid data stream is recommended.



19.17 Resolve Name / IP Number through DNS +NDNSRN

Command syntax	Description
AT+NDNSRN=<resolution_type>,<domain_ip_string> Set command AT+NSOCO=3,"151.63.16.9",1 200	<p>This command translates a domain name to an IP address or an IP address to a domain name by using an available DNS. There are two available DNSs, primary and secondary. They are usually provided by the network after GPRS activation or CSD establishment. They are automatically used in the resolution process if available. The resolver will use first the primary DNS, if it doesn't answer the second DNS will be involved. User can replace each network provided DNS by setting its own DNS. In this case the command AT+NPSND should be used for a GPRS context or the AT+NCSD command for the CSD context. If a DNS value different to "0.0.0.0" is provided, the user DNS will replace the correspondent network provided one. User have to pay attention to the DNS setting for the different profiles since the user DNS can be put into action if the correspondent profile is activated (if the user sets a DNS for a profile, and a different profile is activated, the user DNS has no action and the network DNS is used if available). Please note that the usage of the network provided DNSs is recommended and the user can easily skip DNS setting.</p> <p>OK or +CME ERROR: <error></p>
Set command AT+NDNSRN=0,"www.test.com"	<p>+NDNSRN: "192.168.1.1" (Used syntax: +NDNSRN: <resolved_ip_address>)</p> <p>OK or +CME ERROR: <error></p>
AT+NDNSRN=1,"192.168.1.1"	<p>+NDNSRN: "www.test.com" (Used syntax: +NDNSRN: <resolved_domain_name>)</p> <p>OK or +CME ERROR: <error></p>

<resolution_type > is the type of resolution operation. It may be:

- 0: from IP address to domain name (host by name);
- 1: from domain name to IP address;

<domain_ip_string> is the text string of the domain name (resolution_type=0) or the IP address (resolution_type=1) to be resolved.

<resolved_ip_address> is the text string of the resolved IP address correspondent to the domain name.

<resolved_domain_name> is the test string of the resolved domain name corresponded to the provided IP address.



20 Reference

20.1 External

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- [2] ITU-T Recommendation V250, 05-99.
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20.2 Internal

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21 Appendices

21.1 Mobile Termination error result code +CME ERROR

<err>	Meaning	Resulting from the following commands
0	phone failure	undetermined
1	no connection to phone	
2	phone-adaptor link reserved	
3	operation not allowed	all +C.. commands described in GSM07.07
4	operation not supported	all +C.. commands described in GSM07.07
5	PH-SIM PIN required	all +C.. commands described in GSM07.07
10	SIM not inserted	all +C.. commands described in GSM07.07
11	SIM PIN required	all +C.. commands described in GSM07.07
12	SIM PUK required	all +C.. commands described in GSM07.07
13	SIM failure	all +C.. commands described in GSM07.07
14	SIM busy	all +C.. commands described in GSM07.07
15	SIM wrong	all +C.. commands described in GSM07.07
16	incorrect password	+CLCK, +CPWD, +CPIN, ATD*...#...
20	memory full	+CPBW, +CPOL
21	invalid index	+CPBR, +CPBW
22	not found	+COPS, +CHLD, +CGATT, ATD*...#...
23	memory failure	+CSAS, +CRES, +CSGT
24	text string too long	+CPBW
25	invalid characters in text string	ATD*...#...
26	dial string too long	ATD, +CPBW
27	invalid characters in dial string	ATD, +CPBW, ...
30	no network service	ATD, +COPS, +CLIR, ...
31	network timeout	ATD
100	unknown	commands with wrong syntax
103	illegal MS	+CGATT
106	illegal ME	+CGATT
107	GPRS services not allowed	+CGATT
111	PLMN not allowed	+CGATT
112	Location area not allowed	+CGATT
113	roaming not allowed in this location area	+CGATT
132	service option not supported	+CGACT, or other non-GPRS cmds.
133	requested service option not subscribed	+CGACT, or other non-GPRS cmds.
134	service option temporarily out of order	+CGACT, or other non-GPRS cmds.
149	PDP authentication failure	+CGACT
148	unspecified GPRS error	all GPRS related commands
150	invalid mobile class	all GPRS related commands
1500	Wrong GPIO identifier	+NGPIOC, +NGPIOR, +NGPIOW
1501	Set GPIO default error	+NGPIOC
1502	Select GPIO mode error	+NGPIOC
1503	Read GPIO error	+NGPIOR
1504	Write GPIO error	+NGPIOW
1520	Wrong ADC identifier	+NADC
1521	Read ADC error	+NADC
1540	Wrong ringer identifier	+NRNG



21.2 Message service failure result codes +CMS ERROR

<err>	Meaning	Resulting from the following commands
1 to 127	Error cause values from the GSM recommendation 04.11 Annex E-2	+CMGS
128 to 301	Error cause related to GSM 3.40	(SMS commands)
301	SMS service of ME reserved	+CSMS
302	operation not allowed	all SMS commands
303	operation not supported	all SMS commands
310	SIM not inserted	all SMS commands
311	SIM PIN required	all SMS commands
312	PH-SIM PIN required	all SMS commands
313	SIM failure	all SMS commands
314	SIM busy	all SMS commands
315	SIM wrong	all SMS commands
316	SIM PUK required	all SMS commands
320	memory failure	+CMGR
321	invalid memory index	+CMGR, +CMGL
322	memory full	
330	SMSC address unknown	+CMGR
332	network timeout	
500	unknown error	commands with wrong syntax
512	MN_SMS_RP_ACK	This and the following codes are manufacturer specific
513	MN_SMS_TIMER_EXPIRED	
514	MN_SMS_FORW_AVAIL_FAILED	
515	MN_SMS_FORW_AVAIL_ABORTED	
516	MS invalid TP-Message-Type-Indicator	
517	MS no TP-Status-Report in Phase 1	
518	MS no TP-Reject-Duplicate in phase 1	
519	MS no TP-Replay-Path in Phase 1	
520	MS no TP-User-Data-Header in Phase 1	
521	MS missing TP-Validity-Period	
522	MS invalid TP-Service-Centre-Time-Stamp	
523	MS missing TP-Destination-Address	
524	MS invalid TP-Destination-Address	
525	MS missing Service-Centre-Address	
526	MS invalid Service-Centre-Address	
527	MS invalid alphabet	
528	MS invalid TP-User-Data-length	
529	MS missing TP-User-Data	
530	MS TP-User-Data too long	
531	MS no Command-Request in Phase 1	
532	MS Cmd-Req invalid TP-Destination-Address	
533	MS Cmd-Req invalid TP-User-Data-Length	
534	MS Cmd-Req invalid TP-User-Data	
535	MS Cmd-Req invalid TP-Command-Type	
536	MN MNR creation failed	
537	MS CMM creation failed	
538	MS network connection lost	
539	MS pending MO SM transfer	
540	MS MO SM rejected by SIM MO SMS control	
541	RP-Error OK	
542	RP-Error OK no icon display	
543	Unspecified SMS PP error	



21.3 Failure cause from GSM04.08 (+CEER)

Cause value	Diagnostic
1	unassigned (unallocated) number
3	no route destination
6	channel unacceptable
8	operator determined barring
16	normal call clearing
17	user busy
18	no user responding
19	user alerting, no answer
21	call rejected
22	number changed
26	non selected user clearing
27	destination out of order
28	invalid number format (incomplete number)
29	facility rejected
30	response to STATUS ENQUIRY
31	normal, unspecified
34	no circuit / channel available
38	network out of order
41	temporary failure
42	switching equipment congestion
43	access information discarded
44	requested circuit / channel not available
47	resources unavailable, unspecified
49	quality of service unavailable
50	requested facility not subscribed
55	incoming calls barred with in the CUG
57	bearer capability not authorized
58	bearer capability not presently available
63	service or option not available, unspecified
65	bearer service not implemented
68	ACM equal to or greater than ACMmax
69	requested facility not implemented
70	only restricted digital information bearer capability is available
79	service or option not implemented, unspecified
81	invalid transaction identifier value
87	user not member of CUG
88	incompatible destination
91	invalid transit network selection
95	semantically incorrect message
96	invalid mandatory information
97	message type non-existent or not implemented
98	message type not compatible with protocol state
99	information element non-existent or not implemented
100	conditional IE error
101	message not compatible with protocol state
102	recovery on timer expiry
111	protocol error, unspecified
127	interworking, unspecified



21.4 Specific failure cause for +CEER

Cause value	Diagnostic
244	normal
245	alternate call unsuccessful modify
246	mobile originated unsuccessful call setup
247	mobile terminated unsuccessful call setup
248	unsuccessful in-call-modification
249	normal user request
250	last call release
251	last data call release
252	unsuccessful GPRS attach
253	GPRS detach
254	unsuccessful PDP context activation
255	PDP context deactivation



22 TCP/IP Stack Example

22.1 Activation of a GPRS connection

This example refers to the activation of a GPRS connection on BITE network (a BITE SIM is inserted in the M2M data module) and shows the use of commands +NPSD, +NPSDA, +NPSND to define a GPRS profile with the related parameters, store the profile in NVM for later use, activate the connection, retrieve the dynamic parameters of GPRS connection, deactivate the profile.

at+cmee=2	(Use verbose <err> values)
OK	
at+cops=0	(Ask for automatic operator selection and registration)
+CME ERROR: SIM PIN required	(SIM requests PIN)
at+cpin="0011"	
OK	(Correct PIN)
at+cops=0	(Ask for automatic operator selection and registration)
OK	
at+cops?	(Get the operator name)
+COPS: 0,0," Bite LT"	
OK	
at+npsd=0,1,"apn"	(Define a GPRS profile with ID=0)
OK	(Specify APN parameter for the GPRS profile 0)
at+npsd=0,1	(Get APN of profile 0)
+NPSD: 0,1,"apn"	
OK	
at+npsd=0,2,"UserName"	(Set Username parameter for GPRS profile 0)
OK	
at+npsd=0,2	(Get Username string)
+NPSD: 0,2,"UserName"	
OK	
at+npsd=0,3,"PWD123"	(Set Password of profile 0)
OK	(Get of Password is not allowed!)
at+npsd=0,7,"0.0.0.0"	(Set IP address parameter - 0.0.0.0 means dynamic IP address assigned during context activation)
OK	
at+npsd=0,7	(Get IP address of profile 0)
+NPSD: 0,7,"0.0.0.0"	
OK	
at+npsd=0	(Get all the parameters related to GPRS profile 0)
+NPSD: 0,0,0	(Protocol type: IPv4)
+NPSD: 0,1,"apn"	(APN)
+NPSD: 0,2,"UserName"	(Username)
+NPSD: 0,4,"0.0.0.0"	(Primary DNS address)
+NPSD: 0,5,"0.0.0.0"	(Secondary DNS address)
+NPSD: 0,6,0	(Authentication type: none)
+NPSD: 0,7,"0.0.0.0"	(IP address: dynamic assignment)
+NPSD: 0,8,0	(Data compression: disabled)
+NPSD: 0,9,0	(Header compression: disabled)
+NPSD: 0,10,0	(QoS precedence)
+NPSD: 0,11,0	(QoS delay)
+NPSD: 0,12,0	(QoS reliability)
+NPSD: 0,13,0	(QoS peak rate)
+NPSD: 0,14,0	(QoS mean rate)
+NPSD: 0,15,0	(Minimum QoS precedence)
+NPSD: 0,16,0	(Minimum QoS delay)
+NPSD: 0,17,0	(Minimum QoS reliability)
+NPSD: 0,18,0	(Minimum QoS peak rate)



+NPSD: 0,19,0 OK at+npsda=0,1 OK at+npsda=0,3 OK at+npsnd=0,0 +NPSND: 0,0,"217.201.146.112" OK at+npsda=0,4 OK	(Minimum QoS mean rate) (These parameters are all volatile) (Store all the parameters of profile 0 in NVM for future retrieval) (Activate GPRS profile 0) (Get dynamically assigned IP address) (Deactivate GPRS profile 0)
--	--

22.2 Activation of a CSD connection

This example refers to the activation of a CSD connection and shows the use of commands +NCSD, +NCSDA, +NCSND to define a CSD profile with the related parameters, store the profile in NVM for later use, activate the connection, retrieve the dynamic parameters of CSD connection, disconnect the profile.

at+cmee=2 OK at+cops=0 OK at+ncsda=1,0 OK at+ncsd=1,0,"telephone number " OK at+ncsd=1,0 +NCSD: 1,0,"telephone number" OK at+ncsd=1,2," " OK at+ncsd=1,2 +NCSD: 1,2," " OK at+ncsd=1,3,"userPWD" OK at+ncsd=1,3 +CME ERROR: operation not allowed at+ncsd=1 +NCSD: 1,0," " +NCSD: 1,1,0 +NCSD: 1,2," " +NCSD: 1,4,"0.0.0.0" +NCSD: 1,5,"0.0.0.0" +NCSD: 1,6,0 OK at+ncsda=1,1 OK at+ncsda=1,3 OK at+ncsnd=1,0 +NCSND: 1,0,"151.25.99.187" OK at+ncsnd=1,1 +NCSND: 1,1,"193.70.192.25" OK	(Use verbose <err> values) (Ask for automatic operator selection and registration) (Reset CSD profile with ID=1 and all the related parameters) (Define the CSD profile 1) (Set Phone number parameter for the CSD profile 1) (Get Phone number of profile 1) (Set Username parameter for CSD profile 1) (Get Username string) (Set Password for profile 1) (Get of Password is not allowed!) (Get all the parameters related to CSD profile 1) (Phone number) (Call type: analog) (Username) (Primary DNS address) (Secondary DNS address) (BITEeout: RFU) (These parameters are all volatile) (Store all the parameters of profile 1 in NVM for future retrieval) (Activate CSD profile 1) (Get dynamically assigned IP address) (Get dynamically assigned primary DNS address)
---	--



at+ncsnd=1,2 +NCSND: 1,2,"193.70.152.25" OK	(Get dynamically assigned secondary DNS address)
at+ncsda=1,4 OK	(Deactivate CSD profile 1)

NOTE: 7 GPRS profiles and 7 CSD profiles can be defined, but only one profile at a BITE can be activated!

Once a connection is established, either on GPRS or GSM bearer, sockets can be brought into play. Up to 16 sockets can be managed independently and simultaneously over the same bearer and it's easy to associate services and connections. The serial port of the M2M data module is always in command mode and never switched to data mode. AT commands for both reading and writing data on sockets are available to the application hosted on the external microcontroller and unsolicited indications notify of incoming data and transmission result, thus avoiding the need for polling.

22.3 Client Socket

In the following example the creation of a TCP socket and its connection to a remote end is illustrated, as well as the transmission and reception of data. The use of commands +NSOCR, +NSOCO, +NSORD, +NSOWR, +NSOCL is exemplified. We suppose that a server with IP address 151.9.34.66 is available, where a socket is running in listening mode on port 1500: this listener accepts an incoming socket connection and echoes the received data.

at+cmee=2 OK	(Use verbose <err> values)
at+cops=0 OK	(Ask for automatic operator selection and registration)
at+cops? +COPS: 0,0,"Bite LT" OK	(Get the operator name)
at+npsda=0,2 OK	(Load from NVM a GPRS profile with parameters configuration suited for BITE provider; e.g. profile with ID=0 stored in NVM during the informative example concerning the "Activation of a GPRS connection")
at+npsd=0 +NPSD: 0,0,0 +NPSD: 0,1,"apn" +NPSD: 0,2,"UserName" +NPSD: 0,4,"0.0.0.0" +NPSD: 0,5,"0.0.0.0" +NPSD: 0,6,0 +NPSD: 0,7,"0.0.0.0" +NPSD: 0,8,0 +NPSD: 0,9,0 +NPSD: 0,10,0 +NPSD: 0,11,0 +NPSD: 0,12,0 +NPSD: 0,13,0 +NPSD: 0,14,0 +NPSD: 0,15,0 +NPSD: 0,16,0 +NPSD: 0,17,0 +NPSD: 0,18,0 +NPSD: 0,19,0 OK	(Get all the parameters related to GPRS profile 0) (Protocol type: IPv4) (APN) (Username) (Primary DNS address) (Secondary DNS address) (Authentication type: none) (IP address: dynamic assignment) (Data compression: disabled) (Header compression: disabled) (QoS precedence) (QoS delay) (QoS reliability) (QoS peak rate) (QoS mean rate) (Minimum QoS precedence) (Minimum QoS delay) (Minimum QoS reliability) (Minimum QoS peak rate) (Minimum QoS mean rate)
at+npsda=0,3 OK	(Activate GPRS profile 0)
at+nsocr=6 +NSOCR: 0 OK	(Create a socket and associate it to TCP protocol)



at+nsoco=0,"151.9.34.66",1500 OK	(Handle of the created socket)
at+nsowr=0,18,"data to be written" +NSOWR: 0,18 OK	(Connect the socket 0 peer-to-peer to the remote end) (Write data to connected socket, <i>base syntax</i>) (18 bytes actually written)
+NUSORD: 0,18 at+nsord=0,8 +NSORD: 0,8,"data to " OK	(Listener echoes back received data) (Unsolicited indication of 18 bytes of data to be read from socket 0) (Partial read of data from socket) (Received data)
+NUSORD: 0,10 at+nsord=0,12 +NSORD: 0,10,"be written"	(Unsolicited indication of data available for reading) (Read data from socket)
at+nsowr=0,21 @data<CR> to be <CR>written<BELL> +NSOWR: 0,21 OK	(Write data to connected socket, <i>extended syntax</i>) (@ prompt appears and 21 bytes are provided without startup quotation marks; control chars like the <CR> or <BELL> can be used too). (after the 21st char has been provided, system writes to the socket. 21 bytes are written. System returns to the command prompt state)
+NUSORD: 0,21 at+nsord=0,21 +NSORD: 0,21,"data<CR> to be <CR>written<BELL>" OK	(Unsolicited indication of 21 bytes of data to be read from socket 0) (Read of data from socket) (Received data, control chars are included too; first and last quotation marks are not significant)
at+nsocl=0 OK	(Close socket 0)
at+npsda=0,4 OK	(Deactivate GPRS profile 0)

Note: <CR> is the ASCII char 0x0D, <BELL> is the ASCII char 0x07.

22.4 Listening Socket

This example concerns the creation of a TCP socket set in listening mode. The listening socket is waiting for incoming connections that are automatically accepted and notified via the +NUSOLI indication. The use of commands +NSOCR, +NSOLI, +NSORD, +NSOWR, +NSOCL is demonstrated. We suppose that, once the socket is in listening mode, there is an attempt of connection from a telnet client.

at+cmee=2 OK	(Use verbose <err> values)
at+cops=0 OK	(Ask for automatic operator selection and registration)
at+cops? +COPS: 0,0,"Bite LT" OK	(Get the operator name)
at+npsda=0,2 OK	(Load from NVM a GPRS profile with parameters configuration suited for BITE provider; e.g. profile with ID=0 stored in NVM during the informative example concerning the " <i>Activation of a GPRS connection</i> ")
at+npsd=0 +NPSD: 0,0,0 +NPSD: 0,1,"apn" +NPSD: 0,2,"UserName"	(Get all the parameters related to GPRS profile 0) (Protocol type: IPv4)



+NPSD: 0,4,"0.0.0.0"	(APN)
+NPSD: 0,5,"0.0.0.0"	(Username)
+NPSD: 0,6,0	(Primary DNS address)
+NPSD: 0,7,"0.0.0.0"	(Secondary DNS address)
+NPSD: 0,8,0	(Authentication type: none)
+NPSD: 0,9,0	(IP address: dynamic assignment)
+NPSD: 0,10,0	(Data compression: disabled)
+NPSD: 0,11,0	(Header compression: disabled)
+NPSD: 0,12,0	(QoS precedence)
+NPSD: 0,13,0	(QoS delay)
+NPSD: 0,14,0	(QoS reliability)
+NPSD: 0,15,0	(QoS peak rate)
+NPSD: 0,16,0	(QoS mean rate)
+NPSD: 0,17,0	(Minimum QoS precedence)
+NPSD: 0,18,0	(Minimum QoS delay)
+NPSD: 0,19,0	(Minimum QoS reliability)
OK	(Minimum QoS peak rate)
at+npsda=0,3	(Minimum QoS mean rate)
OK	
at+npsnd=0,0	(Activate GPRS profile 0)
+NPSND: 0,0,"217.201.129.34"	
OK	(Get dynamically assigned IP address)
at+nsocr=6	
+NSOCR: 0	
OK	(Create a socket and associate it to TCP protocol)
at+nsoli=0,80	(Handle of the created socket)
OK	
	(Set the socket 0 in listening mode on port 80)
+NUSOLI: 1,"151.9.34.66",9882	
	(Attempt of connection from remote client using > telnet 217.201.129.34 80)
	(Unsolicited indication notifying establishment of a connection with socket ID=1, carrying the remote IP address and port)
+NUSORD: 1,28	
at+nsord=1,28	
+NSORD: 1,28,"data sent from telnet client"	
OK	(Unsolicited indication of data available for reading)
at+nsowr=1,29,"sending data to telnet client"	(Read data from socket)
+NSOWR: 1,29	
OK	
at+nsocl=1	(Write data to connected socket)
OK	(29 bytes actually written)
at+nsocl=0	
OK	(Close socket 1)
at+npsda=0,4	
OK	(Close listening socket 0)
	(Deactivate GPRS profile 0)