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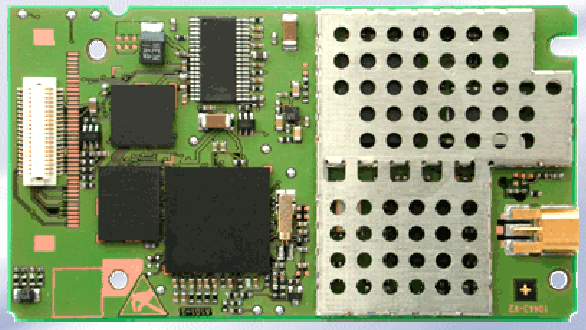

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Siemens Cellular Engine

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AT Command Set

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0 Document history

This chapter reports modifications and improvements over previous versions of the document.

"AT Command Set" Version **AC45-ATC_V01.07 => AC45-ATC_02.02**

Chapter	AT command	What is new
1.4.5	---	Remarks on indication of URCs if autobauding is enabled.
1.5.1	---	New chapter: UCS2 and GSM data coding and conversion in SMS text mode and Remote-SAT
2.4	ATA	Added note regarding FCLASS.
2.45	AT+IPR	Modified / added notes: Write command can be used during Mux mode, but new bit rate takes effect after restart of ME.
2.45.1	Autobauding	Described handling of CSD calls, GPRS and URCs if autobauding is enabled.
3.5	AT+FCLASS	Added note regarding ATA
4.2	AT+CALA	Modified URC description: If autobauding is enabled URC “+CALA: <text>” will be displayed. However, please see [2] for latest information about this release. Time required to re-initialize the RTC corrected from 1s to 2s.
4.7	AT+CCLK	Time required to re-initialize the RTC corrected from 1s to 2s.
4.21 9.16	AT+CLCK AT^SLCK	Renamed parameters.
4.22	AT+CLIP	More detailed description of parameter <CLI validity>
4.26	AT+CMER	AT+CNMI, AT^SSDA and AT+CMER can be only switched on at the same instance.
4.30	AT+COPS	<oper> is stored non-volatile to the SIM.
4.32	AT+CPBR	More detailed description of <tlength>
4.34	AT+CPBW	More detailed description of <tlength>
4.35.1	---	Deleted option AT+CPWD for entering Master Phone Code.
4.36	AT+CPIN2	Modified example of PIN2 unblocking procedure.
4.38	AT+CPWD	More detailed description of parameters. Renamed parameters.
4.43	AT+CRSM	More detailed description of <response>.
5.7	AT+CMGW	Corrected position of comma in write command syntax.
6.1.1	AT+CGACT	Modified notes on max. number of activated contexts.
5.10	AT+CNMI	AT+CNMI, AT^SSDA and AT+CMER can be only switched on at the same instance.
9.13	AT^SHOM	More detailed information on supported network operators.
9.14	AT^SIND	New feature: ciphering indicator
9.37	AT^SPBG	More detailed description of <tlength>
9.39	AT^SPIC	Added info on read command. Added reponse to write command. More detailed description of example 1.
9.43	AT^SPWD	More detailed description of parameters. Renamed parameters.
9.46	AT^SSDA	AT+CNMI, AT^SSDA and AT+CMER can be only switched on at the same instance.
10.1.4	URC summary	Added URC “^SHUTDOWN” to list of URCs.
10.3	AT command overview table	Remote-SAT commands: AT^SSTA, AT^SSTGI, AT^SSTR no more PIN protected.

"AT Command Set" Version **AC45-ATC_V01.03 => AC45-ATC_1.07**

Chapter	AT command	What is new
1.4.4	---	Conditions for command execution and URC presentation
1.4.5	---	More detailed description of URCs.
2.35	AT&F	Time to wait after sending AT&F is 300ms before entering next command. No further commands on same command line.
4.11	AT+CFUN	Under parameter <fun>=0 added remark that ME waits 2s after receiving AT+CFUN=0.
4.11.1	Table 14	Footnote about /RTS0 signal
4.16	AT+CHLD	More detailed description of parameters.
6.1.8	AT^CGREG	Removed parameters <lac> and <ci>. More detailed description of URC "+CREG: <stat>
9.47	AT^SSET	AT&F restores parameter <n> to factory default 0.
9.24	AT^SMSO	Added URC "^SHUTDOWN".
9.9	AT^SCKS	Renamed parameters. Query for SIM connection status can be used for locally attached and remote SIM.
9.11	AT^SCTM	Corrected syntax of write command. Parameter <p> also restorable with AT&F. Added remarks on how to delete <phone number>.
9.27	AT^SNFD	Added note regarding <outstep>.
9.39	AT^SPIC	Added Read and Write command. Enhanced example 2.
10.1.4	---	Description of URCs moved to Chapter 1.4.5, but no changes made in the list of URCs.

"AT Command Set" Version **AC45-ATC_V01.01=> AC45-ATC_01.03**

Chapter	AT command	What is new
1	Added information and documents related to RSA.	
2.10	ATDL	Added note regarding "LD" phonebook.
3	AT Commands for FAX: Revised introduction. Modified table of supported Service Classes.	
4.2	AT+CALA	Modified description of parameter <n>. Corrected notes on usage of alarm functions on several interfaces.
4.19	AT+CIND	More detailed description of "call".
4.20	AT+CLCC	Added further values of parameter <mode>
4.11	AT+CFUN	CYCLIC SLEEP mode requires hardware flow control. Added note on how to set SLEEP mode if Mux mode is active.
4.20	AT+CLCC	Further values of parameter <mode>. More details on <alpha>.
4.21	AT+CLCK	Further details on "FD" phonebook. Notes on Result Codes added.
4.28	AT+CMUX	Deleted notes regarding usage of +++ in Mux mode. Deleted note regarding AT^SMSO in Mux mode. Added note on how to set SLEEP mode if Mux mode is active. Updated Table 16.
4.32, 4.33 4.34 4.35, 5.4, 5.5, 9.19 9.20 9.35 9.36	AT+CPBR, AT+CPBS AT+CPBW, AT+CPIN, AT+CMGL, AT+CMGR, AT^SMGL, AT^SMGR AT^SPBC AT^SPBD	Added notes regarding "CME Error: SIM busy" and AT^SSET command.

Chapter	AT command	What is new
9.37 9.38	AT^SPBG AT^SPBS	
4.33	AT+CPBS	“LD” phonebook only intended for voice call numbers.
4.39	AT+CR	Deleted note regarding influence of PLMN. Added note regarding connection failure.
4.40	AT+CRC	Added note regarding connection failure.
4.41	AT+CREG	More detailed description of parameters and log-in attempts.
5.6	AT+CMGS	More detailed description of send errors.
5.10	AT+CNMI	Completed list of URCs.
5.13	AT+CSCB	Modified description of parameters.
6.1.2	AT+CGATT	Added note regarding status after PLMN reselection.
6.1.3	AT+CGDATA	More detailed command description. Use of V.25ter commands described in greater detail.
6.1.4	AT+CGDCONT	Added references to GSM specifications. More details on <PDP_addr>.
6.1.8	AT+CGREG	Added note regarding status after PLMN reselection.
8	New chapter: AT Commands for Remote SIM Access including AT^SRSA and AT^SRSM	
9.11	AT^SCTM	Added new parameter: predefined <phone number> for deferred shutdown. Two minutes guard period described.
9.14	AT^SIND	New AT command: Extended indicator control.
9.18	AT^SM20	Description of parameter <CmgwMode> applies also to AT+CMGS.
9.25	AT^SNFA	More detailed description of parameters.
9.28	AT^SNFI	More detailed description of parameters.
9.30	AT^SNFO	Parameter <outCalibrate>: Corrected formula for the calculation of volume steps.
9.47	AT^SSET	New AT command: AT^SSET Settings for Unsolicited Result Code "SIM READY"
10.2	---	Added AT^SIND
10.3	---	Added AT^SRSA, AT^SRSM, AT^SSET

1 Introduction

1.1 Scope of the document

This document presents the AT Command Set for the Siemens cellular engine
AC45

AC45 features basic SIM Application Toolkit (SAT) functionality which enables SIM cards to run additional network based applications, such as value added services, online banking, information services etc. To give you an idea, Chapter 7 provides a brief overview. In greater detail, the SAT functions and the required AT commands are described in [4].

Furthermore, AC45 supports Remote SIM Access. RSA enables AC45 to use a remote SIM card via its serial interface, in addition to the SIM card locally attached to the dedicated lines of the application interface. In a vehicle mounted scenario, for example, this allows the driver to access a mobile phone brought into the car from a car-embedded phone. The connection between both phones can be a Bluetooth wireless link or a serial link, e.g. via the car cradle. The necessary protocols and procedures are implemented according to the “SIM Access Profile Interoperability Specification, Revision 0.95c” of the Bluetooth Special Interest Group. All related AT commands are described in Chapter 8, while [14] provides instructions for using the RSA feature.

1.2 Related documents

[1] AC45 Hardware Interface Description, Version 02.02
[2] AC45 Release Notes, Release 02.02
[3] GPRS Startup User's Guide
[4] Remote-SAT User's Guide
[5] Multiplexer User's Guide
[6] Multiplex Driver Developer’s Guide for Windows 2000 and Windows XP
[7] Multiplex Driver Installation Guide for Windows 2000 and Windows XP
[8] DSB45 Support Box – Evaluation Kit for Siemens Cellular Engines
[9] Application Note 02: Audio Interface Design
[10] Application Note 14: Audio and Battery Parameter Download
[11] Application Note 16: Upgrading AC45 Firmware
[12] Application Note 23: Installing AC45 on DSB45
[13] Application Note 24: Application Developer’s Guide
[14] Remote SIM Access User’s Guide
[15] SIM Access Profile Interoperability Specification of the Bluetooth Special Interest Group, version 0.95c

Prior to using AC45 or upgrading to a new firmware release, be sure to carefully read the latest product information provided in the Release Notes.

To visit the Siemens Website you can use the following link:
http://www.siemens.com/wm

1.3 Conventions and abbreviations

Throughout the document, the GSM engines are referred to as ME (Mobile Equipment), MS (Mobile Station), TA (Terminal Adapter), DCE (Data Communication Equipment) or facsimile DCE (FAX modem, FAX board).

To control your GSM engine you can simply send AT Commands via its serial interface. The controlling device at the other end of the serial line is referred to as TE (Terminal Equipment), DTE (Data Terminal Equipment) or plainly “the application” (probably running on an embedded system).

All abbreviations and acronyms used throughout this document are based on the GSM specifications. For definitions please refer to TR 100 350 V7.0.0 (1999-08), (GSM 01.04, version 7.0.0 release 1998).

1.4 AT command syntax

The "AT" or "at" prefix must be set at the beginning of each command line. To terminate a command line enter <CR>.

Commands are usually followed by a response that includes “<CR><LF><response><CR><LF>”. Throughout this document, only the responses are presented, <CR><LF> are omitted intentionally.

Table 1: Types of AT commands and responses

Test command	AT+CXXX=?	The mobile equipment returns the list of parameters and value ranges set with the corresponding Write command or by internal processes.
Read command	AT+CXXX?	This command returns the currently set value of the parameter or parameters
Write command	AT+CXXX=<...>	This command sets user-definable parameter values.
Execution command	AT+CXXX	The execution command reads non-variable parameters affected by internal processes in the GSM engine.

1.4.1 Using parameters

- Factory defaults are underlined or, if necessary, explicitly stated in the parameter description. A factory value will be loaded on power-up if the parameter is not storable (for example if not stored when AT^SMSO is executed, or not stored to the user profile specified with AT&W, or not stored to the audio profile defined with AT^SNFW). To restore factory defaults use AT&F. A variety of audio parameters can be reset to their factory defaults using AT^SNFD.
- Optional parameters are enclosed in square brackets, for example [0]. If optional parameters are omitted, the bracketed value will be used by default. If a parameter is not enclosed in brackets and no other behavior is stated, the current setting remains unchanged when the parameter is omitted.
- To ensure the correct sequence of optional and mandatory parameters, a comma must be kept for each omitted parameter that is followed by further parameters. Example:
  AT+CPBW=,<number>,<type>,<text> writes a phonebook entry to the first free memory location.
  AT+CPBW=<location>,<number>,<type>,<text> writes a phonebook entry to the memory location specified by <location>.
- When the parameter is a character string, e.g. <text> or <number>, the string must be enclosed in quotation marks, e.g. "Charlie Brown" or "+49030xxxx". Symbols within quotation marks will be recognized as strings.
- All spaces will be ignored when using strings without quotaton marks.
- It is possible to omit the leading zeros of strings which represent numbers.

1.4.2 Combining AT commands on the same command line

You may enter several AT commands on the *same* line. This eliminates the need to type the "AT" or "at" prefix before each command. Instead, it is only needed once at the beginning of the command line. Use a semicolon as command delimiter.

The command line buffer accepts a maximum of 391 characters. If this number is exceeded none of the commands will be executed and TA returns ERROR.

The table below lists the AT commands you cannot enter together with other commands on the same line. Otherwise, the responses may not be in the expected order.

Table 2: Illegal combinations of AT commands

V.25ter commands	With	FAX commands, **Prefix AT+F**
GSM 7.07 commands	With	Siemens commands, **Prefix AT^S**
GSM 7.05 commands (SMS)	---	To be used standalone
Commands starting with AT&	---	To be used standalone
AT+IPR	---	To be used standalone

Note: When concatenating AT commands please keep in mind that the sequence of processing may be different from the sequential order of command input. Therefore, if the consecutive order of the issued commands is your concern, avoid concatenating commands on the same line.

1.4.3 Entering successive AT commands on separate lines

When you enter a series of AT commands on *separate* lines, leave a pause between the preceding and the following command until the final response (for example OK, CME error, CMS error) appears. This avoids sending too many AT commands at a time without waiting for a response for each.

1.4.4 Communication between customer application and AC45

Leaving hardware flow control unconsidered, the customer application (TE) is coupled with the AC45 (ME) via a receive and a transmit line.

Since both lines are driven by independent devices collisions may (and will) occur, for example, if the TE issues an AT command at the same time when AC45 starts sending a URC. This will probably cause the TE to misinterpret the URC as part of the response returned to the AT command.

To avoid this conflict the following measures must be taken:

- If an AT command is finished (with "OK" or "ERROR") the TE shall always wait at least 100 milliseconds before sending the next one. This gives AC45 the opportunity to transmit pending URCs and get necessary service.
  Some AT commands may require more delay after an "OK" or "ERROR" response, refer to the following command specifications for details.
- The TE shall communicate with AC45 using activated echo (ATE1), i.e. AC45 echoes characters received from the TE.
  Hence, when the TE receives the echo of the first character "A" of the AT command just sent by itself it has control both over the receive and the transmit paths. This way, no URC can be issued by AC45 in between.

1.4.5 Unsolicited Result Codes (URCs)

An Unsolicited Result Code (URC) is a report message issued by the ME without being requested by the TE, i.e. a URC is delivered automatically when a certain event occurs. Hence, a URC is not issued as part of the response to an executed AT command.

Typical events leading to URCs are incoming calls (“RING”), received short messages, changing temperature, status of the battery etc. A summary of URCs is listed in Table 21 and Table 22.

To announce a pending URC transmission the ME will do the following:

- The ME activates its Ring line (logic "1") for one second, i.e. the line changes to physical "Low" level. This allows the TE to enter power saving mode until ME related events request service.
- If the AT command interface is busy a "BREAK" will be sent immediately but the URC will not be issued until the line is free. This may happen if the URC is pending
  - while an AT command is being processed, i.e. during the time from sending the first character "A" of an AT command by the TE until the ME has responded with "OK" or "ERROR", or
  - during a data call.

  Please note that AT command settings may be necessary to enable in-band signaling. For example, refer to AT+CMER or AT+CNMI.

It is strongly recommended to use the multiplex mode to map logical communication channels onto the serial line of AC45. For details refer to [5] and the AT command AT+CMUX. Doing so it is possible to use one channel to still process URCs while having a data call active on another.

For most of these messages, the ME needs to be configured whether or not to send an unsolicited result code. Depending on the AT command, the URC presentation mode can be saved to the user defined profile (see AT&W in Chapter 2.38), or needs to be activated every time you reboot the ME. Several URCs are not user definable, such as “^SYSSTART”, “^SYSSTART ALARM MODE”, “^SYSSTART, “^SHUTDOWN” and the Fax Class 2 URCs listed in Table 22.

If autobauding is enabled (as factory default mode or set with AT+IPR=0) URCs generated after restart will be output at 57600 bps until the ME has detected the current bit rate. The URCs “^SYSSTART” and “^SYSSTART ALARM MODE”, however, are not presented at all. For details please refer to Chapter 2.45.1. To avoid problems we recommend to configure a fixed bit rate rather than using autobauding.

1.5 Supported character sets

The ME supports two character sets: GSM 03.38 (7 bit, also referred to as SMS alphabet) and UCS2 (16 bit, refer to ISO/IEC 10646). See Chapter 4.44 for information about selecting the character set. Character tables are provided in Chapter 10.5.

Table 3: Explanation of terms

Term	GSM character hex. value
Data Coding Scheme	The Data Coding Scheme (dcs) is part of a short message and is saved on the SIM. When writing a short message to the SIM in text mode, the dcs stored with AT+CSMP is used.
Escape sequences	The escape sequence used within a text coded in GSM default alphabet (0x1B) must be correctly interpreted by the TE, both for character input and output. To the module, an escape sequence appears like any other byte received or sent.
IRA	IRA means that one byte is displayed as two characters in hexadecimal format. For example,. the byte 0x36 (decimal 54) is displayed as "36" (two chars).
TE	TE is the terminal equipment that uses the GSM default alphabet as its character set. MS Hyperterminal (often used with the module) is an ANSI / ASCII terminal that does not support the GSM default alphabet.
TE character set	The currently used TE character set is selected with AT+CSCS.

Due to the constraints described below it is recommended to prefer the USC2 alphabet in any external application.

If the GSM alphabet is selected all characters sent over the serial line are in the range from 0 ... 127.

CAUTION: GSM alphabet is not ASCII alphabet!

Several problems resulting from the use of the GSM alphabet:

1. "@" character with GSM alphabet value 0 is not printable by an ASCII terminal program (e.g. Microsoft© Hyperterminal®).
2. "@" character with GSM alphabet value of binary 0 will terminate any C string!
   This is because the \0 is defined as C string end tag. Therefore, the GSM Null character may cause problems on application level when using a ´C´-function as „strlen()“. This can be avoided if it is represented by an escape sequence as shown in Table 4.
   By the way, this may be the reason why even network providers often replace "@"with “@=*” in their SIM application.
3. Other characters of the GSM alphabet are misinterpreted by an ASCII terminal program. For example, GSM "ö" (as in "Börse") is assumed to be "|" in ASCII, thus resulting in "B|rse". This is because both alphabets mean different characters with values hex. 7C or 00 and so on.
4. In addition, decimal 17 and 19 which are used as XON/XOFF control characters when software flow control is activated, are interpreted as normal characters in the GSM alphabet.

When you write characters differently coded in ASCII and GSM (e.g. Ä, Ö, Ü), you need to enter escape sequences. Such a character is translated into the corresponding GSM character value and, when output later, the GSM character value can be presented. Any ASCII terminal then will show wrong responses.

Table 4: Character definitions depending on alphabet (examples)

GSM 03.38 character	GSM character hex. value	Corresponding ASCII character	ASCII Esc sequence	Hex Esc sequence
Ö	5C	\	\5C	5C 35 43
"	22	“	\22	5C 32 32
ò	08	BSP	\08	5C 30 38
@	00	NULL	\00	5C 30 30

CAUTION: Often, the editors of terminal programs do not recognize escape sequences. In this case, an escape sequence will be handled as normal characters. The most common workaround to this problem is to write a script which includes a decimal code instead of an escape sequence. This way you can write, for example, short messages which may contain differently coded characters.

1.5.1 UCS2 and GSM data coding and conversion in SMS text mode and Remote-SAT

This chapter provides basic information on how to handle input and output character conversion for SMS text mode and Remote-SAT if internal (ME) and external (TE) character representation differ, i.e. if the Data Coding Scheme and the TE character set use different coding.

1.5.1.1 Implementing output of SIM data to the TE

Table 5: Direction ME to TE (output of SIM data to the TE)

dcs CSCS	7 bit (GSM default)	8 bit	16 bit (UCS2)
GSM	Case 1 GSM (1:1)	Case 2 IRA (1:1)	Case 3 IRA (2:2)
UCS2	Case 4 GSM to UCS2 (1:2)	Case 5 GSM to UCS2 (1:2)	Case 6 IRA (2:2)

Case 1
Every byte will be sent as GSM-character (or ASCII if Hyperterminal is used).
Example: 0x41,0x21 → ”AB” (because of conversion from 7-bit to 8-bit)

Case 2
Every byte will be sent as IRA. No conversion.
Example: 0x41,0x42 → ”4142”

Case 3
Every byte will be sent as IRA. No conversion to GSM to avoid data loss.
Example: 0x00,0x41 → ”0041”
Problems:

- 0x41,0x42 → ”4142” (invalid GSM character, but ignored with respect to GSM 07.05)
- 0x41 → Error (there are two bytes needed)

Case 4
Every byte will be converted from GSM to UCS2.
Example: 0x41,0x42 → ”00410042”

Case 5
Every Byte will be converted from GSM to UCS2.
Example: 0x41,0x42 → ”00410042”

Case 6
Example: 0x41,0x42 → ”4142”
Problems: 0x41 → Error (there are two bytes needed)

1.5.1.2 Implementing input of TE data to SIM

Table 6: Direction TE to ME (input of Terminal data to SIM)

CSCS DCS	GSM	UCS2
7 bit (GSM default)	Case 1 GSM (1:1)	Case 4 GSM to UCS2 (2:1)
8 bit	Case 2 GSM to UCS2 (1:2)	Case 5 GSM to UCS2 (2:1)
16 bit (UCS2)	Case 3 IRA (2:2)	Case 6 IRA (2:2)

Case 1
Data will be packed to 7 bit.
Maximum text length: 160 characters
Example: ”AB” → 0x41,0x21

Case 2
Data will be saved without any conversion.
Maximum text length: 280 characters
Example: ”4142” → 0x41,0x42
Problems: ”8f” → Error (invalid GSM character)

Case 3
Two bytes are needed. No conversion.
Maximum text length: 280 characters
Example: ”0041” → 0x00,0x41
Problems: ”41” → Error (there are two bytes needed)

Case 4
Two bytes are needed. Two bytes will be convert to 1 Bye GSM and 7-bit packed.
Maximum text length: 640 characters
Example: ”00410042” → 0x41,0x21
Problems:

- ”41” → Error (there are two bytes needed)
- ”4142” → Error (invalid character)
- ”0000” → Error (not an ucs2 character)
- ”007B” → 0x1B,0x28 (the saved data are two bytes long, not 1 byte like in all other cases. This effects the maximum input length of a string).

Case 5
Two bytes are needed. Two bytes will be converted to 1 Byte GSM.
Maximum text length: 560 characters
Example: ”00410042” → 0x41,0x42
Problems:

- ”41” → Error (there are two bytes needed)
- ”4142” → Error (invalid character)
- ”0000” → Error (not a UCS2 character)
- ”007B” → 0x1B,0x28 (the saved data are two bytes long, not 1 byte like in all other cases. This effects the maximum input length of a string)

Case 6
Two bytes are needed.
Maximum text length: 280 characters
Example: ”00410042” → 0x00,0x41,0x00,0x21
Problems:

- ”41” → Error (there are two bytes needed)
- ”0000” → Error (not an ucs2 character)
- ”007B” → 0x00,0x7B

1.6 Flow control

Flow control is essential to prevent loss of data or avoid errors when, in a data or fax call, the sending device is transferring data faster than the receiving side is ready to accept. When the receiving buffer reaches its capacity, the receiving device should be capable to cause the sending device to pause until it catches up.

There are basically two approaches to regulate data flow: software flow control and hardware flow control. The High Watermark of the input / output buffer should be set to approximately 60% of the total buffer size. The Low Watermark is recommended to be about 30%. The data flow should be stopped when the capacity rises close to the High Watermark and resumed when it drops below the Low Watermark. The time required to cause stop and go results in a hysteresis between the High and Low Watermarks.

In Multiplex mode, it is recommended to use hardware flow control. For details please refer to [5].

1.6.1 Software flow control (XON/OFF flow control)

Software flow control sends different characters to stop (XOFF, decimal 19) and resume (XON, decimal 17) data flow. The only advantage of software flow control is that three wires would be sufficient on the serial interface.

1.6.2 Hardware flow control (RTS/CTS flow control)

Hardware flow control sets or resets the RTS/CTS wires. This approach is faster and more reliable, and therefore, the better choice. When the High Watermark is reached, CTS is set inactive until the transfer from the buffer has completed. When the Low Watermark is passed, CTS goes active once again.

To achieve smooth data flow, ensure that the RTS/CTS lines are present on your application platform. The application should include options to enable RTS/CTS handshake with the GSM engine. This needs to be done with the AT command AT\Q3 - it is not sufficient to set RTS/CTS handshake in the used Terminal program only. For details refer to Chapter 2.3.

The default setting of the GSM engine is AT\Q0 (no flow control) which must be altered to AT\Q3 (RTS/CTS hardware handshake on). The setting is stored volatile. For use after restart, AT\Qn should be stored to the user profile with AT&W.

AT\Q has no read command. To verify the current setting of AT\Q, simply check the settings of the active profile with AT&V.

Often, fax programs run an intialization procedure when started up. The intialization commonly includes enabling RTS/CTS hardware handshake, eliminating the need to set AT\Q3 once again. However, before setting up a CSD call, you are advised to check that RTS/CTS handshake is set.

Note: After deactivating the RTS line, the ME may still send up to 264 bytes (worst case). This can be easily managed if the buffer of the host application is sufficiently sized, and if a hysteresis is implemented in its Rx buffer as mentioned in Chapter 1.6. For host applications that are required to handle a large amount of data at high speed, a total buffer capacity of at least 512 bytes is recommended.

2 Standard V.25ter AT Commands

These AT Commands are related to ITU-T (International Telecommunication Union, Telecommunication sector) V.25ter document.
AC45 supports the registers S0-S29. You can change S0,S3,S4,S5,S6,S7,S8,S10,S18 by using the appropriate ATSn commands. All the other registers are read-only and for internal usage only!

2.1 A/ Repeat previous command line

Execute command	Response
A/	Repeats previous command line. Line does not need to end with terminating character. Parameter
Reference V.25ter	Note • After beginning with the character “a“ or „A“, a second character “t“ ,”T“ or “/“ has to follow. In case of using a wrong second character, it is necessary to start again with character “a“ or “A“. • If autobauding is active (see Chapter 2.45) A/ (and a/) cannot be used.

2.2 +++ Switch from data mode or PPP online mode to command mode

Execute command	Response
+++	This command is only available during a CSD call or a GPRS connection. The +++ character sequence causes the TA to cancel the data flow over the AT interface and switch to command mode. This allows you to enter AT commands while maintaining the data connection to the remote device or, accordingly, the GPRS connection. **OK** To prevent the +++ escape sequence from being misinterpreted as data, it must be preceded and followed by a pause of at least 1000 ms. The +++ characters must be entered in quick succession, all within 1000 ms.
Reference V.25ter	Note: • To return from command mode to data or PPP online mode: Enter ATO as described in Chapter 2.17.

2.3 AT\Qn Flow control

Execute command	Response
AT\Q<n>	**OK** If RTS/CTS flow control is not supported by interface and **<n>** is 2 or 3 **ERROR** Parameter

<n>			
	0	AT\Q0	No flow control
	1	AT\Q1	XON/XOFF software flow control
	2	AT\Q2	Only CTS by DCE
	3	AT\Q3	RTS/CTS hardware flow control Recommended for the following procedures: incoming or outgoing data calls, fax calls, GPRS connections, MUX mode. Often, the initialization routine of Fax programs includes enabling RTS/CTS handshake, eliminating the need to issue AT\Q3 once again.

Reference

Note

- Factory default is 0 (no flow control).
- The setting of AT\Qn is stored volatile. For use after restart it should be stored to the user defined profile (AT&W).
- For compatibility reasons, the AT\Qn command can be used in Multiplex mode, though the settings will not take effect. However, be aware that whenever you use the AT\Qn write command in Multiplex mode and then save the current configuration to the user profile with AT&W, the changed AT\Qn setting will become active after restart.
- See also Chapter 1.6 for general information on flow control.

2.4 ATA Answer a call

Execute command ATA	TA causes remote station to go off-hook (e.g. answer call). Any additional commands on the same command line are ignored. This command may be aborted generally by receiving a character during execution. It can´t be aborted in some connection setup states, such as handshaking. Response Response in case of data call, if successfully connected: **CONNECT<text>** TA switches to data mode. Response in case of voice call, if successfully connected: **OK** When TA returns to command mode: **OK** Response if no connection: **NO CARRIER** Parameter **<text>** Connection status (string) **<text>** output only if +ATX parameter setting with value > 0.
Reference V.25ter	Note • See also AT+ATX in Chapter 2.31 and and result codes in Chapter 10.1.5 for **<text>** • If AT+FCLASS setting is 1 or 2, all incoming calls will be answered as fax calls, when ATA is issued on multiplexer channel 1 resp. ASC0. For calls explicitly signaled as voice or data calls, this procedure will fail with result code “NO CARRIER”, but the incoming call will continue to ring. It is possible to change the AT+FCLASS setting to 0 while the call is ringing and to accept the call afterwards with ATA. See Chapter 3.5 for AT+FCLASS.

2.5 ATD Mobile originated call to dial a number

Execute command

ATD[<n>][<mgsm][;]

This command can be used to set up outgoing *voice, data or fax calls*. It also serves to control *supplementary services*.

The command may be aborted generally when receiving an ATH command during execution. Abortion is not possible during some states of connection setup such as handshaking.

Response

If no dialtone (parameter setting ATX2 or ATX4):
NO DIALTONE

If busy (parameter setting ATX3 or ATX4):
BUSY

If a connection cannot be set up:
NO CARRIER

If successfully connected and non-voice call:
CONNECT<text> TA switches to data state.
Note: **<text>** output only if ATX parameter setting with value > 0.

When TA returns to command mode:
OK

If successfully connected and voice call:
OK

Parameter

<n> String of dialing digits and optionally V.25ter modifiers (dialing digits): 0-9, * , #, +, A, B, C
V.25ter modifiers: these are ignored: ,(comma), T, P, !, W, @

Emergency call:

<n> = Standardized emergency number 112 (no SIM needed)

<mgsm> String of GSM modifiers:

I	Activates CLIR (disables presentation of own phone number to called party)
i	Deactivates CLIR (enables presentation of own phone number to called party)
G	Activates Closed User Group invocation for this call only.
g	Deactivates Closed User Group invocation for this call only.

<;> Only required to set up voice calls. TA remains in command mode.

Reference

V.25ter

GSM 07.07

GSM 02.07 Annex A

General remarks

- Before setting up a data call, check that RTS/CTS handshake is enabled. See Chapters 1.6 and 2.3.
- Parameter "I" and "i" only if no *# code is within the dial string.
- **<mgsm>** is not supported for data calls.
- **<n>** is default for last number that can be dialed by ATDL.
- *# codes sent with ATD are treated as voice calls. Therefore, the command must be terminated with a semicolon ";".
- If ATD is used with a USSD command (e.g. ATD*100#;) an AT+CUSD=1 is executed implicitly (see AT+CUSD, pg. 158).

- Parameter ‘G’ or ‘g’ will be ignored if Closed User Group was already activated, or accordingly, deactivated with AT+CCUG command. Call by call invocation of CUG uses the settings provisioned by the provider or, if available, the settings of the parameters <index> and <info> made with AT+CCUG. See also Chapter 4.8.
- See ATX command in Chapter 2.31 for setting result code and call monitoring parameters. Refer to Chapter 10.1.5 for <**text**>.

Blacklist management:

- The ME provides a blacklist function according to GSM02.07 Annex A. After a predefined number of failed call attempts to the same number, the dialed number is entered into a read-only phonebook called “blacklist” (phonebook “BL”). Call attempts to numbers contained in the blacklist will be barred by the ME and not signaled to the network. An attempt to start a voice call to a barred phone number will be stopped with CME ERROR 257 “Call barred”. An attempt to start a data or fax call to a barred phone number will be answered immediately with the result code “NO CARRIER”.
- GSM02.07 Annex A states a variety of conditions under which a number can be removed from the blacklist. As far as timing conditions are concerned, the ME deletes numbers from the blacklist if a timer condition specified in GSM02.07 Annex A is met. But the most important condition is that the blacklist should be cleared if a user interaction is detected (key pressed). Since the module cannot detect such user interaction, it is up to the application to clear the blacklist in this case, using the AT^SPBD command. See Chapter 9.36.

Different call release indications

- Upon termination, an outgoing fax or data call may show a different result code than a voice call would deliver under identical conditions. In order to track down the actual reason for call release, ATS18 (see Chapter 2.28) or AT+CEER (see Chapter 4.10) should be used.

Different response modes

- For voice calls two different response modes can be determined: TA returns “OK” either after dialing was completed or after the call has been established. The setting is made with AT^SM20 (see Chapter 9.18 for more details). Factory default is AT^SM20=1. This causes the ME to return “OK” in case of successful connection, otherwise one of the call release indications “NO CARRIER”, “NO DIAL TONE”, “NO CARRIER” will follow.
- Data calls: In data connections, call setup always terminates when the call has been established (indicated by result code “CONNECT<text>”) or when it fails (indicated by “NO CARRIER”).

Using ATD during an active voice call:

- When a user originates a second voice call while there is already an active voice call, the first call will be automatically put on hold.
- The second call attempt is acknowledged with “OK” immediately after dialing with ATD has completed, without relation to a successful call setup. In case of failure, the additional result codes “NO CARRIER”, “NO DIAL TONE”, “NO CARRIER” will be presented afterwards (see example below).
  This behavior is similar to the mode set with AT^SM20=0, but occurs also if AT^SM20=1 and cannot be changed. To avoid different behavior in all procedures of voice call setup simply give priority to AT^SM20=0 (“OK” appears always immediately after dialing).
- The current states of all calls can be easily checked at any time by using the AT+CLCC command. For details refer to Chapter 4.20.

Example	The following example shows the call setup procedure when a call is already active and a second call attempt fails because the line of the called party is busy: `atd0301234567;` Dialing out the first party's number. `OK` The first call is established. `atd0302222222;` The number of the second party is dialed. `OK` The response "OK" is issued immediately though no call is established (same behavior as if you had chosen AT^SM20=0). `BUSY` Line of second called party is busy.

2.6 ATD><mem><n> Originate call to phone number <n> in memory <mem>

This command allows you to dial a phone number from a specific phonebook. To initiate a call, enter a two letter abbreviation for the phonebook <**mem**>, followed by the memory location <**n**> of the desired entry. The location range of each phonebook can be queried with AT+CPBR (see Chapter 4.32).

Execute command ATD><mem><n>[<mgsm>];	TA attempts to set up an outgoing call to the specified number. This command may be aborted generally by receiving a character during execution. Abortion is not possible during some states of connection setup such as handshaking. Response If error is related to ME functionality: **+CME ERROR: <err>** If no dialtone (parameter setting ATX2 or ATX4): **NO DIALTONE** If busy (parameter setting ATX3 or ATX4): **BUSY** If connection cannot be set up: **NO CARRIER** If successfully connected: **OK**
	Parameter <**mem**> phonebook: "SM" SIM phonebook (storage depending on SIM card) "FD" SIM fixdialing phonebook (storage depending on SIM card) "LD" Last-dialing-phonebook (list of up to 10 most recently dialed numbers. Depending on the SIM card, the storage is located either on the SIM card only or shared by SIM and ME). "MC" ME missed (unanswered received) calls list (up to 10 numbers) "RC" Received calls list (up to 10 numbers stored in ME) "ME" ME phonebook (up to 250 numbers) "ON" Own numbers (MSISDNs) list. Storage depending on SIM card. Notes: Refer to Chapter 4.33 for more information regarding the capacity of each phonebook and types of storage (ME / SIM card). <**n**> Integer type memory location in the range of locations available in the selected memory, i.e. the index number returned by AT+CPBR. <**mgsm**> I Activates CLIR (disables presentation of own phone number to called party) i Deactivates CLIR (enables presentation of own phone number to called party) <;> The semicolon is mandatory since dialing from a phonebook is only supported for voice calls.

Reference	Note
V.25ter/GSM 07.07	• There is no <**mem**> for emergency call (“EN”). • The command is not applicable to data calls. Any attempt to dial a data call number from <**mem**> causes the result code “NO CARRIER” to appear. • Parameter <**mgsm**> only if no *# code is within the dial string. • *# codes sent with ATD are treated as voice calls. Therefore, the command must be terminated with a semicolon “;”. • See ATX command in Chapter 2.31 for setting result code and call monitoring parameters.

Example	To query the location number of the phonebook entry:
	`AT+CPBR=1,xx`
	TA returns the entries available in the active phonebook.
	
	To dial a number from the SIM phonebook, for example the number stored to location 15:
	`ATD>SM15;`
	`OK`
	
	To dial a phone number stored in the last dial memory on the SIM card:
	`ATD>LD9;`
	`OK`

2.7 ATD><n> Originate call to phone number selected from active memory

This command can be used to dial a phone number selected from the active memory. The active memory is the phonebook selected with AT+CPBS (see Chapter 4.33). To set up a call simply enter the memory location of the desired entry. The memory location range of each phonebook can be queried by AT+CPBR (see Chapter 4.32).

Execute command ATD><n>[<mgsm>];	TA attempts to set up an outgoing call to the stored number. The command may be aborted generally by receiving a character during execution. Abortion is not possible during some states of connection setup such as handshaking. Response If error is related to ME functionality: **+CME ERROR: <err>** If no dialtone (parameter setting ATX2 or ATX4): **NO DIALTONE** If busy (parameter setting ATX3 or ATX4): **BUSY** If a connection cannot be set up: **NO CARRIER** If successfully connected: **OK** Parameter **<n>** integer type memory location should be in the range of locations available in the memory used, i.e. the index number returned by AT+CPBR. **<mgsm>** I Activates CLIR (disables presentation of own phone number to called party) i Deactivates CLIR (enables presentation of own phone number to called party) <;> The semicolon is mandatory since dialing from a phonebook is only supported for voice calls.
Reference V.25ter/GSM 07.07	Note • Parameter **<mgsm>** only if no *# code is within the dial string. • The command is not applicable to data calls. Any attempt to dial a data call number from **<mem>** causes the result code “NO CARRIER” to appear. • *# codes sent with ATD are treated as voice calls. Therefore, the command must be terminated with a semicolon “;”. • See ATX command in Chapter 2.31 for setting result code and call monitoring parameters.

2.8 ATD><str> Originate call to phone number in memory with corresponding field

This command searches the active phonebook for a given string <str> and dials the assigned phone number. The active phonebook is the one set with AT+CPBS.

Execute command ATD><str>[mgsm];	TA attempts to set up an outgoing call to stored number. This command may be aborted generally by receiving a character during execution. Abortion is not possible during some states of connection setup such as handshaking. Response If error is related to ME functionality: **+CME ERROR: <err>** If no dialtone (parameter setting ATX2 or ATX4): **NO DIALTONE** If busy (parameter setting ATX3 or ATX4): **BUSY** If a connection cannot be set up: **NO CARRIER** If successfully connected: **OK** Parameter **<str>** string type value (“x”), which should equal an alphanumeric field in at least one phonebook entry in the searched memories; used character set should be the one selected with AT+CSCS. **<str>** can contain escape sequences as described in Chapter 1.5. **<str>** must be enclosed in quotation marks (""), if escape sequences or parameter **<mgsm>** are used or if the alphanumeric strings contains a blank. If not, quotation marks are optional. **<mgsm>** I Activates CLIR (disables presentation of own phone number to called party) i Deactivates CLIR (enables presentation of own phone number to called party) **<;>** The semicolon is mandatory since dialing from a phonebook is only supported for voice calls.
Reference V.25ter/GSM 07.07	Note • The command is not applicable to data calls. Any attempt to dial a data call number from **<mem>** causes the result code “NO CARRIER” to appear. • See ATX command in Chapter 2.31 for setting result code and call monitoring parameters. Refer to Chapter 10.1.5 for **<text>**.

2.9 ATDI Mobile originated call to dialable ISDN number <n>

Execute command ATDI<n>[;]	TA attempts to set up an outgoing call to ISDN number. This command may be aborted generally by receiving a character during execution. Abortion is not possible during some states of connection setup such as handshaking. Response If no dialtone (parameter setting ATX2 or ATX4): **NO DIALTONE** If busy (parameter setting ATX3 or ATX4): **BUSY** If a connection cannot be set up: **NO CARRIER** If successful connected and non-voice call: **CONNECT<text>** TA switches to data state. Note: **<text>** output only if +ATX parameter setting with value > 0. When TA returns to command mode: **OK** If successfully connected and voice call: **OK**
	Parameter <n> [+]<d> phone number string with maximum length of 20 characters + international dialing format <d> ISDN number string of digits: +,0-9, A, B, C <;> voice call
Reference V.25ter	Note See ATX command in Chapter 2.31 for setting result code and call monitoring parameters. Refer to Chapter 10.1.5 for **<text>**.

2.10 ATDL Redial last telephone number used

Execute command ATDL[;]	This command redials the last telephone number dialed. • To redial the last data call number simply enter ATDL • To redial the last voice call number type ATDL; The command may be aborted generally by receiving a character during execution. Abortion is not possible during some states of connection setup such as handshaking. Response If there is no last number or number is not valid: **+CME ERROR** If no dialtone (parameter setting ATX2 or ATX4): **NO DIALTONE** If busy (parameter setting ATX3 or ATX4): **BUSY** If a connection cannot be set up: **NO CARRIER** If successfully connected and non-voice call: **CONNECT<text>** TA switches to data state. Note: **<text>** output only if +ATX parameter setting with value > 0. When TA returns to command mode: **OK** If successfully connected and voice call: **OK** Parameter <;> voice call
Reference V.25ter	Note • See ATX command in Chapter 2.31 for setting result code and call monitoring parameters. Refer to Chapter 10.1.5 for **<text>**. • If terminated with semicolon, ATDL dials the last voice call number stored in the “LD”phonebook. Otherwise, the last dialed data or fax number will be used which is not stored in the “LD”phonebook. See Chapter 4.33.

2.11 ATE Enable command echo

Write command ATE[<value>]	This setting determines whether or not the TA echoes characters received from TE during command state. Response **OK** Parameter **<value>** 0 Echo mode off 1 Echo mode on
Reference V.25ter	Note In case of using the command without parameter, <value> is set to 0.

2.12 ATH Disconnect existing connection

Execute command ATH[n]	Disconnects any call in progress, such as voice, fax or CSD calls. See notes below for GPRS and multiplex mode. Response **OK** Note: OK is issued after circuit 109 (DCD) is turned off, if it was previously on. Parameter **<n>** [0] terminate call
Reference V.25ter	Note Using ATH in Multiplex mode: • ATH terminates every voice, fax or CSD call, no matter on which logical channel ATH was executed. For more details see [2]. For example, if ATH is executed on channel 2 or 3, a voice call on channel 1 will be disconnected, too. This behavior is in accordance with ITU-T V.25 ter; (07/97, see “6.3.6 Hook control“: "ATH is terminating any call in progress"). Using ATH while GPRS is active during Multiplex mode: • ATH clears an active PDP context or terminates an existing PPP connection, but only if issued on the same logical channel where GPRS is used. It does not affect PDP contexts and PPP connections on other interfaces or logical channels. • See also Chapter 6.3.3, ATH Manual rejection of a network request for PDP context activation.

2.13 ATI Display product identification information

Execute command	Response
ATI	ME issues product information text **SIEMENS** **AC45** **REVISION xx.yy** **OK** Explanation of “Revision“ parameter: Version xx and variant yy of software release.
Reference	Note
V.25ter	

2.14 ATI[value] Display additional identification information

Execute command	Response
ATI[value]	<value>=9 delivers the following information. Other values are not supported and only return OK. ATI9 SIEMENS Gipsy Soft Protocolstack V2.550
Reference	Note
V.25ter	

2.15 ATL Set monitor speaker loudness

Execute command	Response
ATL[val]	**OK**
Reference	Note
V.25ter	• The two commands ATL and ATM are implemented only for V.25ter compatibility reasons and have no effect. • In multiplex mode the command is supported on logical channel 1 only.

2.16 ATM Set monitor speaker mode

Execute command	Response
ATM[val]	**OK**
Reference	Note
V.25ter	• The two commands ATL and ATM are implemented only for V.25ter compatibility reasons and have no effect. • In multiplex mode the command is supported on logical channel 1 only.

2.17 ATO Switch from command mode to data mode / PPP online mode

Execute command	Response
ATO[n]	ATO is the corresponding command to the +++ escape sequence described in Chapter 2.2: When you have established a CSD call or a GPRS connection and TA is in command mode, ATO causes the TA to resume the data or GPRS connection and takes you back to data mode or PPP online mode. If connection is not successfully resumed **NO CARRIER** or TA returns to data or PPP online mode from command mode **CONNECT <text>** Note: **<text>** output only if +ATX parameter setting with value > 0. Parameter **<n>** [0] switch from command mode to data or PPP online mode
Reference	Note
V.25ter	

2.18 ATQ Set result code presentation mode

Write command	Response
ATQ[<n>]	Specifies whether or not the TA transmits any result code to the TE. Information text transmitted in response is not affected by this setting. If <n>=0: **OK** If <n>=1: **(none)** Parameter **<n>** 0 DCE transmits result code 1 Result codes are suppressed and not transmitted
Reference V.25ter	Note

2.19 ATP Select pulse dialing

Execute command	Response
ATP	**OK**
Reference V.25ter	Note No effect for GSM

2.20 ATS0 Set number of rings before automatically answering the call

Read command	Response
ATS0?	**<n> OK**
Write command ATS0=<n>	Specifies whether or not the TA will accept an incoming data / fax call without user intervention. **<n>** determines the number of rings to wait before the TA will automatically answer. Response **OK** Parameter **<n>** 000 disables automatic answer mode 001-255 enables automatic answering after specified number of rings (not supported on multiplex interfaces 2 and 3).
Reference V.25ter	Note • If **<n>** is set too high, the calling party may hang up before the call can be automatically answered. • The correlation between ATS7 and ATS0 is important. Example: Call setup may fail if ATS0=20 and ATS7=30. • On multiplex interfaces 2 and 3 only ATS0=0 is allowed.

2.21 ATS3 Write command line termination character

Read command ATS3?	Response **<n> OK**
Write command ATS3=<n>	This parameter setting determines the character recognized by TA to terminate an incoming command line. Response **OK**
	Parameter **<n>** 000-013-127 command line termination character
Reference V.25ter	Note Using other value than 13 can cause problems when entering commands.

2.22 ATS4 Set response formatting character

Read command ATS4?	Response **<n> OK**
Write command ATS4=<n>	This parameter setting determines the character generated by the TA for result code and information text. Response **OK**
	Parameter **<n>** 000-010-127 response formatting character.
Reference V.25ter	Note

2.23 ATS5 Write command line editing character

Read command ATS5?	Response **<n> OK**
Write command ATS5=<n>	This parameter setting determines the character recognized by TA as a request to delete the immediately preceding character from the command line. Response **OK**
	Parameter **<n>** 000-008-127 command line editing character
Reference V.25ter	Note

2.24 ATS6 Set pause before blind dialing

Read command ATS6?	Response **<n> OK**
Write command ATS6=<n>	No effect for GSM Response **OK**
	Parameter **<n>** 000-255 number of seconds to wait before blind dialing.
Reference V.25ter	Note

2.25 ATS7 Set number of seconds to wait for connection completion

Read command ATS7?	Response **<n> OK**
Write command ATS7=<n>	Specifies the number of seconds the TA will wait for the completion of the call setup when answering or originating a data call. Also referred to as "no answer timeout". To put it plainly, this is the time to wait for the carrier signal. If no carrier signal is received within the specified time, the TA hangs up. Response **OK**
	Parameter **<n>** 000 – 060 no. of seconds to wait for connection completion.
Reference V.25ter	Note • Values greater than 60 cause no error, but **<n>** will be restored to the maximum value of 60. • If called party has specified a high value for ATS0=**<n>**, call setup may fail. • The correlation between ATS7 and ATS0 is important. Example: Call setup may fail if ATS7=30 and ATS0=20. • ATS7 is only applicable to data calls.

2.26 ATS8 Set number of seconds to wait for comma dial modifier

Read command ATS8?	Response **<n> OK**
Write command ATS8=<n>	No effect for GSM Response **OK**
Reference V.25ter	Note

2.27 ATS10 Set disconnect delay after indicating the absence of data carrier

Read command ATS10?	Response <n> OK
Write command ATS10=<n>	This parameter setting determines the amount of time, that the TA remains connected in absence of a data carrier. If the data carrier is detected before disconnect, the TA remains connected. Response **OK**
	Parameter **<n>** 001-002-254 number of tenths of seconds of delay
Reference V.25ter	Note

2.28 ATS18 Extended error report

Read command ATS18?	Response **<n> OK**
Write command ATS18=<n>	The write command enables or disables the presentation of more detailed error messages reported in the case of unsuccessful CSD or fax calls. Parameter of the write command **<n>** 0 – 255 Odd numbers enable the presentation of extended error reports. Even numbers disable the presentation of extended error reports. Response **OK**
Extended error report	If the presentation is enabled (odd number), the TA returns an extended error report every time it fails to establish a data or fax call. Errors are reported only for failures that occur before call setup is complete, for example if the result code NO CARRIER, NO DIALTONE or BUSY appears. Extended error report **+CAUSE: <location ID>: <reason >** Parameters of the extended error report **<location ID>** Location ID as number code Location IDs are listed in Chapter 10.1.6. Each ID is related to another table that contains a list of **<reason>**s. **<reason>** Reason for last failure, stated as number code <reason> numbers and associated descriptions are listed in several tables, sorted by different categories (see Chapters 10.1.7 to 10.1.22). The Chapter numbers can be found proceeding from the Location ID table in Chapter 10.1.6.
Reference Siemens	Note This command applies only to circuit switched data calls and fax calls. For voice calls, extended error reports can be retrieved using the execute command AT+CEER (Chapter 4.10).

Example	To enable the presentation of extended error reports:
	`ats18=1`
	`OK`
	
	Now, a mobile originated data call fails. Call setup is terminated with an extended error report, followed by the result code NO CARRIER:
	`atd0301234567`
	`+CAUSE: 8:16`
	`NO CARRIER`
	
	The Location ID 8 stated in Chapter 10.1.6 points to Chapter 10.1.11, where 16 = “Normal call clearing”.

2.29 ATT Select tone dialing

Execute command	Response
ATT	**OK**
Reference	Note
V.25ter	No effect for GSM

2.30 ATV Set result code format mode

Write command	Response
ATV[<value>]	This parameter setting determines the contents of the header and trailer transmitted with result codes and information responses. When <**value**> =0 **0** When <**value**> =1 **OK** Parameter <**value**> [0] Information response: <**text**><**CR**><**LF**> Short result code format: <**numeric code**><**CR**> 1 Information response: <**CR**><**LF**><**text**><**CR**><**LF**> Long result code format: <**CR**><**LF**><**verbose code**><**CR**><**LF**>
Reference	Note
V.25ter	In case of using the command without parameter <**value**> will be set to 0. Information responses are listed in Chapter 10.1.5 (verbose code and numeric code).

2.31 ATX Set CONNECT result code format and call monitoring

Write command	Response
ATX[<value>]	This parameter setting determines whether or not the TA detects the presence of dial tone and busy signal and whether or not TA transmits particular result codes. **OK** Parameter <**value**> [0] CONNECT result code only returned, dial tone and busy detection are both disabled 1 CONNECT<text> result code only returned, dial tone and busy detection are both disabled 2 CONNECT<text> result code returned, dial tone detection is enabled, busy detection is disabled 3 CONNECT<text> result code returned, dial tone detection is disabled, busy detection is enabled 4 CONNECT<text> result code returned, dial tone and busy detection are both enabled
Reference	Note
V.25ter	See Chapter 10.1.5 for related <**text**>.

2.32 ATZ Set all current parameters to user defined profile

Execute command	Response
ATZ[<value>]	TA sets all current parameters to the user profile stored with AT&W. If a connection is in progress, it will be terminated. All defined GPRS contexts which are not activated or not online will be undefined (see +CGDCONT,+CGQREQ,+CGQMIN commands). Note: Any additional commands on the same command line will be ignored. A delay of 300 ms is required before next command is sent, otherwise "OK" response may be corrupted. **OK** Parameter **<value>** [0] Reset to user profile
Reference V.25ter	Note AC45 can be assigned two profiles: the factory profile (restored with AT&F) and the user profile (stored with AT&W). Related chapters: AT&F in Chapter 2.35, AT&W in Chapter 2.38.

2.33 AT&C Set circuit Data Carrier Detect (DCD) function mode

Write command	Response
AT&C[<value>]	This parameter determines how the state of circuit 109(DCD) relates to the detection of received line signal from the distant end. **OK** If DCD is not supported by the interface **ERROR** Parameter **<value>** [0] DCD line is always ON. 1 DCD line is ON in the presence of data carrier only.
Reference V.25ter	Note Factory default is 1.

2.34 AT&D Set circuit Data Terminal Ready (DTR) function mode

Write command	Response
AT&D[<value>]	This command is only intended for data calls. The <value> parameter determines how the TA responds when circuit 108/2 (DTR) is changed from ON to OFF during data mode. **OK** If DTR is not supported by the interface and <**value**> is 1 or 2 **ERROR** Parameter **<value>** [0] TA ignores status on DTR. 1 ON->OFF on DTR: Change to command mode while retaining the connected call. 2 ON->OFF on DTR: Disconnect data call, change to command mode. During state DTR = OFF is auto-answer off.
Reference V.25ter	Note Factory default is 2 if DTR is supported by the interface, otherwise 0.

2.35 AT&F Set all current parameters to manufacturer defaults

Execute command	Response
AT&F[value]	TA sets all current parameters to the manufacturer defined profile. Note: Any additional commands on the same command line will be ignored. A delay of 300 ms is required before next command is sent, otherwise "OK" response may be corrupted. **OK** Parameter <value> 0 Set all TA parameters to manufacturer default. See Table 7: Factory settings.
Reference	Note
V.25ter	In addition to the default profile, you can store an individual one with AT&W. To alternate between the two profiles enter either ATZ (loads user profile) or AT&F (restores factory profile). Refer to Chapter 2.38 for AT&W and Chapter 2.32 for ATZ. Audio parameters set with AT^SNFA, AT^SNFO and AT^SNFI can be restored with AT^SNFD. See Chapter 9.27.

Table 7: Factory settings

AT command	Restored parameters
AT\Q	<n>=0
ATE	<value>=1
ATQ	<n>=0
ATS0	<n>=000
ATS3	<n>=013
ATS4	<n>=010
ATS5	<n>=008
ATS6	<n>=000
ATS7	<n>=060
ATS10	<n>=002
ATS18	<n>=0
ATV	<value>=1
ATX	<value>=4
AT&C	<value>=1
AT&D	<value>=2
AT&S	<value>=0
AT+ILRR	<value>=0
AT+FCLASS	<n>=0
AT+CBST	<speed>=7, <name>=0, <ce>=1
AT+CFUN	<fun>=1
AT+CLIP	<n>=0
AT+CMEE	<n>=0
AT+CMER	<mode>=0, <keyp>=0, <disp>=0, <ind>=0, <bfr>=0

AT command	Restored parameters
AT+COPS	<format>=0
AT+CPBS	<storage>=”SM”
AT+CR	<mode>=0
AT+CRC	<mode>=0
AT+CREG	<n>=0
AT+CRLP	<iws>=61, <mws>=61, <T1>=78, <N2>=6
AT+CSCS	<chset>=”GSM”
AT+CSCS	<chset>=”GSM”
AT+CSSN	<n>=0, <m>=0
AT+VTD	<duration>=1
AT+CMGF	<mode>=0
AT+CNMI	<mode>=0, <mt>=0, <bm>=0, <ds>=0, <bfr>=1
AT+CSDH	<show>=0
AT+CSMP	<dcs>=0, <fo>=17, <pid>=0, <vp>=167
AT+CSMS	<service>=0, <mt>=1, <mo>=1, <bm>=1
AT^SMGO	<n>=0
AT^SSCONF	<ra>=0
AT^SSDA	<da>=0
AT^SSMSS	<seq>=0
AT^SACM	<n>=0
AT^SCKS	<n>=0
AT^SCTM	<n>=0, <p>=0
AT^SM20	<CallMode>=1, <CmgwMode>=1
AT^SPBS	internal counter

2.36 AT&S Set circuit Data Set Ready (DSR) function mode

Write command AT&S<value>	Response This parameter determines how the TA sets circuit 107 (DSR) depending on the communication state of the TA interfacing TE. **OK** If DSR is not supported by the interface **ERROR**
	Parameter **<value>** 0 DSR always on. 1 TA in command mode: DSR is OFF. TA in data mode: DSR is ON.
Reference V.25ter	Note Factory default is 0.

2.37 AT&V Display current configuration

Execute command	Response
AT&V[<n>]	TA returns the current parameter setting. The configuration varies depending on whether or not PIN authentication has been done, or Multiplex mode has been activated. Parameter <n> 0 profile number
Reference	Note: • Parameter values and order are subject to change. • The parameters of AT^SMGO can only be displayed after the SMS data from the SIM have been read successfully for the first time. Reading starts after successful SIM authentication has been performed, and may take up to 30 seconds depending on the SIM used. While the read process is in progress, an attempt to read the parameter will result in empty values. • The parameter of AT+CSDH will only be displayed in SMS text mode, i.e. if AT+CMGF=1.

Table 8: AT&V responses on ASC0 or multiplex channel 1

PIN authentication done	No PIN authentication
ACTIVE PROFILE: E1 Q0 V1 X4 &C1 &D2 &S0 \Q0 S0:000 S3:013 S4:010 S5:008 S6:000 S7:060 S8:000 S10:002 S18:000 +CBST: 7,0,1 +CRLP: 61,61,78,6 +CR: 0 +FCLASS: 0 +CRC: 0 +CMGF: 1 +CSDH: 0 +CNMI: 0,0,0,0,1 +ILRR: 0 +IPR: 57600 +CMEE: 2 ^SMGO: 0,0 +CSMS: 0,1,1,1 ^SACM: 0,”000000”,”000000” ^SCKS: 0,1 ^SSET: 0 +CREG: 0,1 +CLIP: 0,2 +CAOC: 0 +COPS: 0,0,”operator” +CGSMS: 3 OK	ACTIVE PROFILE: E1 Q0 V1 X4 &C1 &D2 &S0 \Q0 S0:000 S3:013 S4:010 S5:008 S6:000 S7:060 S8:000 S10:002 S18:000 +CBST: 7,0,1 +CRLP: 61,61,78,6 +CR: 0 +FCLASS: 0 +ILRR: 0 +IPR: 57600 +CMEE: 2 ^SCKS: 0,1 ^SSET: 0 +CGSMS: 3 OK

Table 9: AT&V responses on multiplex channels 2 / 3

PIN authentication done	No PIN authentication
ACTIVE PROFILE: E1 Q0 V1 X4 &C1 &D0 &S0 \Q0 S0:000 S3:013 S4:010 S5:008 +CR: 0 +CRC: 0 +CMGF: 1 +CSDH: 0 +CNMI: 0,0,0,0,1 +ILRR: 0 +IPR: 19200 +CMEE: 2 ^SMGO: 0,0 +CSMS: 0,1,1,1 ^SACM: 0,”000000”,”000000” ^SCKS: 0,1 ^SSET: 0 +CREG: 0,1 +CLIP: 0,2 +CAOC: 0 +COPS: 0,0,”operator” +CGSMS: 3 OK	ACTIVE PROFILE: E1 Q0 V1 X4 &C1 &D0 &S0 \Q0 S0:000 S3:013 S4:010 S5:008 +CR: 0 +ILRR: 0 +IPR: 19200 +CMEE: 2 ^SCKS: 0,1 ^SSET: 0 +CGSMS: 3 OK

2.38 AT&W Store current configuration to user defined profile

Execute command AT&W[<n>]	TA stores the current settings to a user defined profile in the non-volatile memory. Response **OK** or if error is related to ME functionality: **ERROR / +CME ERROR: <err>** Parameter **<n>** 0 number of profile
Reference V.25ter	Note • The user defined profile will be loaded automatically after PowerUp. Use ATZ to restore user profile and AT&F to restore factory settings. Until the first use of AT&W, ATZ works as AT&F. See Chapter 2.32 for details on ATZ and Chapter 2.35 for AT&F. • On each multiplexer channel you can save an individual profile.

Table 10: List of settings stored to user profile on ASC0 or multiplex channel 1

AT command	Stored parameters
AT\Q	<n>
ATE	<value>
ATQ	<n>
ATS0	<n>
ATS3	<n>
ATS4	<n>
ATS5	<n>
ATS6	<n>
ATS7	<n>
ATS8	<n>
ATS10	<n>
ATS18	<n>
ATV	<value>
ATX	<value>
AT&C	<value>
AT&D	<value>
AT&S	<value>
AT+ILRR	<value>
AT+FCLASS	<n>
AT+CBST	<speed>, <name>, <ce>
AT+CLIP	<n>
AT+CMEE	<n>
AT+COPS	<format>
AT+CR	<mode>
AT+CRC	<mode>
AT+CREG	<n>
AT+CRLP	<iws>, <mws>, <T1>, <N2>
AT+CMGF	<mode>
AT+CNMI	<mode>, <mt>, <bm>, <ds>, <bfr>

AT command	Stored parameters
AT+CSDH	<show>
AT+CSMS	<service>
AT^SMGO	<n>
AT^SACM	<n>
AT^SCKS	<n>
AT^SSET	<n>

Table 11: List of settings stored to user profile on multiplex channel 2 and 3

AT command	Stored parameters
AT\Q	<n>
ATE	<value>
ATQ	<n>
ATS3	<n>
ATS4	<n>
ATS5	<n>
ATV	<value>
ATX	<value>
AT&C	<value>
AT&D	<value>
AT&S	<value>
AT+CLIP	<n>
AT+CMEE	<n>
AT+COPS	<format>
AT+CR	<mode>
AT+CRC	<mode>
AT+CREG	<n>
AT+CMGF	<mode>
AT+CNMI	<mode>, <mt>, <bm>, <ds>, <bfr>
AT+CSDH	<show>
AT+CSMS	<service>
AT^SMGO	<n>
AT^SACM	<n>
AT^SCKS	<n>
AT^SSET	<n>

2.39 AT+GCAP Request complete TA capabilities list

Test command AT+GCAP=?	Response **OK** Parameter
Execute command AT+GCAP	Response TA reports a list of additional capabilities. **+GCAP: <name>** **OK** Parameter **<name>** e.g.: +**CGSM,+FCLASS**
Reference V.25ter	Note +CGSM: The response text shows which GSM commands of the ETSI standard are supported.

2.40 AT+GMI Request manufacturer identification

Test command AT+GMI=?	Response **OK**
Execute command AT+GMI	Response TA reports information to identify the manufacturer. **SIEMENS** **OK**
Reference V.25ter	Note See also ”AT+CGMI Request manufacturer identification”, Chapter 4.12.

2.41 AT+GMM Request TA model identification

Test command AT+GMM=?	Response **OK**
Execute command AT+GMM	TA reports one or more lines of information text which permit the user to identify the specific model of device. **AC45** **OK**
Reference V.25ter	Note See also ”AT+CGMM Request model identification”, Chapter 4.13.

2.42 AT+GMR Request TA revision identification of software status

Test command	Response
AT+GMR=?	OK
Execute command	**Response**
AT+GMR	TA returns product software version identification text. **REVISION xx.yy** **OK** xx.yy Version xx and variant yy of software release.
Reference	**Note**
V.25ter	See also AT+CGMR Request revision identification of software status, Chapter 4.14.

2.43 AT+GSN Request TA serial number identification (IMEI)

Test command	Response
AT+GSN=?	**OK**
Execute command	**Response**
AT+GSN	TA reports one or more lines of information text which permit the user to identify the individual device. **<sn>** **OK**
	Parameter
	<sn> IMEI of the telephone (International Mobile station Equipment Identity)
Reference	**Note**
V.25ter	The serial number (IMEI) varies for every individual ME device.

2.44 AT+ILRR Set TE-TA local rate reporting

Test command AT+ILRR=?	Response **+ILRR:** (list of supported **<value>s**) **OK** Parameter See write command
Read command AT+ILRR?	Response **+ILRR: <value> OK** Parameter See write command
Write command AT+ILRR= <value>	The write command specifies whether or not an intermediate result code shall indicate the currently used local rate when an incoming or outgoing data call is established. The message is transmitted from the DCE (= TA) to the DTE (=TE) before the final result code of the connection setup (e.g. CONNECT) appears. Response **OK** Parameter **<value>** 0 Disables reporting of local port rate 1 Enables reporting of local port rate
	Intermediate result code **+ILRR:<rate>** Parameter **<rate>** port rate setting in bit per second 0 (Autobauding, see Chapter 2.45.1) 300 600 1200 2400 4800 9600 14400 19200 28800 38400 57600 115200 230400
Reference V.25ter	Note Factory default is 0

Example	`ATD"030112233445"`
	`+ILRR: 57600`
	`CONNECT 9600/RLP`

2.45 AT+IPR Set fixed local rate

Test command AT+IPR=?	Response **+IPR:** (list of supported auto-detectable **<rate>s**), (list of supported fixed-only **<rate>s**) **OK** Parameter See write command
Read command AT+IPR?	Response **+IPR: <rate> OK** Parameter See write command
Write command AT+IPR=<rate>	This command specifies the DTE-DCE bit rate. When you set a fix rate, make sure that both DTE (TE) and DCE (= TA) are configured to the same rate. When you select autobauding the DCE will automatically recognize the bit rate currently used by the DTE. The setting is stored in the non-volatile memory and will be used whenever the engine is powered up again. However, in case of autobaud mode (AT+IPR=0) the detected DCE bit rate will not be saved and, therefore, needs to be re-synchronized after restarting the ME (see Chapter 2.45.1). Response **OK** or if error is related to ME functionality: **ERROR** / **+CME ERROR: <err>** Parameter **<rate>** bit rate per second 0 (Autobauding, see Chapter 2.45.1) 300 600 1200 2400 4800 9600 14400 19200 28800 38400 57600 115200 230400
Reference V.25ter	Note • Factory setting is AT+IPR=0 (autobauding). It cannot be restored with AT&F. The current setting will be preserved when you download new firmware or when the ME is powered down. • In order to account for greater amounts of data it is recommended to choose a minimum bit rate of 2400 bps. If the ME is operated in Multiplex mode we suggest a minimum bit rate of 4800 bps. See Chapter 4.28 for AT+CMUX. • A selected bit rate takes effect after the write command returns OK (except for Multiplex mode). • In Multiplex mode, the write command AT+IPR=<rate> will not change the bit rate currently used, but the new bit rate will be stored and becomes active, when the module is restarted.

	• Generally, **AT+IPR=x** should be used as a standalone command. If nevertheless combinations with other commands on the same line cannot be avoided, there are several constraints to be considered: - Avoid combinations with the AT commands listed in Chapter 1.4.2. - Take into account that a delay of 100 ms is required between a response to the last command (e.g. **OK**) and the next command on the same line. - When you enter AT+IPR=0, autobauding will be activated after the response to the last command is received. - When local echo is active (ATE1) and you enter **AT+IPR=x** with other commands you may encounter the following problem: If switching to the new bit rate takes effect while a response is being transmitted, the last bytes may be sent at the new bit rate and thus, not properly transmitted. The following commands will be correctly sent at the new bit rate.

2.45.1 Autobauding

Synchronization between DTE and DCE

Ensure that DTE and DCE are correctly synchronized and the bit rate used by the DTE is detected by the DCE (= ME). To allow the bit rate to be synchronized simply issue an "AT" or "at" string. This is necessary

- after you have activated autobauding
- when you start up the module while autobauding is enabled. It is recommended to wait 3 to 5 seconds before sending the first AT character. Otherwise undefined characters might be returned.

If you want to use autobauding and autoanswer at the same time, you can easily enable the DTE-DCE synchronization, when you activate autobauding first and then configure the autoanswer mode (ATS0=n>0).

Restrictions on autobauding operation

- The serial interface has to be operated at 8 data bits, no parity and 1 stop bit (factory setting).
- The A/ command (and a/) cannot be used.
- Only the strings “AT“ or “at“ can be detected (neither “aT“ nor “At“).
- Unsolicited Result Codes that may be issued before the ME detects the new bit rate (by receiving the first AT command string) will be sent at the previously detected bit rate. See further note below.
- It is not recommended to switch to autobauding from a bit rate that cannot be detected by the autobaud mechnism (e.g. 300 baud). Responses to +IPR=0 and any commands on the same line might be corrupted.

Autobauding and bit rate after restart

The most recently detected bit rate cannot be stored when AC45 is powered down (with AT^SMSO). Therefore, each time the module is restarted the correct bit rate must be found as described above. Unless the bit rate is determined, the following constraints apply:

- An incoming CSD call or a network initiated GPRS request cannot be accepted. This must be taken into account when autobauding and autoanswer mode (ATS0=n>0) are enabled at the same time, especially if SIM PIN1 authentication is done automatically and the setting ATS0=n>0 is stored to the user profile with AT&W (if not stored to the user profile ATS0 is reset to its default 000 after restart and thus not relevant for autobauding).
- Until the correct bit rate is found, URCs generated after restart will be output at 57600 bps. This applies only to user defined URCs, such as “RING”, “+CREG”, “^SCKS”, “^SSIM” etc. (see list of URCs in Chapter 10.1.4). The URCs "^SYSSTART" and "^SYSSTART ALARM MODE" will not be indicated.

Note: To avoid any problems caused by undetermined bit rates in the direction from DCE to DTE we strongly recommend to configure a fixed bit rate rather than using autobauding.

Autobauding and multiplex mode

If autobauding is active you cannot switch to multiplex mode (see Chapter 4.28).

3 AT Commands for FAX

The following commands can be used for FAX transmission. If the ME is acting as a Fax modem to a PC-based application (e.g. “WinFax“) it is necessary to select the proper Service Class (Fax Class) provided by the ME. The ME reports its Service Class capabilities, the current setting and the range of services available. This is provided by the AT+FCLASS command (see pg. 61).

Table 12: Service Classes supported by ME

+FCLASS parameter	Service Class	Reference, Standard
0	Data modem	e.g. TIA/EIA-602 or ITU V.25*ter*
1	Service Class 1	EIA/TIA-578-A
2	Manufacture specific	This document and EIA PN-2388 (draft)

Notes:

- When sending a FAX with a standard FAX application for Personal Computers it is recommended to use autobauding (AT+IPR=0).
- Responses that may occur during a fax call are presented in the form of Unsolicited Result Codes (URCs). A summary of Fax specific URCs is listed in Chapter 10.1.4, Table 22.

The following AT commands are dummy commands. Invoking these commands will not cause ERROR result codes, but the commands have no functionality.

AT+FAA	Auto Answer mode
AT+FECM	Error Correction Mode control
AT+FLNFC	Page Length format conversion
AT+FLPL	Indicate document available for polling
AT+FMINSP	Minimum Phase C speed
AT+FRBC	Phase C data receive byte count
AT+FREL	Phase C received EOL alignment
AT+FSPL	Enable polling
AT+FTBC	Phase C data transmit byte count
AT+FWDFC	Page width format conversion

3.1 AT+FBADLIN Bad Line Threshold

Read command AT+FBADLIN?	This command defines the "Copy-Quality-OK"-threshold. If **<badline>** consecutive lines have pixel count errors in normal resolution (98 dpi) mode, then the copy quality is unacceptable. If **<badline>** * 2 consecutive lines have pixel count errors in fine resolution (196 dpi) mode, then the copy quality is unacceptable. "Copy Quality Not OK" occurs if either the error percentage is too high or too many consecutive lines contain errors. A value of 0 implies that error checking is not present or disabled. Response **<badlin> OK** Parameter See write command
Write command AT+FBADLIN= <badlin>	Response **OK** If error is related to ME functionality: **ERROR** Parameter **<badlin>** 0 – 10 – 255 bad lines
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.2 AT+FBADMUL Error Threshold Multiplier

Read command AT+FBADMUL?	This command defines the "Copy-Quality-OK" multiplier. The number of lines received with a bad pixel count is multiplied by this number. If the result exceeds the total number of lines on the page the error rate is considered too high. A threshold multiplier value of 20 corresponds to a 5% error rate. A value of 0 implies that error checking is not present or disabled. Response **<badmul> OK** Parameter See write command
Write command AT+FBADMUL= <n>	Response **OK** If error is related to ME functionality: **ERROR** Parameter **<n>** 0 – 20 – 255
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.3 AT+FBOR Query data bit order

Test command AT+FBOR=?	Query the bit order for receive mode. The mode is set by the ME depending on the selected Service Class, see "AT+FCLASS Fax: Select, read or test service class", pg. 61. Response (list of supported bit order modes **<bor>s**) **OK** Parameter See write command
Read command AT+FBOR?	Response **<bor> OK** Parameter See write command
Write command AT+FBOR=<bor>	Response **OK** Parameter **<bor>** 0 direct bit order for both Phase C and for Phase B/D data. [1] Reversed bit order for Phase C data, direct Bit Order for Phase B/D data.
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.4 AT+FCIG Query or set the Local polling id

Test command AT+FCIG =?	Response (max. length of Local Polling ID string) (range of supported ASCII character values) **OK** Parameter See write command
Read command AT+FCIG?	Response **<id> OK** Parameter See write command
Write command AT+FCIG =<id>	Response **OK** Parameter **<id>** Local Polling ID string, max. length and possible content as reported by test command. Default value is empty string (“”).
Reference EIA PN-2388	Note See also “AT+FLID Query or set the Local Id setting capabilities”, pg. 67. Used for Fax Class 2 only

3.5 AT+FCLASS Fax: Select, read or test service class

Test command AT+FCLASS=?	See introduction to fax commands, pg. 57. Response (list of supported **<n>s)** **OK** Parameter See write command
Read command AT+FCLASS?	Response **<n> OK** Parameter See write command
Write command AT+FCLASS= <n>	The ME is set to a particular mode of operation (data, fax). This allows the ME to process information in a manner suitable for that type of information. Response **OK** Parameter **<n>** [0] data (e.g. EIA/TIA-602 or ITU V.25ter) 1 Fax Class 1 (EIA/TIA-578-A, Service Class 1) 2 Fax Class 2 (EIA/TIA SP-2388, an early draft version of EIA/TIA-592-A – Service class 2.1)
Reference EIA/TIA-592-A	Note • Using Error Correcting Mode (ECM) when sending FAXes over GSM should be avoided. • If AT+FCLASS setting is 1 or 2, all incoming calls will be answered as fax calls, when ATA is issued on multiplexer channel 1 resp. ASC0. For calls explicitly signaled as voice or data calls, this procedure will fail with result code “NO CARRIER”, but the incoming call will continue to ring. It is possible to change the AT+FCLASS setting to 0 while the call is ringing and to accept the call afterwards with ATA.

3.6 AT+FCQ Copy Quality Checking

Test command AT+FCQ =?	This command controls Copy Quality checking when receiving a fax. Response (list of supported copy quality checking <cq>s) **OK** Parameter See write command
Read command AT+FCQ?	Response **<cq> OK** Parameter See write command
Write command AT+FCQ =<cq>	Response **OK** Parameter **<cq>** 0 No copy quality checking. The ME will generate Copy Quality OK (MCF) responses to complete pages. [1] ME can check 1-D phase data. The connected application must check copy quality for 2-D phase C data
Reference EIA PN-2388	Note Used for Fax Class 2 only.

3.7 AT+FCR Capability to receive

Write command AT+FCR=<cr>	Response **OK** Parameter **<cr>** [0] ME will not receive message data. This can be used when the application has insufficient storage. The ME can send and can be polled for a file. 1 ME can receive message data.
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.8 AT+FDCC Query or set capabilities

Test command AT+FDCC =?	This command allows the connected application to sense and constrain the capabilities of the facsimile DCE (=ME), from the choices defined in CCITT T.30 Table 2. Response (list of **<VR>s**), (list of ** s**), (list of **<WD>s**), (list of **<LN>s**), (list of **<DF>s**), (list of **<EC>s**), (list of **<BF>s**), (list of **<ST>s**) **OK** Parameter VR: Vertical Resolution, BR: Bit Rate, WD: Page Width, LN: Page Length, DF: Data Compression Format, EC: Error Correction Mode, BF: Binary File Transfer Mode, ST: Scan Time/Line. Note: For further information see AT+FDIS, pg. 65
Read command AT+FDCC?	Response **<VR>, ,<WD>,<LN>,<DF>,<EC>,<BF>,<ST>** **OK** Parameter See write command
Write command AT+FDCC=<VR>, ,<WD>,<LN>,<DF>,<EC>,<BF>,<ST>	Response **OK** Parameter VR: Vertical Resolution, BR: Bit Rate, WD: Page Width, LN: Page Length, DF: Data Compression Format, EC: Error Correction Mode, BF: Binary File Transfer Mode, ST: Scan Time/Line. Note: For further information see AT+FDIS, pg. 65
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.9 AT+FDFFC Data Compression Format Conversion

Test command AT+FDFFC=?	This parameter determines the ME response to a mismatch between the data format negotiated for the facsimile session, reported by the +FDCS:DF subparameter, and the Phase C data desired by the controlling application, indicated by the optional +FDT:DF subparameter, or the +FDIS=DF subparameter for the +FDR operation. Response (list of supported **<df>**s) **OK** Parameter See write command
Read command AT+FDFFC?	Response **<df> OK** Parameter See write command
Write command AT+FDFFC =<df>	Response **OK** Parameter **<df>** [0] Mismatch checking is always disabled. The controlling application has to check the +FDCS: DF subparameter and transfer matching data.
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.10 AT+FDIS Query or set session parameters

Test command
AT+FDIS =?

This command allows the controlling application to sense and constrain the capabilities used for the current session. It uses +FDIS to generate DIS or DTC messages directly, and uses +FDIS and received DIS messages to generate DCS messages.

Response

(list of <**VR**>s), (list of <**BR**>s), (list of <**WD**>s), (list of <**LN**>s), (list of <**DF**>s), (list of <**EC**>s), (list of <**BF**>s), (list of <**ST**>s)

Parameter

See write command

Read command
AT+FDIS?

Response

**<VR>,
,<WD>,<LN>,<DF>,<EC>,<BF>,<ST>**

OK

Parameter

See write command

Write command
AT+FDIS = <VR>,
,<WD>, <LN>,<DF>,<EC>, <BF>,<ST>

Response

OK

Parameter

Vertical Resolution	VR	0	normal, 98 lpi
		1	fine, 196 lpi
Bit Rate	BR	0	2400 bit/s, V.27ter
		1	4800 bit/s, V.27ter
		2	7200 bit/s, V.29
		3	9600 bit/s, V.29
Page Width	WD	0 *)	1728 pixels in 215mm
		1	2048 pixels in 255 mm
		2	2432 pixels in 303 mm
		3	1216 pixels in 151 mm
		4	864 pixels in 107 mm
Page Length	LN	0	A4, 297mm
		1	B4, 364mm
		2	unlimited length
Data Compression Format	DF	0 *)	1-D modified Huffman
		1	2-D modified read
		2	2-D uncompressed mode
Error correction (Annex A/T.30)	EC	0 *)	disable ECM
		1	enable ECM, 64 bytes/frame
		2	enable ECM, 256 bytes/frame
Binary File mode Transfer Mode	BF	0 *)	disable BFT
		1	enable BFT
Scan Time/Line	ST	0 *)	0 ms (at VR= normal)
		1	5 ms
		2	10 ms
		3	10 ms
		4	20 ms
		5	20 ms
		6	40 ms
		7	40 ms

*) Note: Only the default value needs to be implemented. Use test command to check which parameter values are really possible.

Reference
EIA PN-2388

Note

Used for Fax Class 2 only

3.11 AT+FDR Begin or continue phase C data reception

Execute command AT+FDR	The +FDR command initiates transition to Phase C data reception. Response **CONNECT** or **OK** If error is related to ME functionality: **ERROR**
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.12 AT+FDT Data Transmission

Execute command AT+FDT	This command requests the ME to transmit a Phase C page. When the ME is ready to accept Phase C data, it issues the negotiation responses and the CONNECT result code to the application. In Phase B, the +FDT command releases the ME to proceed with negotiation, and releases the DCS message to the remote station. In Phase C, the +FDT command resumes transmission after the end of a data stream transmited before. Response **CONNECT**
Write command AT+FDT= <DF>,<VR>, , <WD>,<LN>	Response **CONNECT** Parameter **<dt>** **DF,VR,BR,WD,LN** comma separated parameter list Data Compression Format DF: 0 1-D modified Huffman; 1 2-D modified read; 2 2-D uncompressed mode Vertical Resolution VR: 0 normal, 98 lpi; 1 fine, 196 lpi Bit Rate BR: 0 2400 bit/s, V.27ter; 1 4800 bit/s, V.27ter; 2 7200 bit/s, V.29; 3 9600 bit/s, V.29 Page Width WD: 0 1728 pixels in 215mm; 1 2048 pixels in 255 mm; 2 2432 pixels in 303 mm; 3 1216 pixels in 151 mm; 4 864 pixels in 107 mm Page Length LN: 0 A4, 297mm; 1 B4, 364mm; 2 unlimited length
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.13 AT+FET End a page or document

Write command AT+FET=<ppm>	This command indicates that the current page or partial page is complete. An ERROR response code results if this command is issued while the mode is on-hook. Response **OK** Parameter **<ppm>** Post Page Message Codes 1 another document next 2 no more pages or documents 4 another page, procedure interrupt 5 another document, procedure interrupt
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.14 AT+FK Kill operation, orderly FAX abort

Execute command AT+FK	This command causes the TA to terminate the session in an orderly manner. Response **OK**
Reference	Note Used for Fax Class 2 only

3.15 AT+FLID Query or set the Local Id setting capabilities

Test command AT+FLID =?	Response (max. character length of Local ID string) (range of supported ASCII character values) OK Parameter See write command
Read command AT+FLID?	Response **< lid > OK** Parameter See write command
Write command AT+FLID =<lid>	Response **OK** Parameter **<lid>** Local ID string, max. length and possible content as reported by test command. Default value is empty string (“”).
Reference EIA PN-2388	Note See also “AT+FCIG Query or set the Local polling id”, pg. 59. Used for Fax Class 2 only

3.16 AT+FMDL Identify Product Model

Read command AT+FMDL?	Send the model identification to the TA Response **Gipsy Soft Protocolstack** **OK**
Reference Siemens	Note Used for Fax Class 2 only

3.17 AT+FMFR Request Manufacturer Identification

Read command AT+FMFR?	Send the manufacturer identification to the TA Response **SIEMENS** **OK**
Reference Siemens	Note Used for Fax Class 2 only

3.18 AT+FOPT Set bit order independently

Write command AT+FOPT=<opt>	Model specific command to set bit order independently of the understanding which is "mirrored" and which is direct. Response **OK** Parameter **<opt>** 0 non-standard 1 standard
Reference Siemens	Note Used for Fax Class 2 only

3.19 AT+FPHCTO DTE Phase C Response Timeout

Read command AT+FPHCTO?	The time-out value <**tout**> determines how long the DCE will wait for a command after reaching the end of data when transmitting in Phase C. When time-out is reached, the DCE assumes that there are no more pages or documents to send. Response <**tout**> **OK** Parameter See write command
Write command AT+FPHCTO=<tout>	Parameter **<tout>** 0 – 30 – 255 time-out value in 100ms units. Response **OK** If error is related to ME functionality: **ERROR**
Reference EIA PN-2388	Note Used for Fax Class 2 only

3.20 AT+FREV Identify Product Revision

Test command AT+FREV?	Sends the revision identification to the TA Response **V2.550** **OK**
Reference Siemens	Note Used for Fax Class 2 only

3.21 AT+FRH Receive Data Using HDLC Framing

Execute command AT+FRH=<mod>	This command causes the TA to receive frames using the HDLC protocol and the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook. Response **CONNECT** If error is related to ME functionality: **ERROR** Parameter **<mod>** modulation mode 3 V21 Ch2 300 bps 24 V.27ter 2400 bps 48 V.27ter 4800 bps 72 V.29 7200 bps 96 V.29 9600 bps
Reference TIA/EIA-578	Note Used for Fax Class 1 only

3.22 AT+FRM Receive Data

Test command AT+FRM=?	Response (List of supported modulation modes <**mod**>s) **OK** Parameter See write command
Write command AT+FRM=<mod>	This command causes the TA to enter the receive mode using the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook. Response **CONNECT** If error is related to ME functionality: **ERROR** Parameter <**mod**> 96 V.29 9600 bps 72 V.29 7200 bps 48 V.27ter 4800 bps 24 V.27ter 2400 bps
Reference TIA/EIA-578	Note Used for Fax Class 1 only

3.23 AT+FRS Receive Silence

Write command AT+FRS=<time>	+FRS=n causes the TA to report an OK result code to the TE after <**time**> 10 millisecond intervals of silence have been detected on the line. This command is aborted if any character is received by the DTE. The modem discards the aborting character and issues an OK result code. An ERROR response code results if this command is issued while the mode is on-hook. Response **OK** If error is related to ME functionality: **ERROR** Parameter <**time**> 0 – 255 no. of 10 millisecond intervals
Reference TIA/EIA-578	Note Used for Fax Class 1 only

3.24 AT+FTH Transmit Data Using HDLC Framing

Write command AT+FTH=<mod>	This command causes the TA to transmit data using HDLC protocol and the modulation mode defined below. An ERROR response code results if this command is issued while the modem is on-hook. Response **CONNECT** Parameter <**mod**> 3 V.21 Ch2 300 bps
Reference TIA/EIA-578	Note Used for Fax Class 1 only

3.25 AT+FTM Transmit Data

Test command AT+FTM=?	Response (List of supported modulation modes) **OK** Parameter See write command
Write command AT+FTM=<mod>	This command causes the TA to transmit data using the modulation mode defined below. An ERROR response code results if this command is issued while the modem is on-hook. Response **CONNECT** If error is related to ME functionality: **ERROR** Parameter **<mod>** modulation mode 96 V.29 9600 bps 72 V.29 7200 bps 48 V.27ter 4800 bps 24 V.27ter 2400 bps
Reference TIA/EIA-578	Note Used for Fax Class 1 only

3.26 AT+FTS Stop Transmission and Wait

Write command AT+FTS=<time>	This command causes the TA to terminate a transmission and wait for **<time>** 10 millisecond intervals before responding with the OK result code to the DTE. Response An ERROR response code results if this command is issued while the modem is on-hook. Parameter **<time>** 0 – 85 no. of 10 millisecond intervals
Reference TIA/EIA-578	Note Used for Fax Class 1 only

3.27 AT+FVRFC Vertical resolution format conversion

Test command AT+FVRFC =?	This command determines the DCE response to a mismatch between the vertical resolution negotiated for the facsimile session and the Phase C data desired by the DTE. Response (List of supported mismatch checking modes) **OK** Parameter See write command
Read command AT+FVRFC?	Response **<vrfc> OK** Parameter See write command
Write command AT+FVRFC =<vrfc>	Response **OK** Parameter **<vrfc>** 0 disable mismatch checking. [2] enable mismatch checking, with resolution conversion of 1-D data in the DCE, and an implied AT+FK command executed on 2-D mismatch detection
Reference EIA PN-2388	Note Used for Fax Class 2 only

4 AT Commands originating from GSM 07.07

These AT Commands are according to ETSI (European Telecommunications Standards Institute) GSM 07.07 document.

4.1 AT+CACM Accumulated call meter (ACM) reset or query

Test command AT+CACM=?	Response **OK** Parameter
Read command AT+CACM?	Response TA returns the current ACM value. **+CACM: <acm> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<acm>** string type; three bytes of the current ACM value in hexadecimal format (e.g. “00001E” indicates decimal value 30) 000000 – FFFFFF
Write command AT+CACM= [<passwd>]	Parameter **<passwd>** string type: **SIM PIN2** Response TA resets the Advice of Charge related to the accumulated call meter (ACM) value in SIM file EF(ACM). ACM contains the total number of home units both for the current and preceding calls. **OK** If error is related to ME functionality: **+CME ERROR: <err>**
Reference GSM 07.07	

4.2 AT+CALA Set alarm time

Test command AT+CALA=?	Test command returns supported array index values <**n**>, alarm types <**type**>, and maximum length of the text <**tlength**> to be output. Response **+CALA:** (list of supported <**n**>s), (list of supported <**type**>s), (range of supported <**tlength**>) **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Read command AT+CALA?	Read command returns the list of current active alarm settings in the ME. Response **+CALA: <time>[,<n>[,<type>[,<text>]]]** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT+CALA=<time>[,<n>[,<type>[,<text>]]]	The write command sets an alarm time in the ME. When the alarm is timed out and executed the ME returns an Unsolicited Result Code (URC) and the alarm time is reset to “00/01/01,00:00:00”. The alarm can adopt two functions, depending on whether or not you switch the GSM engine off after setting the alarm: Reminder message: You can use the alarm function to generate reminder messages. For this purpose, set the alarm as described below and do not switch off or power down the ME. When executed the message comes as an Unsolicited Result Code. Alarm mode: You can use the alarm function to restart the ME when powered down. For this purpose, set the alarm as described below. Then power down the ME by entering the AT^SMSO command (see Chapter 9.24). When the alarm time is reached, the ME will wake up to Alarm mode. To prevent the ME from unintentionally logging into the GSM network, Alarm mode provides restricted operation. Upon wake-up, the ME indicates an Unsolicited Result Code which reads: ^SYSSTART ALARM MODE. A limited number of AT commands is available during Alarm mode: AT+CCLK, AT+CALA, AT^SBC, AT^SCTM, AT^SMSO. The ME remains deregistered from the GSM network. If you want the ME to return to full operation (normal operating mode) it is necessary to drive the ignition line (IGT pin of application interface) to ground. For details please refer to [1]. Response **OK** If setting fails: **+CME ERROR: <err>** Refer to Chapter 10.1.1, pg. 297, for <err> values.

	Parameter **<time>** string type value; format is "yy/MM/dd,hh:mm:ss", where characters indicate year (two last digits), month, day, hour, minutes. E.g. 6th of May 2003, 22:10:00 hours equals to "03/05/06,22:10:00" (see also AT+CCLK in Chapter 4.7). Note: if **<time>** equals current date and time or is to an earlier date, TA returns **+CME ERROR: <21>.** **<n>** Integer type value indicating the array index of the alarm. The ME allows to set only one alarm at a time. Therefore, the list of supported alarm events indicated by the test command AT+CALA=? is <n>=0. If a second alarm time is set, the previous alarm will be deleted. Therefore, the read command AT+CALA? will always return <n>=0. This is also true if individual settings are made on the various Multiplexer channels, for details see notes below. **<type>** Integer type value indicating the type of the alarm **0** Alarm indication: text message via serial interface **<text>** String type value indicating the text to be displayed when alarm time is reached; maximum length is **<tlength>**. By factory default, **<text>** is undefined. Note: **<text>** will be stored to the non-volatile flash memory when the device enters the Power Down mode via AT^SMSO (pg. 255). Once saved, it will be available upon next power-up, until you overwrite it by typing another text. This eliminates the need to enter the full string when setting a fresh alarm. For text coding see Chapters 1.5 and 10.5. **<tlength>** integer type value indicating the maximum length of **<text>**. The maximum length is 16.
Unsolicited result code	Indicates reminder message: **+CALA: <text>** Indicates ME wake-up into Alarm mode: **^SYSSTART ALARM MODE** **+CALA: <text>** If autobauding is active (AT+IPR=0) the URC "^SYSSTART ALARM MODE" does not appear, but your individual text message "+CALA: <text>" will be displayed.
Reference GSM 07.07	Note • After the alarm was executed the parameter <time> of AT+CALA will be reset to "00/01/01,00:00:00", but **<text>** will be preserved as described above. • If AC45 is totally disconnected from power supply the most recently saved configuration of **+CALA: <time>[,<n>[,<type>[,<text>]]]** will be presented when AC45 is powered up. • Each time AC45 is restarted it takes 2s to re-initialize the RTC and to update the current time. Therefore, it is recommended to wait 2s before using the commands AT+CCLK and AT+CALA (for example 2s after ^SYSSTART has been output). • Alarm settings on different Multiplexer channels (see Chapter 4.28): - On each channel an individual <text> message can be stored, but only one time setting applies. This means an alarm <time> set on one of the

	channels overwrites the time setting on all remaining channels. Therefore, the total number of alarm events returned by the read command AT+CALA? will always be <n>=0, no matter whether different text messages are stored. - When the alarm is timed out and executed the ME sends the URC only on the channel where the most recent alarm setting was made. The alarm time will be reset to "00/01/01,00:00:00" on all channels.

Examples	Example 1:
	You may want to configure a reminder message for May 31, 2003, at 9.30h, including the message "Good Morning".
	Write command:
	`AT+CALA="03/05/31,09:30:00",0,0,"Good Morning"`
	`OK`
	Do not switch off the GSM engine. When the alarm is executed the ME returns the following URC:
	`+CALA: Good Morning`

	Example 2:
	To set a fresh alarm using the same message as in Example 1, simply enter date and time. **<n>**, **<type>, <text>, <tlength>** can be omitted:
	`AT+CALA="03/05/31,08:50:00"`
	`OK`
	When the alarm is executed the URC comes with the same message:
	`+CALA: Good Morning`

	Example 3:
	To configure the alarm mode, e.g. for May 20, 2003, at 8.30h, enter
	`AT+CALA="03/05/20,08:30:00"`
	`OK`
	Next, power down the ME:
	`AT^SMSO`
	`^SMSO: MS OFF`
	When the alarm is executed the ME wakes up to Alarm mode and displays a URC. If available, this line is followed by the individual **<text>** most recently saved. If no individual message was saved only the first line appears.
	`^SYSSTART ALARM MODE`
	`+CALA: Good Morning`

Table 13: Summary of AT commands available in Alarm mode

AT command	Use
AT+CALA	Set alarm time
AT+CCLK	Set date and time of RTC
AT^SBC	Enable / disable presentation of URC ^SBC for indication of undervoltage Query average current consumption of AC45
AT^SCTM	Query temperature of GSM engine
AT^SMSO	Power down GSM engine

4.3 AT+CAMM Accumulated call meter maximum (ACMmax) set or query

Test command AT+CAMM=?	Response OK Parameter
Read command AT+CAMM?	Response TA returns the current ACMmax value. **+CAMM: <acmmax> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT+CAMM= [<acmax>[,<passwd>]]	Response TA sets the Advice of Charge related to the accumulated call meter maximum value in SIM file EF (ACMmax). ACMmax contains the maximum number of home units allowed to be consumed by the subscriber. **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<acmmax>** string type; three bytes of the max. ACM value in hexadecimal format (e.g. "00001E" indicates decimal value 30) 000000 disable ACMmax feature 000001-FFFFFF **<passwd>** string type SIM PIN2
Reference GSM 07.07	Note

4.4 AT+CAOC Advice of Charge information

Test command AT+CAOC=?	Response **+CAOC:** (list of supported **<mode>s**) **OK** Parameter See write command
Read command AT+CAOC?	Response **+CAOC: <mode> OK** Parameter See write command
Write command AT+CAOC=<mode>	Response TA sets the Advice of Charge supplementary service function mode. If error is related to ME functionality: **+CME ERROR: <err>** If **<mode>=0**, TA returns the current call meter value **OK** Parameter **<mode>** 0 query CCM value **<ccm>** string type; three bytes of the current CCM value in hexadecimal format (e.g. "00001E" indicates decimal value 30); bytes are similarly coded as ACMmax value in the SIM 000000-FFFFFF
Execute command AT+CAOC	Response TA returns the current call meter value If error is related to ME functionality: **+CME ERROR: <err>** If **<mode>=0**, TA returns the current call meter value **+CAOC: <ccm> OK** Parameter See write command
Reference GSM 07.07	Note

4.5 AT+CBST Select bearer service type

Test command AT+CBST=?	Response **+CBST:** (list of supported **<speed>s**),(list of supported **<name>s**),(list of supported **<ce>s**) **OK** Parameter See write command
Read command AT+CBST?	Response **+CBST: <speed>,<name>,<ce>** **OK** Parameter See write command
Write command AT+CBST=<speed>[,<name>[,<ce>]]	Response TA selects the bearer service **<name>**, the data rate **<speed>** and the connection element **<ce>** to be used when data calls are originated. The settings also apply to mobile terminated data calls, especially when single numbering scheme calls or calls from analog devices are received (see also Chapter 4.45). **OK** Parameter **<speed>** 0 autobauding 4 2400 bps (V.22bis) 6 4800 bps (V.32) 7 9600 bps (V.32) 14 14400 bps (V.34) 68 2400 bps (V.110) 70 4800 bps (V.110) 71 9600 bps (V.110) 75 14400 bps (V.110) **<name>** 0 asynchronous modem **<ce>** 1 non-transparent Transparent mode is not supported.
Reference GSM 07.07	Note • GSM 02.02[1]: List of allowed combinations of subparameters. • The PLMN influences the second air interface (to the terminator), therefore another mode may be established by the network.

4.6 AT+CCFC Call forwarding number and conditions control

Test command AT+CCFC=?	Response **+CCFC:** (list/range of supported <**reas**>s) **OK** Parameter See execute command
Write command AT+CCFC=<reas>, <mode>[,<number> [,<type>[,<class> [,<time>]]]]	Response TA controls the call forwarding supplementary service. Registration, erasure, activation, deactivation and status query are supported. If <**mode**> ≠ 2 and command successful: **OK** If <**mode**> = 2, <**reas**> ≠ 2 and command successful: **+CCFC: <status>, <class1>[, <number>, <type>]** **[<CR><LF>+CCFC: ....] OK** If <**mode**> = 2, <**reas**> = 2 and command successful: **+CCFC: <status>, <class1>[, <number>, <type> [, <time>]]** **[<CR><LF>+CCFC: ....] OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter <**reas**> 0 unconditional 1 mobile busy 2 no reply 3 not reachable 4 all call forwarding (includes reasons 0, 1, 2 and 3) 5 all conditional call forwarding (includes reasons 1, 2 and 3) <**mode**> 0 disable call forwarding 1 enable call forwarding 2 query status of call forwarding 3 register <**number**> and activate call forwarding 4 erase <**number**> and deactivate call forwarding <**number**> string type phone number of forwarding address in format specified by <**type**>. If you select <**mode**> = 3, the phone <**number**> will be registered in the network. This allows you to disable / enable CF to the same destination without the need to enter the phone number once again. Depending on the services offered by the provider the registration may be mandatory before CF can be used. The number remains registered in the network until you register another number or erase it using <**mode**> = 4. <**type**> type of address in integer format; default 145 when dialing string includes international access code character “+”, otherwise 129

	<class> integer or sum of integers each representing a **<class>** of information: 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 x combination of some of the above classes. For example, the default setting 7 represents the sum of the integers 1, 2 and 4 (CF for voice, data and fax). The value 255 covers all classes. If the **<class>** parameter is omitted, the default value 7 is used. **<time>** time to wait before call is forwarded, rounded to a multiple of 5 sec.. 1...20..30 (only for <reas>=no reply) **<status>** 0 not active 1 active
Reference GSM 07.07 GSM 02.04 GSM 02.82 GSM 03.82 GSM 04.82	Note • You can register, disable, enable and erase **<reas>** 4 and 5 as described above. However, querying the status of **<reas>** 4 and 5 with AT+CCFC will result in an error (“CME error: Operation not supported”). As an alternative, you may use the ATD command followed by *'# codes to check the status of these two reasons. See Chapter 10.4 for a complete list of *# GSM codes. See also examples below. • The AT+CCFC command offers a broad range of call forwarding options according to the GSM specifications. However, when you attempt to set a call forwarding option which is not provisioned or not yet subscribed to, the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example “OK”, “Operation not allowed”, “Operation not supported” etc.). To make sure check the call forwarding status with **<mode>=2**. • **<class> 2** (data) comprises all those <class> values between 16 and 128, that are supported both by the network and the MS. This means, a setting made for <class> 2 applies to all remaining data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate Call Forwarding for all data classes, but deactivate it for a specific data class. • The command has been implemented with the full set of <class> parameters according to GSM 07.07. For actual applicability of SS “call forwarding” to a specific service or service group (a specific <class> value) please consult table A.1 of GSM 02.04. • Most networks will not permit registration of new parameters for conditional call forwarding (reasons 1,2,3,5) while unconditional call forwarding is enabled.

4.6.1 Examples: Call forwarding

Please note that when you configure or query call forwarding without specifying any classes, the settings will refer to classes 1, 2 and 4 only (=default).

Example 1	To register the destination number of unconditional call forwarding (CFU) for the default classes voice, data and fax:
	`at+ccfc=0,3,"+493012345678",145`
	`OK`
	Remember that call forwarding will be activated when you register the destination number.

Example 2	To query the status of CFU without specifying <class>:
	`at+ccfc=0,2`
	`+CCFC: 1,1,"+493012345678",145`
	`+CCFC: 1,2,"+493012345678",145`
	`+CCFC: 1,4,"+493012345678",145`
	`OK`

Example 3	To deactivate CFU without specifying <class>:
	`at+ccfc=0,0`
	`OK`
	
	To check whether CFU was successfully deactivated (note that the destination number remains registered in the network when you disable CFU):
	`at+ccfc=0,2`
	`+CCFC: 0,1,"+493012345678",145`
	`+CCFC: 0,2,"+493012345678",145`
	`+CCFC: 0,4,"+493012345678",145`
	`OK`

Example 4	To erase the registered CFU destination number:
	`at+ccfc=0,4`
	`OK`
	
	Now, when you check the status, no destination number will be indicated:
	`at+ccfc=0,2`
	`+CCFC: 0,1`
	`+CCFC: 0,2`
	`+CCFC: 0,4`

Example 5	To query the status of CFU for all classes:
	
	`at+ccfc=0,2,,,255`
	
	`+CCFC: 0,1`
	`+CCFC: 0,2`
	`+CCFC: 0,4`
	`+CCFC: 0,8`
	`+CCFC: 0,16`
	`+CCFC: 0,32`
	`+CCFC: 0,64`
	`+CCFC: 0,128`
	`OK`

Example 6	<reas>=4 or 5 cannot be used to query the status of all call forwarding reasons (see also notes above): at+ccfc=4,2 +CME error: operation not supported at+ccfc=5,2 +CME error: operation not supported

4.7 AT+CCLK Real Time Clock

Test command AT+CCLK=?	Response **OK**
Read command AT+CCLK?	Response **+CCLK: <time>** **OK / ERROR / +CME ERROR** Parameter: **<time>:** string type value; format is "yy/MM/dd,hh:mm:ss", where characters indicate year (two last digits), month, day, hour, minutes, seconds; e.g. 6th of May 2003, 22:10:00 hours equals to “03/05/06,22:10:00"
Write command AT+CCLK=<time>	Response **OK / ERROR / +CME ERROR** Parameter: **<time>** see read command
Reference GSM 07.07	Note • Each time AC45 is restarted it takes 2s to re-initialize the RTC and to update the current time. Therefore, it is recommended to wait 2s before using the commands AT+CCLK or AT+CALA command (for example 2s after ^SYSSTART has been output). • **<time>** is retained if the device enters the Power Down mode via AT^SMSO (pg. 257). • **<time>** will be reset to its default value if power is totally disconnected. In this case, the clock starts with <time> = “02/01/01,00:00:00” upon next power-up. • See AT+CALA, pg. 74.

4.8 AT+CCUG: Closed User Group

Test command AT+CCUG=?	The Test command returns the supported parameters. Response **+CCUG:** (list of supported **<n>**s),(list of supported **<index>**),(list of supported **<info>**) **OK**
Read command AT+CCUG?	The Read command returns if the permanent CUG invocation is activated, which CUG index is chosen, and if Preferential Group or Outgoing Access is suppressed. Response **+CCUG: <n>**, **<index>**,**<info> OK**
Write command AT+CCUG=[[<n>[,<index>[,<info>]]	The write command serves to activate or deactivate permanent CUG invocation, to set the desired CUG index, and to specify if Preferential Group or Outgoing Access shall be suppressed. Parameter **<n>** (numeric) 0 Deactivate permanent CUG mode 1 Activate permanent CUG mode **<index>** (numeric) 0…9 Explicit selection of CUG index 10 No index (preferred CUG taken from subscriber data) **<info>** State of the call (numeric) 0 No information 1 Suppress Outgoing Access 2 Suppress preferential CUG 3 Suppress preferential CUG and Outgoing Access. Response **OK / ERROR / +CME ERROR**
Reference GSM 02.85, GSM 03.85, GSM 04.85, Siemens	Note • The active settings of omitted parameters are retained without changes. • Upon delivery, settings are predefined with <n>=0, <index>=10, <info>=0. These delivery defaults cannot be recalled automatically. • Some combinations of parameters may lead to the rejection of CUG calls by the network. For more information please consult GSM 04.85. • ATZ or AT&F have no impact on the current settings. • See Chapter 2.5 for instructions of how to activate or deactivate the CCUG feature call by call.

4.9 AT+CCWA Call waiting

Test command AT+CCWA=?	Response **+CCWA:** (list of supported <**n**>s) **OK / ERROR / +CME ERROR** Parameter See write command
Read command AT+CCWA?	Response **+CCWA: <n>** **OK / ERROR / +CME ERROR** Parameter See write command
Write command AT+CCWA= [<n>,[<mode> [,<class>]]]	This command controls the Call Waiting supplementary service according to GSM 02.83. Activation, deactivation and status query are supported. Response If command is successful: If <mode>=2 **+CCWA: <status>, <class>** **[<CR><LF>+CCWA: ...]** **<CR><LF>OK** otherwise **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameters **<n>** Sets/shows the presentation mode of URC in the TA 0 disable display of the URC “+CCWA” or “^SCWA” 1 enable display of the URC “+CCWA” or “^SCWA” **<status>** 0 Call Waiting service not active 1 Call Waiting service active **<mode>** When <mode> is not given, network is not interrogated. 0 disable 1 enable 2 query status **<class>** Sum of integers each representing a class of information (default 7). Specifies the class of the active call. 1 voice 2 data 4 fax 7 voice, data and fax (1+2+4) 8 SMS 16 data circuit sync 32 data circuit async 64 dedicated packet access 128 dedicated PAD access

	Notes regarding **<class>**: • The AT+CCWA command offers a broad range of options according to the GSM specifications. However, when you attempt to set a **<class>** which is not provisioned or not supported, the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example "OK", "Operation not allowed", "Operation not supported" etc.). To make sure check the current Call Waiting settings with **<mode>=2**. • **<class> 2** (data) comprises all those <class> values between 16 and 128, that are supported both by the network and the MS. This means, a setting made for <class> 2 applies to all remaining data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate Call Waiting for all data classes, but deactivate it for a specific data class. • Despite the specifications stated in GSM 02.04 Call Waiting is not handled uniformly among all networks: GSM 02.04, Annex A, provides the following 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, networks do differ on the actual implementation of the service. For example, the activation of "call waiting" for <class> 4, "fax", causes some networks to send a call waiting indication if a call "*of any kind*" comes in during an active fax call, but others may (with the same settings active) indicate a waiting fax call during any kind of active call. Thus, the only reliable way to receive or prevent a call waiting indication under any circumstances and in any network, is to activate or deactivate call waiting for all tele- and bearer services (<class> 255).
Unsolicited Result Codes	If **<n>=1** and the Call Waiting service is enabled the following URCs indicate a waiting call to the TE: **+CCWA: <number>,<type>,<class>,,<CLI validity>** This URC appears while the waiting call is still ringing. or **^SCWA:** This URC indicates that a waiting call rang when the ME was in online mode during a CSD call, but the calling party hang up before the ME went to command mode. Parameters of the URC +CCWA **<number>** String type phone number of calling address in format specified by <type> **<type>** Type of address octet in integer format (refer to GSM 04.08 subclause 10.5.4.7) **<class>** Indicates the class of the waiting call. See Write command for possible values. **<CLI validity>** 0 CLI valid 1 CLI has been withheld 2 CLI is not available If the active call is a CSD call, and a waiting call is received, then ME produces a BREAK while still in online mode, and displays • +CCWA URC (as above) when ME goes back to command mode while the waiting call is still active and can be accepted;

	• or ^SCWA URC (as above) when ME goes back to command mode after the waiting call has ended.
Reference GSM 07.07, GSM 02.04, GSM 02.83	Note • With the AT+CHLD command, it is possible to establish a multiparty call or to set the active voice call on hold and then accept a waiting voice call. See also AT+CHLD in Chapter 4.16. • Users should be aware that if Call Waiting is activated (<mode>=1), the presentation of URCs needs to be enabled, too (<n>=1). Otherwise, on the one hand, a waiting caller would be kept waiting due to lack of BUSY signals, while, on the other hand, the waiting call would not be indicated to the called party.
Example	`at+ccwa=1,1` To enable the presentation of the URC and to switch on the indication of waiting calls during active voice, data, fax calls (default classes). `OK` `at+ccwa=,2` To query the status of CW for default classes. `+CCWA: 1,1` CW is activated during voice calls. `+CCWA: 1,2` CW is activated during data calls. `+CCWA: 1,4` CW is activated during fax calls. `OK` `at+ccwa=0,0` To deactivate CW for default classes. `OK`

4.10 AT+CEER Extended error report

Test command AT+CEER=?	Response **OK**
Execute command AT+CEER	TA returns an extended error report of the reason for • the last failure to set up a call (both mobile originated or terminated) • the last call release • the last unsuccessful GPRS attach or unsuccessful PDP context activation • the last GPRS detach or PDP context deactivation • the last failure to modify a call by using Supplementary Services • the last failed attempt to activate, register, deactivate or deregister a Supplementary Service The error report is presented in numeric format. A description associated with each number can be found in the Appendix. The first parameter <**location ID**> serves to locate the other two parameters. Depending on the failure either <**reason**> or <**ss_release**> are applicable. Response **+CEER: <location ID>, <reason > , <ss_release>OK** Parameter <**location ID**> Location ID as number code. Location IDs are listed in Chapter 10.1.6. Each ID is related with another table that contains a list of <**reason**>s or <**ss_release**>s. **<reason>** Reason for last failure as number code. <reason> numbers and associated descriptions are listed in several tables, sorted by different categories (see Chapters 10.1.7 to 10.1.19). The chapter numbers can be found proceeding from the Location ID table in Chapter 10.1.6. **<ss_release>** Reason for last failure related to a Supplementary Service. <ss_release> numbers and associated descriptions are listed in several tables (see Chapters 10.1.14 and 10.1.15. The chapter numbers can be found proceeding from the Location ID table in Chapter 10.1.6.
Reference GSM 07.07	Note • AT+CEER is not available for data calls, please use ATS18=1. • Default output in the case of a no-error-situation is **+CEER: 0,0,0**. • If <reason> ≠ 0, then <ss_release> = 0. Vice versa, if <reason> = 0, then <ss_release> may be ≠ 0.

Example 1	A mobile originated call is rejected by the called party. Call setup is terminated with NO CARRIER. To check for the cause the caller enters AT+CEER:
	
	`Atd"017511223344";` Call is rejected by called party.
	`NO CARRIER`
	`at+ceer`
	`+CEER: 8,21,0` Location ID stated in Chapter 10.1.6: 8 = GSM call for L3 Call Control. The reference points to Chapter 10.1.11 where 21 = Call rejected. 0 = No error (parameter <ss_release> is not applicable).
	`OK`

Example 2	User attempts to set up a multiparty call, though there are only two parties involved in the present conversation:
	
	`Atd”017511223344”;`
	`OK`
	`at+chld=2`
	`OK`
	`at+chld=3`
	`+CME ERROR: operation temporary not allowed`
	`at+ceer`
	`+CEER: 22,0,2` Location ID stated in Chapter 10.1.6: 22 = SIEMENS cause for L3 call related SS. The reference points to Chapter 10.1.15 where 2 = Initial conditions not fulfilled (one active, one held call). 0 = No error (parameter <reason> is not applicable).

Example 3	User attempts to activate call barring. Activation is denied by the network since the password is blocked after previous failures to enter the password.
	
	`at+clck=”oi”,1,”0000”,3`
	`+CME ERROR: incorrect password`
	`at+ceer`
	`+CEER: 35,0,43` Location ID stated in Chapter 10.1.6: 35 = Supplementary Services network error. The reference points to Chapter 10.1.14 where 43 = NumberOfPWAttemptsViolation (for example if wrong password has been entered 3 times or more). 0 = No error (parameter <reason> is not applicable).

4.11 AT+CFUN Set phone functionality

Test command AT+CFUN=?	Response **+CFUN:** (list of supported <**fun**>s), (list of supported <**rst**>s) If error is related to ME functionality: **+CME ERROR: <err>** Parameter See below
Read command AT+CFUN?	Response **+CFUN: <fun>** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See below
Write command AT+CFUN= [<fun>[,<rst>]]	The write command can be used to reset the ME, to choose one of the SLEEP modes or to return to full functionality. Intended for power saving, SLEEP mode reduces the functionality level of the ME to a minimum and, thus, minimizes the current consumption. SLEEP mode falls in two categories: NON-CYCLIC SLEEP mode <fun>=0 and CYCLIC SLEEP modes, selectable as <fun>= 5, 6, 7 and 8. NON-CYCLIC SLEEP mode permanently blocks the serial interface. The CYCLIC SLEEP mode, however, is a dynamic process which alternatingly enables and disables the serial interface. The major benefit of CYCLIC SLEEP mode is that the serial interface remains accessible and that packet-switched calls can be done without exiting the SLEEP mode. Also, NON-CYCLIC and CYCLIC SLEEP mode provide different ways to wake up the ME. For details see Chapter 4.11.1. For CYCLIC SLEEP mode (<fun>=5, 6, 7 and 8) both the ME and the application must be configured to use hardware flow control. This is necessary since the CTS signal is set/reset every time when the ME listens to a paging message from the base station. This is the way how the module indicates to the application when the UART is active. For detailed information on the timing of the CTS signal refer to [1]. The default setting of hardware flow control is AT\Q0 which must be altered to AT\Q3 (see Chapter 2.3). For use after restart you are advised to add it to the user profile saved with AT&W. Response **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<fun>** 0 NON-CYCLIC SLEEP mode: In this mode, the AT interface is not accessible. Consequently, once you have set <**fun**> level 0, **do not send** further characters. Otherwise these characters remain in the input buffer and may delay the output of an unsolicited result code. After receiving the AT+CFUN=0 command the ME waits 2 seconds before entering the power saving mode. The first wake-up event stops power saving and takes the ME back to full functionality level <**fun**>=**1**.

		1	Full functionality. If the ME is in one of the CYCLIC SLEEP modes you can issue AT+CFUN=1 to stop power saving and return to full functionality. Keep in mind that, unlike the reset command described below, this action does not restart the ME but only changes the level of functionality. See parameter <**rst**> for details on the reset.
		5	CYCLIC SLEEP mode: In this mode, the serial interface is shortly enabled during paging. If characters are recognized on the serial interface, the ME stays active for *2 seconds* after the last character was sent or received.
		6	CYCLIC SLEEP mode: In this mode, the serial interface is shortly enabled during paging. If characters are recognized on the serial interface, the ME stays active for *10 minutes* after the last character was sent or received.
		7	CYCLIC SLEEP mode: In this mode, the serial interface is shortly enabled during paging. If characters are recognized on the serial interface, the ME stays active for *2 seconds* after the last character was sent or received. ME exits SLEEP mode only if AT+CFUN=1 is entered.
		8	CYCLIC SLEEP mode: In this mode, the serial interface is shortly enabled during paging. If characters are recognized on the serial interface, the ME stays active for *10 minutes* after the last character was sent or received. ME exits SLEEP mode only if AT+CFUN=1 is entered.
	<**rst**>	[0]	The <**rst**> parameter can only be used if the serial interface is enabled. Due to the command syntax, you need to enter <**fun**>, followed by <**rst**>, where <**fun**> is only a placeholder and has no effect. See examples below.
		1	ME resets and restarts to full functionality. After reset and restart, PIN 1 authentication is necessary (AT+CPIN). If autobauding is enabled it is recommended to wait 3 to 5 seconds before entering the first AT command. For details on autobauding refer to Chapter 2.45.
Reference GSM 07.07	Note • If the ME is in Multiplexer mode, it is not recommended to activate SLEEP mode with AT+CFUN=<n>. The best approach to properly control SLEEP mode in this case is to issue the PSC messages described in [5], Chapter “Power saving control (PSC)”. • In Multiplex mode, the CFUN profile is shared by all multiplexer channels. • When a circuit-switched call is in progress, <fun>=7 or 8 can be activated without terminating the call. However, setting <fun>=0, 5 or 6 during a circuit-switched call immediately disconnects this call. • Please keep in mind *that power saving works only while the ME is registered to the GSM network*. If you attempt to activate one of the SLEEP modes while the ME is deregistered, the selected <fun> level will be set, but power saving does not work to its full extent. Furthermore, in order to accept incoming calls, SMS or network related URCs in SLEEP mode the ME must be registered when it enters the SLEEP mode. • To check that power saving is on, you can query the status with AT+CFUN?, if you have chosen CYCLIC SLEEP mode. If available, you can take advan-		

	tage of the status LED controlled by the SYNC pin. See Chapter 9.49 and [1]. The LED stops flashing once the module starts power saving.
Example 1	To check the level of functionality use the read command: AT+CFUN? +CFUN: 1 Default mode after ME was restarted. Remember that the AT interface is not accessible in NON-CYCLIC SLEEP mode. Consequently, the read command is only useful when the ME is set to full functionality or, when <fun> is set to 5, 6, 7 or 8. AT+CFUN? +CFUN: 5 CYCLIC SLEEP mode.
Example 2	To set the ME to NON-CYCLIC SLEEP mode enter AT+CFUN=0 OK When, for example, an SMS is being received and indicated by an unsolicited result code (URC), the ME wakes up to full operation. +CMTI: "SM",5 Note that the URC used in this example will appear only if CMTI=1,1 was configured before. See Chapters 5.10 and 10.1.4. After this, you may want to verify the operating status: AT+CFUN? +CFUN: 1 Indicates that ME has entered full functionality mode.
Example 3	To stop CYCLIC SLEEP mode and return to full functionality: AT+CFUN? +CFUN: 5 OK AT+CFUN=1 OK Remember that this approach is not applicable to the NON-CYCLIC SLEEP mode (since the serial interface is disabled). The NON-CYCLIC SLEEP mode ends with the first wake-up event.
Example 4	To reset and restart the ME: AT+CFUN=1,1 or alternatively, AT+CFUN=0,1 or 5,1 or 6,1 or 7,1 or 8,1 OK ^SYSSTART The ^SYSSTART URC confirms that the ME has been rebooted. Note that ^SYSSTART appears only if AT+IPR≠0. If the ME is in autobaud mode, it is recommended to wait 3 to 5 seconds before entering the first AT command. Remember to enter the SIM PIN after restart.

4.11.1 Wake up the ME from SLEEP mode

A wake-up event is any event that switches off the SLEEP mode and causes the ME to return to full functionality. In short, it takes the ME back to AT+CFUN=1.

Definitions of the state transitions described in Table 14:
Yes = ME exits SLEEP mode.
No = ME does not exit SLEEP mode.

Table 14: Wake-up events in NON-CYCLIC and CYCLIC SLEEP modes

Event	From SLEEP mode AT+CFUN=0 to AT+CFUN=1	From SLEEP mode AT+CFUN=5 or 6 to AT+CFUN=1	From SLEEP mode AT+CFUN=7 or 8 to AT+CFUN=1
Ignition line	No	No	No
Activation of /RTS0	Yes[1)]	No[1)]	No[1)]
Unsolicited Result Code (URC)	Yes	Yes	No
Incoming voice or data call	Yes	Yes	No
Any AT command (incl. outgoing voice or data call, outgoing SMS)	Not possible (UART disabled)	No	No
Incoming SMS depending on mode selected by AT+CNMI:			
AT+CNMI=0,0 (= default, no indication of received SMS)	No	No	No
AT+CNMI=1,1 (= displays URC upon receipt of SMS)	Yes	Yes	No
GPRS data transfer	Not possible (UART disabled)	No	No
RTC alarm[2)]	Yes	Yes	No
AT+CFUN=1	Not possible (UART disabled)	Yes	Yes

1) During all CYCLIC SLEEP modes, /RTS0 is conventionally used for flow control: The assertion of /RTS0 signal is that the application is ready to receive data - without waking up the module. Be aware that this behavior is different if CFUN=0: In this case, the assertion of /RTS0 serves as a wake-up event, giving the application the possibility to intentionally terminate power saving.

2) Recommendation: In NON-CYCLIC SLEEP mode, you can set an RTC alarm to wake up the ME and return to full functionality. This is a useful approach because, in this mode, the AT interface is not accessible.

4.12 AT+CGMI Request manufacturer identification

Test command	Response
AT+CGMI=?	**OK**
Execute command	Response
AT+CGMI	TA returns manufacturer identification text. **SIEMENS** **OK**
Reference	Note
GSM 07.07	See also ”AT+GMI Request manufacturer identification”.

4.13 AT+CGMM Request model identification

Test command	Response
AT+CGMM=?	**OK**
Execute command	Response
AT+CGMM	TA returns product model identification text. **AC45** **OK**
Reference	Note
GSM 07.07	See also ”AT+GMM Request TA model identification”.

4.14 AT+CGMR Request revision identification of software status

Test command	Response
AT+CGMR=?	OK
Execute command	Response
AT+CGMR	TA returns product firmware version identification text. **REVISION xx.yy** **OK** xx.yy Version xx and variant yy of software release
Reference	Note
GSM 07.07	See also AT+GMR Request TA revision identification of software status

4.15 AT+CGSN Request product serial number identification (IMEI) identical to GSN

Test command AT+CGSN=?	Response **OK**
Execute command AT+CGSN	Response TA returns identification text for determination of the individual ME. **<sn> OK** Parameter **<sn>** IMEI of the telephone (International Mobile station Equipment Identity)
Reference GSM 07.07	Note See also ”AT+GSN Request TA serial number identification”.

4.16 AT+CHLD Call hold and multiparty

Test command	Response
AT+CHLD=?	**+CHLD:** (list of supported **<n>s**) **OK**

Execute command	Response
AT+CHLD=[<n>]	TA controls the supplementary services Call Hold and MultiParty. Calls can be put on hold, recovered, released and added to a conversation. Like for all Supplementary services, the availability and detailed functionality of ”Call hold and multiparty” services depends on the configuration of the GSM network. The AC45 can only request the service, but the network decides whether and how the request will be answered. **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<n>** 0 Release all held calls or set UDUB (User Determined User Busy) for a waiting call: - If a call is waiting, release the waiting call. The calling party will receive a ”BUSY” indication (Supplementary Service User Determined User Busy ”UDUB”). - Otherwise, terminate all held calls (if any). 1 Terminate all active calls (if any) and accept the other call as the active call: - If a call is waiting, the waiting call will be accepted. - Otherwise, if a held call is present, the held call will be accepted. 1X Terminate the active call X (X= 1-7). The call may be active, held or waiting. The remote party of the terminated call will receive a ”NO CARRIER” indication. Parameter X is the call identification number <idx> of the targeted call in the list of current calls available with AT command AT+CLCC. 2 Place all active calls on hold (if any) and accept “the other call” as the active call: - If a call is waiting, the waiting call will be accepted. - Otherwise, if a held call is present, the held call will be accepted. 2X Place all active calls except call X (X= 1-7) on hold. Parameter X is the call identification number <idx> of the targeted call in the list of current calls available with AT command AT+CLCC. 3 Add a held call to the active calls (set up conference (multiparty) call).

Reference	Note
GSM 07.07	• The AT+CHLD command offers a broad range of options according to the GSM specifications. However, many of these options are dependent on the SIM card / service provider. If you attempt to invoke an option which is not provisioned by the network, or not subscribed to, invocation of this option will fail. The responses in these cases may vary with the network (for example “Operation not allowed”, “Operation not supported” etc.). • The supplementary service is only applicable to teleservice 11 (Speech telephony). AT+CHLD can be used to both accept a waiting voice call and put an active voice call on hold. A data or fax call, however, cannot be put on hold. But it is possible to place a voice call on hold in order to accept a waiting data or fax call, and afterwards to recover the voice call. In this case, the only difference over speech telephony is that AT+CHLD only puts the voice call on hold, the data or fax call need to be manually accepted (via ATA). Use the AT+CCWA command to activate the Call Waiting service. The classes (bearer services) of waiting calls can be easily distinguished if the URC +CCWA: <number>,<type>,<class>,,<CLI validity> is enabled. For step-by-step instructions refer to the example below. A description of the AT+CCWA command can be found in Chapter 4.9. • The NO CARRIER result code is not displayed when a held call has been disconnected from either party. In order to get an indication of this disconnection, please refer to the AT+CSSN command (see Chapter 4.47). • In conflicting situations, e.g. when a waiting call comes while there are already held calls, the above procedures apply to the waiting call only. For example, <n>=0 rejects the waiting call, but does not affect the held calls. • The current states of all calls can be easily checked at any time by using the AT+CLCC command. For details refer to Chapter 4.20.

Example 1

```
^SYSSTART
at+cpin="9999"
OK

+CREG: 2

+CREG: 1,"0145","0016"          You are now registered.
at+ccwa=1,1,1                   You activate the indication of waiting calls
OK                              during active voice calls.

atd"0301234567";                You start a voice call.
OK
+CCWA: "+4901772222",145,32,,0  You receive a URC indicating a waiting data
                                call.
at+chld=2                       You set the voice call on hold.
OK                              You receive now the RING of the data call.
RING

RING
ata                             You accept the data call.
CONNECT 9600/RLP
OK                              With “+++” you go in command mode.

at+clcc                         You interrogate the status of established calls.
+CLCC: 1,0,1,0,0,"0301234567",129
+CLCC: 2,1,0,1,0,"+491772222",145
OK
at+chld=1                       The active data call is terminated and the held
                                voice call becomes active.
```

	OK at+clcc +CLCC: 1,0,0,0,0,"0301234567",129 OK
Example 2	The example shows how to place a voice call on hold in order to accept a waiting voice call and then return to the first call. at+ccwa=,2,1 — You query the status of CW during voice calls. +CCWA: 1,1 — Indication of waiting calls during active voice calls is switched on. OK atd03038639839; — You start a voice call. OK +CCWA: "017511111",129,1,,0 — You receive a URC indicating a waiting voice call. at+clcc — You interrogate the status of established calls. +CLCC: 1,0,0,0,0,"03038639839",129,"Test" +CLCC: 2,1,5,0,0,"01755812934",129,"D1 Voice" OK at+chld=2 — You put the first voice call on hold and accept OK — the waiting voice call. at+clcc — You interrogate the status of established calls. +CLCC: 1,0,1,0,0,"03038639839",129,"Test" +CLCC: 2,1,0,0,0,"01755812934",129,"D1 Voice" OK at+chld=1 OK at+clcc +CLCC: 1,0,0,0,0,"03038639839",129,"Test" OK ath OK

4.17 AT+CHUP Hang up call

Test command AT+CHUP=?	Response **OK**
Execute command AT+CHUP	Cancels all active and held calls. Response **OK/ERROR**
Reference GSM 07.07	Note **AT+CHUP** implements the same behavior as **ATH** (see Chapter 2.12**)**.

4.18 AT+CIMI Request international mobile subscriber identity

Test command AT+CIMI=?	Response **OK**
Execute command AT+CIMI	Response TA returns < IMSI> for identifying the individual SIM which is attached to ME. **<IMSI> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<IMSI>** International Mobile Subscriber Identity (string without quotes)
Reference GSM 07.07	Note

4.19 AT+CIND Indicator control

AC45 supports indicator event reporting for the following items: signal quality, service availability, generation of sound in the ME, indication of unread short messages, full SMS storage, call in progress and roaming activities.

There are two ways to display the status and event reports by indicators:

1. You can directly query the current status of each indicator, simply by using the Read command AT+CIND?. The Read command returns the status no matter whether the indicator has been registered with the Write command AT+CIND=[<stat>[,<stat>[,...]]].
2. You can take advantage of Unsolicited Result Codes. These are the +CIEV URCs which the ME automatically sends to the application, whenever the value of the associated indicator changes. The presentation of these URCs depends on two settings:
   a) The indicators must be registered with the Write command AT+CIND=[<stat>[,<stat>[,...]]]. By default, all of them are registered when the ME is switched on. Any URCs you do not need can easily be excluded if deregistered with <stat>=0.
   b) The URC presentation mode must be enabled with AT+CMER (see Chapter 4.26).

Test command	Response
AT+CIND=?	**+CIND:** (**<indDescr>**,(list of supported **<indValue>**s)) [,(**<indDescr>**,(list of supported **<indValue>**s))[,...]]

Parameters

<indDescr> indicator names and their **<indValue>** ranges.

"battchg"	Battery charge level (5). Not relevant for AC45.
"signal"	Signal quality (0-7 or 99 if not measurable). The indicated value is the bit error rate of the signal received. See also AT+CSQ in Chapter 4.46.
"service"	Service availability (0-1). 0: Not registered to any network 1: Registered to home network or, if "roam"=1 then registered to another network
"sounder"	Sounder activity (0-1). The indicator provides information about tones generated in the ME. The value 1 means for example: Incoming call - ME is ringing. Note that the URC +CIEV: sounder will be output only if ringing tones are activated with AT^SRTC (see Chapter 9.44) Waiting call – ME generates waiting call tone (if call waiting is enabled). Outgoing call – ME generates Call Progress tone. Outgoing call – ME generates BUSY tone. The value changes to 0, when the tone stops.
"message"	Unread short message(s) at memory location <mem1> (0-1).
"call"	Call in progress (0-1). Applies to voice, data and fax calls. Indicator value is "1" if at least one call is in state "active" or "held". The indicator is issued each time a call status transition ends in the "active" state or when a call is removed from the list of current calls. (For the list of current calls see AT+CLCC described in Chapter 4.20.)

	"roam" Roaming indicator (0-1). 0: Registered to home network or not registered 1: Registered to other network "smsfull" A short message memory storage in the MT has become full (1) or memory locations are available (0); i.e. the range is (0-1). "rssi" Received signal (field) strength, scaled to value range 0…5, or 99 if not measurable. 0: Signal strength ≤ 112 dBm 1 – 4: Signal strength in 15 dBm steps 5: Signal strength ≥ -51 dBm See also AT+CSQ in Chapter 4.46. Value range of AT+CSQ is 0 – 31. **<indValue>** integer type value, in the range stated above for the corresponding **<indDescr>**.
Read command AT+CIND?	Response TA returns the status of the ME indicators. **+CIND: <indValue>[,<indValue>[,...]]** **OK** If error is related to ME functionality **+CME ERROR: <err>** Parameter See Test command
Write command AT+CIND= [<state> [,<state>[,...]]]	Response **OK / ERROR / +CME ERROR: <err>** Parameter The Write command simply controls the registration / deregistration of indicators. **<state>** 0 Indicator is deregistered. The indicator cannot be presented as +CIEV URC, but can be directly queried with AT+CIND?. 1 Indicator is registered, indicator event report is allowed.
Reference GSM 07.07	Note

Examples	`at+cind?`
	`+CIND: 5,99,1,0,1,0,0,0,5` First parameter not relevant for AC45. The bit error rate of the signal quality is not available (since there is no call in progress). The ME is registered to the home network. Unread short message(s) available. Signal strength greater or equal -51 dBm.
	
	`at+cmer=2,0,0,2` Activate Indicator Event Report with `at+cmer`
	`OK`
	`+CIEV: battchg,5`
	`+CIEV: signal,99`
	`+CIEV: service,1`

	+CIEV: sounder,0 +CIEV: message,0 +CIEV: call,0 +CIEV: roam,0 +CIEV: smsfull,0 +CIEV: rssi,4	
	atd"0123456"; OK	You make a call.
	+CIEV: sounder,1 +CIEV: call,1 +CIEV: sounder,0	A set of +CIEV URCs reports is presented.
	+CIEV: call,0 NO CARRIER	The receiver hangs up.
	at+cind=,,,0,,0 OK	You deregister the indicators ‘sounder’ and ‘call’.
	atd"0123456"; OK	You make a call.
	NO CARRIER	This time, no +CIEV URCs are displayed.

4.20 AT+CLCC List current calls of ME

Test command AT+CLCC=?	Response **OK**
Execute command AT+CLCC	Response TA returns a list of current calls of ME. If command successful, but no calls are available, no information response is sent to TE. **[+CLCC: <idx>,<dir>,<stat>,<mode>,<mpty>,[<number>,<type>,[<alpha>]]]** **[+CLCC: <idx>,<dir>,<stat>,<mode>,<mpty>,[<number>,<type>,[<alpha>]]]** **[...]]]** **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameters **<idx>** (numeric) call identification number as described in GSM 02.30, subclause 4.5.5.1; this number can be used in +CHLD command operations **<dir>** (numeric) 0 mobile originated (MO) call 1 mobile terminated (MT) call **<stat>** state of the call (numeric) 0 active 1 held 2 dialing (MO call) 3 alerting (MO call) 4 incoming (MT call) 5 waiting (MT call) **<mode>** bearer/teleservice (numeric): 0 voice 1 data 2 fax 3 voice followed by data, voice mode (only in connection with single numbering scheme AT+CSNS) 4 alternating voice/data, voice mode (only in connection with single numbering scheme AT+CSNS) 5 alternating voice/fax, voice mode (only in connection with single numbering scheme AT+CSNS) 6 voice followed by data, data mode (only in connection with single numbering scheme AT+CSNS) 7 alternating voice/data, data mode (only in connection with single numbering scheme AT+CSNS) 8 alternating voice/fax, fax mode (only in connection with single numbering scheme AT+CSNS) 9 unknown

	<mpty>	(numeric) 0 call is not one of multiparty (conference) call parties 1 call is one of multiparty (conference) call parties 2
	<number>	(string) phone number in format specified by <type>
	<type>	(numeric) type of address octet in integer format; 145 when dialing string includes international access code character "+", otherwise 129
	<alpha>	(string) type alphanumeric representation of **<number>** corresponding to the entry found in phonebook; used character set should be the one selected with command AT+CSCS. The maximum displayed length of **<alpha>** is 16 characters. If **<alpha>** has more than 16 characters, only the first 15 characters will be displayed. To indicate an overflow, a special character will be used for the 16th character: This will be a space if the character set selected with AT+CSCS is "GSM", or "E400" if the character set is "UCS2". Due to time constraints on the necessary evaluation of the phonebook, this parameter may show a default value during early call phases (e.g. for <stat> = "dialing", "incoming" or "alerting"), even if a phonebook entry is present for the number concerned.
Reference GSM 07.07	Note	

4.21 AT+CLCK Facility lock

Test command AT+CLCK=?	Response **+CLCK**: (list of supported **<facility>) OK** Parameter See write command
Write command AT+CLCK= <facility>,<mode> [,<password> [,<class>]]	Use this command to lock, unlock or interrogate a ME or a network facility **<facility>**. The command can be aborted when network facilities are being set or interrogated. Response If **<mode>** ≠ **2** and command is successful **OK** If **<mode>** = **2** and command is successful **+CLCK: <status>[,<class1>[<CR><LF>** **+CLCK: <status>, class2....]] OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<facility>** Phone security locks: Primarily intended for the client to take safety precautions, ”SC”, “PS” and “FD” can be configured individually. “PS” may also be factory set. “SC” SIM (lock SIM cards). SIM requests password upon ME power-up and when this lock command is issued. <password>: SIM PIN1. The password can be modified with AT+CPWD or AT^SPWD (see Chapters 4.38 and 9.43). If the password is incorrectly entered three times, the SIM PUK1 is required to perform authentication. Input of the SIM PUK1 is possible only with AT+CPIN or ATD. “PS” Phone locked to SIM card. ME requests password when other than current SIM card is inserted. "PS" lock is frequently referred to as "phone lock", or "device lock". Accordingly, the password may be called "phone code" or "device code". <password>: Usually, user defined password. It is needed before the first use of <facility>”PS” and, therefore, must first be specified with AT+CPWD or AT^SPWD, if it has not been predefined by factory settings. If set by factory (e.g. for a prepaid mobile), the password is supplied by the provider or operator. The "PS" password is not associated with the PUK of the SIM card. If it is incorrectly entered three times, the Master Phone Code is required to lift the lock. This is an 8-digit device code associated to the IMEI number of the mobile which can only by obtained from the manufacturer of the AC45 module. Once the Master Phone Code has been acctepted, the mobile is operational, and the "PS" lock is no longer active. In case of failure to enter correct “PS” password see Chapter 4.35.1 and examples below.

“FD” SIM fixed dialing memory: If the mobile is locked to "FD", only the phone numbers stored to the "FD" memory can be dialed (depending on the SIM card, usually up to 7 numbers).
<password>: SIM PIN2
If a lock on the SIM fixed dialing memory is active, the following applies:

- Outgoing voice, data or fax calls can be made only to numbers stored in "FD" phonebook. Result code depends on the type of the call: For voice calls, indication is "+CME Error 257: Call barred". For data and fax calls, indication is "NO CARRIER".
- Access to defined Supplementary Services such as Call barring, Call waiting, Call forwarding, Call hold and Multiparty is possible only if the exact corresponding public MMI *# code for the desired service is stored in the fixed dialing number phonebook, and used with ATD. AT commands for supplementary service control are barred while "FD" lock is active. Indication is "+CME Error 257: Call barred".
- Access to Unstructured supplementary services ("USSD") is possible only if the exact desired USSD string is stored in the fixed dialling number phone book, and used with ATD. AT commands for USSD are barred while "FD" lock is active. Indication is "+CME Error 257: Call barred".
- SMS can be sent only to phone numbers which are stored in the "fixed dialing numbers" phonebook "FD". Indication is "+CMS Error 302: operation not allowed".
- GPRS commands can be used only if the "fixed dialing numbers" phonebook "FD" contains an entry with phone number "*99#". This single entry enables all GPRS commands, including AT commands and modem compatibility commands like "ATD*99***1#" or "ATD*98***1#".
  Indication is "+CME Error 257: Call barred".

Factory set SIM locks
Typical examples of factory set SIM locks are prepaid phones or network locks, used to restrict the operation of a mobile to a specific provider or operator. The end user should be aware that each of these lock types can only be unlocked if the associated password is available. For example, a mobile can be locked to accept only SIM cards from the respective provider, or even one single SIM card. Once a different SIM card is inserted the ME will prompt the client to enter a specific code. This is not the PUK of the SIM card, but usually an 8-digit code which needs to be requested from the provider.
The locks can only be set by the manufacturer of the AC45 modules and need to be agreed upon between the parties concerned, e.g. provider, operator, distributor etc. on the one side and the manufacturer on the other side. For details contact your local dealer or Siemens AG.
See Chapter 4.35 and 4.35.1 for further instructions.
<password>: Factory set password.

“PF” lock Phone to the very First SIM card
“PN” Network Personalisation
“PU” Network subset Personalisation
“PP” Service Provider Personalisation
“PC” Corporate Personalisation

Supplementary Service: Call barring:
The Supplementary Service ”Call Barring” serves to specify conditions under which calls will be disallowed by the network.
The availability of the Supplementary Services varies with the network. To benefit from call barring services the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package. Call barring is protected by a password supplied from the provider or operator. Usually there is one password which applies to all call barring options. For details contact your provider. With AT+CPWD or AT^SPWD the default password can be changed individually. After 3 failed attempts to enter the correct password, the client is required to contact the provider.
When you attempt to set a <facility> or <class> which is not provisioned, not yet subscribed to, or not supported by the module, the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example “OK”, “Operation not allowed”, “Operation not supported” etc.). To make sure check the call barring status with <mode>=2 and use AT+CEER to view the the extended error response.
<password>: Network dependent password.

“AO” BAOC (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 barring services (applicable only for <mode>=0)
“AC” All inComing barring services (applicable only for <mode>=0)

<mode>
0 unlock
1 lock
2 query status

<password> Password string used to lock or unlock a <facility>. The length of a password and the authority depend on the <facility>. Passwords can be modified with AT+CPWD (Chapter 4.38) or AT^SPWD (Chapter 9.43).

<class> integer or sum of integers each representing a **<class>** of information:

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
x	combination of some of the above classes. For example, the default setting 7 represents the sum of the integers 1, 2 and 4 (call barring for voice, data and fax). The value 255 covers all classes. If the **<class>** parameter is omitted, the default value 7 is used.

See examples in Chapter 4.21.3 for correct handling of class numbers.

<class> 2 (data) comprises all those <class> values between 16 and

	128, that are supported both by the network and the MS. This means, a setting made for <class> 2 applies to all remaining data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate call barring for all data classes, but deactivate it for a specific data class. <status> 0 off 1 on
Reference GSM 07.07 GSM 02.04 GSM 02.88 GSM 03.88 GSM 04.88	Note • If an outgoing international voice call is rejected due to active call barring supplementary service, the call will be terminated with result code NO DIALTONE. Under the same conditions, an outgoing fax or data call will be terminated with result code NO CARRIER. • The command has been implemented with the full set of <class> parameters according to GSM 07.07. For actual applicability of a specific <facility> to a specific service or service group (a specific <class> value) please consult table A.1 of GSM 02.04. • AT^SLCK is a Siemens defined command equivalent to AT+CLCK. See Chapter 9.16. Both commands are using the same parameters.

4.21.1 Examples: Enabling / disabling PIN 1 authentication

Example 1	To lock or unlock the SIM card: The "SC" parameter enables or disables the SIM PIN authentication (PIN 1) when you power up the GSM engine: `AT+CLCK="SC",1,"9999"` Activates SIM card lock. `OK` As a result, SIM PIN 1 must be entered to enable ME to register to the GSM network. `AT+CLCK="SC",0,"9999"` Unlocks SIM card. `OK` When powered up, ME registers to the GSM network without requesting SIM PIN1. Note: Depending on the services offered by the provider, this feature is not supported by all SIM card types. If so, the command returns ERROR when you attempt to unlock the card.
Example 2	To query the status of the SIM card lock: `AT+CLCK="SC",2` `+clck: 1` SIM card is locked. SIM PIN1 must be entered to enable ME to register to the GSM network.

4.21.2 Examples: Phone lock

Example 1	Be sure that PIN 1 authentication is valid:
	`AT+CPIN?`
	`+CPIN: SIM PIN`
	`OK`
	
	`AT+CPIN=”9999”`
	`OK`
	
	To lock the mobile to the currently inserted SIM card, first specify a password (= a phone code):
	`AT+CPWD="PS",,”1234”` If "PS" lock has not been set before: enter new
	`OK` password.
	`or:`
	`AT+CPWD="PS",”1234”,”3333”` To replace existing "PS" pass
	`OK` word: Enter old and new one.
	
	Then, activate the phone lock:
	`AT+CLCK="PS",1,”3333”` Locks the mobile to the current SIM card.
	`OK`

Example 2	To deactivate the phone lock: `AT+CLCK="PS",0,”3333”` Enter lock type "PS", followed by 0 to lift the `OK` lock. Then type "PS" lock password. As a result, the mobile accepts any SIM card and can be operated after the card's SIM PIN 1 was entered.

Example 3	To operate the mobile with the SIM card for which "PS" lock was activated:
	`AT+CPIN?` Enter SIM PIN used when locking the mobile.
	`+CPIN: SIM PIN` "PS"lock password is not needed.
	`AT+CPIN=”9999”`
	`OK`

Example 4	To operate the mobile with other SIM card than the one used for the "PS" lock: Enter SIM PIN of present card, followed by "PS" lock password.
	`AT+CPIN?` Enter SIM PIN of present SIM card.
	`+CPIN: SIM PIN`
	`AT+CPIN=”1111”`
	`OK` SIM PIN accepted.
	
	`AT+CPIN?`
	`+CPIN: PH-SIM PIN` "PS" lock password is required.
	`AT+CPIN=”3333”`
	`OK` "PS" lock password has been accepted.

Example 5	Attempt to unblock the "PS" lock using an invalid password: AT+CPIN? Enter SIM PIN of present SIM card. +CPIN: SIM PIN AT+CPIN=”1111” OK SIM PIN accepted. AT+CPIN? +CPIN: PH-SIM PIN "PS" lock password is required. AT+CPIN=”4444” Bad password is given: +CME ERROR: incorrect password After the "PS" lock password was incorrectly entered three times in a row: AT+CPIN? +CPIN: PH-SIM PUK Master Phone Code is required (8-digit code available from the manufacturer. See Chapter 4.35.1). AT+CPIN=”12345678” Master Phone Code has been accepted. As a result, the mobile is operational, and the "PS" lock is totally removed. If needed, it must be set once again.
Example 6	Attempt to unblock the "PS" lock using an invalid Master Phone Code: Due to the timing algorithm explained in Chapter 4.35.1 the intervals between each attempt are getting longer. See also AT^SPIC in Chapter 9.39.
Example 7	As an alternative to the AT+CPIN command you can use AT+CPWD. In this case the following syntax shall be observed: AT+CPWD=PS,Master Phone Code[,new password]. AT+CPWD=”PS”,”12345678” Deactivates the "PS" lock. Or AT+CPWD=”PS”,”12345678”,”3333” Deactivates the present "PS" lock and sets a new "PS" lock.

4.21.3 Examples: Call barring

Please note that when you configure or query call barring without specifying any classes, the settings will refer to classes 1, 2 and 4 only (default setting).
Usually, the service is subject to a password supplied from the provider.

Example 1	When checking the status of barring for outgoing international calls without specifying classes, please note that the ME returns only the status of voice, data, fax calls. The status of SMS and other classes is not reported.
	
	`at+clck="oi",2,"0000"` or without <password>: `at+clck="oi",2`
	`+CLCK: 1,1` outgoing international voice calls barred
	`+CLCK: 1,2` outgoing international data calls barred
	`+CLCK: 1,4` outgoing international fax calls barred
	`OK`

Example 2	To check the call barring status for outgoing international calls and all classes, you are required to enter the integer sum referring to all classes:
	
	`at+clck="oi",2,"0000",255`
	or without <password>:
	`at+clck="oi",2,,255`
	`+CLCK: 1,1` outgoing international voice calls barred
	`+CLCK: 1,2` outgoing international data calls barred
	`+CLCK: 1,4` outgoing international fax calls barred
	`+CLCK: 1,8` outgoing international SMS barred
	`+CLCK: 0,16` no barring (e.g. not supported or not activated at all)
	`+CLCK: 1,32` outgoing international data calls barred
	`+CLCK: 0,64` no barring (e.g. not supported or not activated at all)
	`+CLCK: 0,128` no barring (e.g. not supported or not activated at all)
	`OK`

Example 3	To activate call barring for outgoing international voice and data calls: `at+clck="oi",1,"0000",3` (where 3 is the sum of class 1 + class 2) `OK`
Example 4	To disable call barring for outgoing international fax (class 4) and SMS (class 8) calls: `at+clck="oi",0,"0000",12` (where 12 is the sum of class 4 + class 8) `OK`

Example 5	To disable call barring for all outgoing international calls:
	
	`at+clck="oi",0,"0000",255`
	`OK`

4.22 AT+CLIP Calling line identification presentation

This command refers to the GSM supplementary service CLIP (Calling Line Identification Presentation) that enables a called subscriber to get the calling line identity (CLI) of the calling party when receiving a mobile terminated call.

Test command AT+CLIP=?	Response + **CLIP:** (list of supported <**n**>s) **OK** Parameter See write command
Read command AT+CLIP?	Response **+CLIP: <n>, <m> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT+CLIP=<n>	Set command enables or disables the presentation of the CLI at the TE. It has no effect on the execution of the supplementary service CLIP in the network. Response **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<n>** 0 suppress unsolicited result codes 1 display unsolicited result codes **<m>** 0 CLIP not provisioned 1 CLIP provisioned 2 unknown
Unsolicited result code	If CLIP is enabled at the TE (and is permitted by the calling subscriber), an unsolicited result code is presented after every RING (or +CRING: <type>) when there is a mobile terminated call. Voice call response format: **+CLIP: <number>, <type>,,,,<CLI validity>** Data/FAX call response format: **+CLIP: <number>, <type>** Parameter **<number>** string type phone number of calling address in format specified by **<type>** **<type>** type of address octet in integer format; **145** when dialing string includes international access code character "+", otherwise **129**. **<CLI validity>** 0 CLI valid 1 CLI has been withheld by the originator. 2 CLI is not available due to interworking problems or limitations of originating network. <number> shall be an empty string ("") and <type> value will not be significant. When CLI is not available (<CLI validity>=2), <number> shall be an empty string ("") and <type> value will not be significant. Nevertheless, TA shall return the recommended value 128 for <type> (TON/NPI unknown in accordance with GSM 04.08 subclause 10.5.4.7).

		When CLI has been withheld by the originator, (<CLI validity>=1) and the CLIP is provisioned with the "override category" option (refer to GSM 02.81 and GSM 03.81), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available.
Reference GSM 07.07	Note	

4.23 AT+CLIR Calling line identification restriction

This command refers to the GSM supplementary service CLIR (Calling Line Identification Restriction).

Test command AT+CLIR=?	Response **+CLIR: (**list of supported **<n>**s) **OK** Defined values **<n>** 0 Presentation indicator is used according to the subscription of the CLIR service 1 CLIR invocation (incognito) 2 CLIR suppression (not incognito)
Read command AT+CLIR?	Response **+CLIR: <n>,<m>** Defined values **<n>** See test command **<m>** Parameter shows the subscriber CLIR service status in the network: 0 CLIR not provisioned 1 CLIR provisioned in permanent mode 2 Unknown (e.g. no network, etc.) 3 CLIR temporary mode presentation restricted 4 CLIR temporary mode presentation allowed
Write command AT+CLIR=[<n>]	Response **OK / ERROR / +CME ERROR** Parameter: See test command
Reference GSM 07.07	Note: The settings made with AT+CLIR=1 or AT+CLIR=2 are used for all outgoing calls until the ME is switched off or AT+CLIR=0 is used.

4.24 AT+CLVL Loudspeaker volume level

Test command AT+CLVL=?	Response **+CLVL**: (list of supported <level>s) OK
Read command AT+CLVL?	Response **+CLVL:** <level> **OK / ERROR / +CME ERROR**
Write command AT+CLVL=<level>	Response **OK / ERROR / +CME ERROR** Parameter **<level>** Loudspeaker Volume Level (0-4)
Reference GSM 07.07	Note • The write command can only be used in audio mode 2 – 6. • The values of the volume steps are specified with the parameters **<outCalibrate[0]>,...<outCalibrate[4]>** of the AT^SNFO command (see Chapter 9.30). • As an alternative to AT+CLVL, you can use AT^SNFO and AT^SNFV (Chapter 9.33). The parameter **<level>** is identical with **<outStep>** used by both commands. • Any change to **<level>** (or **<outStep>**) takes effect in audio modes 2 to 6. That is, when you change **<level>** (or **<outStep>**) and then select another mode with AT^SNFS, the same step will be applied. The only exception is audio mode 1 which is fixed to **<level>=4** (or accordingly **<outStep>=4**). • **<level>** (or **<outStep>** is stored non-volatile when the ME is powered down with AT^SMSO or reset with AT+CFUN=1,1.

4.25 AT+CMEE Report mobile equipment error

Test command AT+CMEE=?	Response **+CMEE:** (list of supported **<n>s) OK** Parameter See write command
Read command AT+CMEE?	Response **+CMEE: <n> OK** Parameter See write command
Write command AT+CMEE=<n>	This command controls the presentation of the result codes **+CME ERROR: <err>** and **CMS:<err>** that indicate errors relating to ME functionality. When you power down or reset the ME with AT+CFUN=1,1 the setting will be reset to its default. The levels 1 or 2 need to be selected every time you reboot the ME, or may be included, for permanent use, in the user profile saved with AT&W. Response **OK** Parameter **<n>** 0 disable result code (only 'ERROR' will be displayed) 1 enable result code and use numeric values 2 enable result code and use verbose values
Example	To obtain enhanced error messages it is recommended to choose <n>=2. AT+CMEE=2 OK
Reference GSM 07.07 GPRS GSM 07.05	Note • The possible error result codes are listed in Chapters 10.1.1, 10.1.2, and 10.1.3. • In multiplex mode (see “AT+CMUX Enter multiplex mode”, pg. 120) the setting applies only to the logical channel where selected. The settings on the other channels may differ.

4.26 AT+CMER Mobile equipment event reporting

Test command AT+CMER=?	Response **+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) Parameters See write command
Read command AT+CMER?	Response **+CMER: <mode>,<keyp>,<disp>,<ind>,<bfr>** Parameters See write command
Write command AT+CMER= [<mode> [,<keyp> [,<disp> [,<ind> [,<bfr>]]]]]	The Write command enables and disables the presentation of Unsolicited Result Codes for event reporting. AC45 supports only the type +CIEV (indicator event reporting). If enabled the +CIEV URCs are sent whenever the value of an indicator changes. Response **OK** Parameters If a parameter is not specified the current value remains unchanged. **<mode>** 0 Discard +CIEV Unsolicited Result Codes 1 Discard +CIEV Unsolicited Result Codes when TA-TE link is reserved (e.g. in on-line data mode); otherwise forward them directly to the TE 2 Buffer +CIEV Unsolicited Result Codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation. Otherwise forward them directly to the TE. 3 Forward +CIEV Unsolicited Result Codes directly to the TE; TA-TE link specific inband technique used to embed result codes and data when TA is in on-line data mode: While the ME is in online data mode, no URC will be displayed. Each +CIEV URC is replaced with a Break (100 ms), and is stored in a buffer. Once the ME goes into command mode (after +++ was entered), all URCs stored in the buffer will be output. **<keyp>** 0 Keypad event reporting not supported. **<disp>** 0 Display event reporting not supported. **<ind>** 0 No indicator event reporting 2 Indicator event reporting using Unsolicited Result Codes +CIEV: <descr>,<value> **<bfr>** 0 TA buffer of Unsolicited Result Codes is cleared when <mode> 1...3 is entered
	Unsolicited Result Code: **+CIEV: <indDescr>,<indValue>** Parameters **<indDescr>** Name of indicator. **<indValue>** New value of this indicator.

	For a list of all supported indicators <indDescr> and their values <indValue> please refer to the commands AT+CIND command described in Chapter 4.19.
Reference GSM 07.07	Note • Only the indicators which are registered (see AT+CIND command), will be reported if CMER is enabled. • After CMER has been switched on, +CIEV URCs for all registered indicators with their default value will be presented to the TE. • The indication commands AT+CNMI and AT^SSDA as well as AT+CMER can be only switched on at the same instance.

4.27 AT+CMUT Mute control

Test command AT+CMUT=?	Response **+CMUT**: (list of supported **<n>s**) **OK**
Read command AT+CMUT?	Response **+CMUT: <n>** **OK / ERROR / +CME ERROR**
Write command AT+CMUT=<n>	Response **OK / ERROR / +CME ERROR** Parameter **<n>:** 0 mute off 1 mute on
Reference GSM 07.07	Note This command can be used in all audio modes (1 to 6) and during a voice call only. See AT^SNFS in Chapter 9.32 for more details on the various audio modes. Users should be aware that when they switch back and forth between different audio modes the value of **<mute>** does not change. This means that the status of mute operaton is retained until explicitly changed. As alternative, you can use the AT^SNFM command described in Chapter 9.29.

4.28 AT+CMUX Enter multiplex mode

Multiplex mode according to the ETSI TS 101 669 and GSM 07.10 enables one physical serial asynchronous interface to be partitioned into three virtual channels. This allows you to take advantage of up to 3 simultaneous sessions running on the serial interface. For example, you can send or receive data or make a call on the first channel, while the other two channels are free to control the module with AT commands.

The AC45 module incorporates an internal multiplexer and thus integrates all the functions needed to implement full-featured multiplex solutions. For the application on top, customers have the flexibility to create their own multiplex programs conforming to the multiplexer protocol. To help system integrators save the time and expense of designing multiplexer applications, SIEMENS AG offers WinMUX2k, a ready-to-use multiplex driver for Windows 2000 and Windows XP. Another approach is to develop customized solutions based on the sources of the WinMux2k driver.

Refer to [5] which provides a detailed description of the multiplex architecture and step-by-step instructions of how to install and configure the multiplex mode. The WinMUX2k driver and its source files can be supplied on request. Please contact your local distributor to obtain the latest installation software and user's guide.

Test command AT+CMUX=?	Response **+CMUX:** (list of supported **<mode>**s) **OK**
Read command AT+CMUX?	Response **+CMUX: <mode> OK** If error is related to ME functionality: **+CME ERROR: <err>**
Write command AT+CMUX=<mode>	Response **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<mode>** multiplexer transparency mechanism 0 basic option Subparameters defined in GSM07.07 are adjusted for control and logical channels as follows: **<subset>** 0 UIH frames used only (control channel)
Reference GSM 07.07 GSM07.10	Note • The write command is used to enter the multiplex mode. The setup of the logical channels is initiated by the TE, i.e. the TE acts as initiator. This means that the TE shall ensure that logical channels are established before any further actions on the channels can be started. • There is a timeout of five seconds, if the multiplexer protocol is enabled and no multiplexer control channel is established. The GSM engine returns to the AT command mode. • The parameter maximum frame size (N1) of AT+CMUX in GSM07.10 is fixed to 97 and cannot be changed. All other parameters are not available.

4.28.1 Restricted use of AT commands in Multiplex mode

In multiplex mode, CSD and fax calls can only be set up on logical channel 1. Due to this restriction, AT commands have a different behavior on channels 2+3 compared to channel 1. Several commands are not available, others return different responses. This chapter summarizes the concerned commands. For general rules and restrictions to be considered in Multiplex mode please refer to [5].

Table 15: Availability of AT commands on virtual channels

Command	Behavior on channel 1	Differences on channel 2+3
+++	not usable, but see note [3]	not usable, but see note [3]
ATL	as described	not usable
ATM	as described	not usable
AT+CBST	as described	not usable
AT+CRLP	as described	not usable
AT+CG... (GPRS commands)	as described	see note [2]
AT+F.... (Fax commands)	as described	not usable
AT&S	as described	not usable
ATA	as described	no data calls
ATD	as described	no data calls
ATDI<n>	as described	not usable
ATO	as described	not usable
ATS0 [1])	as described	only <n>=000
ATS6 [1])	as described	not usable
ATS7 [1])	as described	not usable
ATS8 [1])	as described	not usable
ATS10 [1])	as described	not usable
ATS18 [1])	as described	not usable

1) Siemens GSM engines support the registers S0 - S29. You can change S0, S3, S4, S5, S6, S7,S8, S10 and S18 using the related ATSn commands (see starting from pg. 36).

2) PDP contexts can be defined on any channel, but are visible and usable only on the channel on which they are defined (thus it is not possible to define a context on channel 2 and activate it on channel 3). GPRS connections can be established on two channels at a time.

3) The applicability of the +++ escape sequence depends on the customer's external application based on the Mulitplexer Protocol. The WinMux2k driver uses the +++ escape sequence as described in Chapter 2.2. Recommendations for implementing an appropriate modem status command (MSC) are provided in [5], Chapter "Escape Sequence".

Table 16: Summary of AT commands with different behavior in Multiplex mode

Command	Description	Chapter
AT\Q<n>	It is recommended to use hardware flow control (AT\Q3). XON/XOFF flow control (AT\Q1) is not supported in Multiplex mode. See note regarding AT\Qn settings stored with AT&W if Multiplex mode is active.	2.3
AT&V	Different configurations on channels 1, 2 and 3	2.37
AT&W	Different user profiles can be stored on each channel.	2.38
AT+IPR	Before you start Multiplex mode, it is recommended to set the ME to 57600 bps (minimum should be 4800 bps). For GPRS we suggest to use 115200 bps or 230400 bps. The bit rate cannot be changed while Multiplex mode is active, there-	2.45

Command	Description	Chapter
	fore do not use AT+IPR=<rate> in this mode.	
AT+IPR=0	Multiplex mode cannot be activated while autobauding is enabled.	2.45.1
AT+CALA	On each channel an individual <text> message can be stored. but only one time setting applies to all channels. This means an alarm <time> set on one of the channels overwrites the time setting on all remaining channels.Therefore, the total number of alarm events returned by the read command AT+CALA? will always be <n>=0, no matter whether individual text messages are stored. When the alarm is timed out and executed the ME sends the URC only on the channel where the most recent alarm setting was made. The alarm time will be reset to “00/01/01,00:00:00” on all channels.	4.2
AT+CMEE	Presentation mode can be separately configured for each channel.	4.25
AT+CNMA	If Multiplex mode is activated the +CNMI parameter will be set to zero on all channels, if one channel fails to acknowledge an incoming message within the required time.	5.9
AT+CNMI	Phase 2+ parameters can only be used on one channel. The parameters for <mt> and <ds> on the other channels have to be set to zero. If either a SM or a Status Report is not acknowledged, all +CNMI parameters will be set to zero on all channels.	5.10
AT+CFUN	If the ME is in Multiplexer mode, it is not recommended to activate SLEEP mode with AT+CFUN=<n>. The best approach to properly control SLEEP mode in this case is to issue the PSC messages described in [5], Chapter “Power saving control (PSC)”.	4.11
AT+CPMS	Parameter <mem3> will be the same on all instances, but the settings of <mem1> and <mem2> may vary on each instance.	5.11
AT^SSDA	If one instance is set to <da>=1 and <mt>=1, then all other instances must be configured for <mt>=0.	9.46

4.29 AT+COPN Read operator names

Test command AT+COPN=?	Response **OK**
Execute command AT+COPN	TA returns the list of operator names from the ME. Each operator code <numericn> that has an alphanumeric equivalent <alphan> in the ME memory is returned. Response +COPN: numeric <**numeric1**>,long alphanumeric <**alpha1**><**CR**><**LF**> +**COPN:.....OK** If error is related to ME functionality: +**CME ERROR:** <**err**> Parameter <**numericn**> string type; operator in numeric form; GSM location area identification number <**alphan**> string type; operator in long alphanumeric format; can contain up to 16 characters
Reference GSM 07.07	Note See also AT^SPLM, pg. 283

4.30 AT+COPS Operator selection

This command can be used to query the present status of the ME's network registration and to determine whether automatic or manual network selection shall be used.

Automatic mode: Lets the ME automatically search for the home operator. If successful the ME registers to the home network and enters the IDLE mode. If the home network is not found, ME goes on searching. If then a permitted operator is found, ME registers to this operator. If no operator is found the ME remains unregistered.

Manual mode: Desired operator can be manually entered, using the AT+COPS write command. If the operator is found, ME immediately registers to this network. If the selected operator is forbidden, the ME remains unregistered.

Manual/automatic: In this mode, the ME first tries to find the operator that was manually entered. If the ME fails to register to this operator, then it starts to select automatically another network.

Test command
AT+COPS=?

TA returns a list of quadruplets, each representing an operator present in the network. The list of operators is presented in the following order: Home network, networks referenced in SIM, and other networks. Two consecutive commas (,,) are used as a placeholder for a non-implemented parameter, such as <format>1 (short alphanumeric operator name).

Response

+COPS: [list of supported: (**<stat>**, long alphanumeric **<oper>**,,numeric **<oper>**)][,,list of supported **<mode>**s, list of supported **<format>**s] **OK**

If error is related to ME functionality:
+CME ERROR: <err>

Parameters

<stat>	0	unknown
	1	operator available
	2	current operator (registered)
	3	forbidden operator
<oper>	operator as per **<format>**	
<mode>	[0] - 4	see write command
<format>	0 - 2	see write command

Read command
AT+COPS?

TA returns the current mode and, if registered, the currently used operator. If the ME is unregistered, **<format>** and **<oper>** are omitted.

Response

+COPS: <mode>[, <format>[, <oper>]] OK

If error is related to ME functionality:
+CME ERROR: <err>

Parameters

See write command

Write command
AT+COPS=
<mode>
[,<format>[,<oper>]]

The write command allows you to choose whether the GSM network operator is to be selected automatically or manually. When using the manual mode, the <operator> must be entered, no matter whether you want to search for the home operator or another one.

	Response **OK** If error is related to ME functionality: **+CME ERROR: <err>** **<mode>** Mode (numeric). Parameter values 0 and 1 are stored non-volatile in the ME. [0] automatic mode; <oper> field is ignored. 1 manual operator selection <oper> field must be present, **<format>** can only be = 2 2 manually deregister from network and remain unregistered until mode 0,1,4 is selected 3 set **<format>** for read command +COPS? 4 combination of manual/automatic mode; if manual selection fails, ME switches to automatic mode **(<mode>=0)**. (**<oper>** field must be present) **<oper>** Operator as per **<format>**. The numeric format is the GSM Location Area Identification number which consists of a 3-digit country code plus a 2- or 3-digit network code. Parameter is stored non-volatile to the SIM. **<format>** Format (numeric) Parameter can be stored non-volatile in the user profile using AT&W. 0 long format alphanumeric **<oper>**; up to 16 characters. Factory default can be restored with AT&F. 2 numeric **<oper>**; GSM Location Area Identification number
Reference GSM 07.07	Note AT+COPS settings are effective over all Mux channels.

Example 1	To query the present status of ME's network registration using the test command:
	`AT+COPS=?`
	`+COPS: (2,"D2",,"26202"),(3,"E-Plus",,"26203"),(3,"T-D1",,"26201"),(3,"Interkom",,"26207"),,(0-4),(0,2)`
	`OK`
	
	Registered operator is D2. The other operators are present in the network, but not allowed to be used with the current SIM card.
	
	To query the status of the ME's network registration using the read command:
	`AT+COPS?`
	`+COPS: 0,0,"D2"` (command returns mode, format, registered operator)
	`OK`

Example 2	Attempt to manually select a forbidden operator:
	`AT+COPS=1,2,26203`
	`OK`
	
	If the selected operator was not allowed, the ME is now unregistered. The read command will return only the mode, but no operator:
	`AT+COPS?`
	`+COPS: 1`
	
	In this case, the test command returns only that the desired operator is available (<stat=1). Nevertheless, the registration is not successful. Please use the AT+CREG command (Chapter 4.41) to verify the registration status.
	`AT+COPS=?`
	`+COPS: (1,"D2",,"26202"),(3,"E-Plus",,"26203"),(3,"T-D1",,"26201"),(3,"Interkom",,"26207"),,(0-4),(0,2)`
	`OK`
	`AT+CREG?`
	`+CREG: 0,3` (where 3 = registration denied)
	`OK`

4.31 AT+CPAS Mobile equipment activity status

Test command AT+CPAS=?	Response **+CPAS:** (list of supported **<pas>**s) **OK** Parameter See execute command
Execute command AT+CPAS	Response TA returns the activity status of ME. **+CPAS: <pas> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<pas>** 0 ready 3 incoming call (ringing) 4 call in progress or call hold
Reference GSM 07.07	Note

4.32 AT+CPBR Read current phonebook entries

Test command AT+CPBR=?	The test command returns location range supported by the current storage as a compound value and the maximum length of <**number**> and <**text**> fields. Note: If SIM storage is selected, the length may not be available. If storage does not offer format information, the format list should be empty parentheses. Response **+CPBR:** (list of supported <**1-maxloc**>s), <**nlength**>, <**tlength**> **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command.
Write command AT+CPBR= <location1> [,<location2>]	The write command selects the memory location <location1>, or the range of locations <location1>…<location2> to be displayed. If no <location2> is given, only the entry at <location1> will be displayed. If no entries are found in the indicated range of locations, only ”OK” is returned. Response **+CPBR: <location1>, <number>, <type>, <text>[<CR><LF>+CPBR: .....+CPBR: <location2>, <number>, <type>, <text>] OK** If error is related to ME functionality: **+CME ERROR** Parameter **<location1>** (numeric) The first (lowest) location number within phonebook memory for which the corresponding entry is to be displayed. The supported range is given in the test command response. If <location1> exceeds the upper bound <maxloc> (as indicated by the test command), the AT command will return a CME ERROR 21 ”INVALID INDEX”. **<location2>** (numeric) The last (highest) location number within phonebook memory for which the corresponding entry is to be displayed. The supported range is given in the test command response. If both <location1> and <location2> are in the range indicated by the test command in parameter <maxloc>, the list of entries will be output and terminated with OK. If <location2> exceeds the range indicated by the test command in parameter <maxloc>, the list of entries will be output but terminated with a +CME ERROR 21 ”INVALID INDEX”. **<number>** (string) String type phone number in format specified by <type>. The number parameter may be an empty string. **<type>** (numeric) Type of address octet 145 Dialing string <number> includes international access code character ’+’ 209 Dialing string <number> contains printable non-alphabetic non-digit characters saved with the number string. For phonebook entries with this <type>, dialing from phone

	book with ATD> is not possible. For further detail, check the parameter descriptions referring to AT+CPBW. 129 Otherwise **<text>** (string) Text assigned to the phone number. The maximum length for this parameter is given in test command response parameter <tlength>. The text string is returned in the character set and format as specified with AT+CSCS . When using an ASCII terminal, characters which are coded differently in ASCII and GSM have to be entered via escape sequences as described in Chapter 1.5. **<maxloc>** (numeric) Maximum location number for the currently selected storage. For phonebooks located on SIM, this value may vary between SIM cards. **<nlength>** (numeric) Max. length of phone number for ”normal” locations. Depending on the storage, a limited number of locations with extended memory is available per phonebook. These locations allow storing numbers with twice the standard length, which is 2* <nlength> digits for normal numbers, but only <nlength> digits for numbers saved with parameter <type>= 209. **<tlength>** (numeric) Max. length of <text>assigned to the telephone number. The value indicated by the test command is given in octets. If the <text> string is given in GSM characters, each character corresponds to one octet. If the <text> string is given in UCS2, the maximum number of characters depends on the coding scheme used for the alpha field of the SIM according to GSM 11.11, Annex B. In the worst case, the number of UCS2 characters is less than half the number of GSM characters. For a detailed description see GSM 11.11, Annex B.
Reference GSM 07.07	Note This command can be used only after the phonebook data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use any of the phonebook commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.

Example	1. First, run the *Test command* to find out the maximum range of entries stored in the active phonebook:
	AT+CPBR=?
	TA returns the supported values in the format: +CPBR: (1-100),20,17 where 100 is the supported range of location numbers, 20 is the length of the phone number and 17 is the maximum length of the associated text.
	2. Now, run the *Execute command* to display the phonebook entries sorted by location numbers.
	`AT+CPBR =1,100`
	`+CPBR 1,"+999999",145,"Charlie"`
	`+CPBR: 2,"+777777",145,"Bill"`
	`+CPBR: 3,"+888888",145,"Arthur" .....`

4.33 AT+CPBS Select phonebook memory storage

This command is used to select the active phonebook storage, i.e. the phonebook storage that all subsequent phonebook commands will be operating on.

Phonebooks ”MC” (missed calls), ”RC” (Received Calls) and ”ME” are stored permanently within the ME. Furthermore, depending on the facilities offered by the SIM, phonebook ”LD” (Last Dialed) may reside partly or completely in ME memory.

In the”MC”, ”RC” and ”LD” phonebooks, automatic deletion of the entries stored in ME will be performed if the SIM card is changed. If the same SIM is removed and reinserted, no automatic deletion is performed. Calls made after last switch-on will be lost from ”LD”, ”MC” and ”RC” phonebook, if the SIM is removed and reinserted during normal operation.

Test command AT+CPBS=?	Response **+CPBS:** (list of supported **<storage>**s) **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Read command AT+CPBS?	The read command returns the currently selected <storage>, the number of <used> entries and the <total> number of entries available. Response **+CPBS: <storage>,<used>,<total> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT+CPBS= <storage>	The write command selects current phonebook memory storage, which can then be used by other phonebook commands. Response **OK** If error is related to ME functionality: **+CME ERROR: <err>**
	Parameter **<storage>** “SM” SIM phonebook. Storage depends on SIM card. By default, the SM phonebook is selected each time the ME is re-started. “ME” ME phonebook. Storage positions 1-250. “FD” SIM fixdialing phonebook. All records are located on the SIM card. Total storage depends on SIM card. If the mobile is locked to FD, only the numbers stored to the FD memory can be dialed and call related Supplementary Services can only be configured if the required *# code is included in the FD phonebook. To edit the FD phonebook PIN 2 is required. See Chapters

		AT+CPIN2 Enter PIN2 and AT+CLCK Facility lock, AT^SLCK Facility lock.
		"LD" Last dialing phonebook. Stores all voice call numbers dialed with ATD, but no data call numbers. Storage positions 1-10 located on SIM card only or both on SIM card and ME. The share of each storage is determined by the SIM card: If the locations available on the SIM card are full, the memory of the ME can be filled until a total of 10 locations is reached. If another SIM card is inserted then all LD entries stored in the ME will be deleted. This is necessary to prevent unauthorized access to the LD list. AT+CPBW is not be applicable to this storage. The LD list can be deleted with AT^SPBD (see Chapter 9.36) and AT^SDLD (see Chapter 9.12).
		"MC" List of missed (unanswered received) calls. Storage positions 1-10 based in ME. The MC list is located in the ME and stored when ME is powered down with AT^SMSO. To be protected from unauthorized access the MC list will be deleted when another SIM card is inserted. AT+CPBW not applicable to this storage. The MC list can be deleted with AT^SPBD.
		"RC" List of received calls. Storage positions 1-10 based in ME. The RC list is located in the ME and stored when ME is powered down with AT^SMSO. To be protected from unauthorized access the RC list will be deleted when another SIM card is inserted. AT+CPBW not applicable to this storage. The RC list can be deleted with AT^SPBD.
		"ON" Own numbers (MSISDNs). Storage and handling is dependent on SIM card. Can be edited with AT+CPBW.
	<used>	(numeric) Value indicating the number of used locations in selected storage
	<total>	(numeric) Value indicating the maximum number of locations allowed in the selected storage
Reference	Note	
GSM 07.07	This command can be used only after the phonebook data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use any of the phonebook commands will result in "+CME Error: 14" (SIM busy). We recommend to take advantage of the "^SSIM READY" URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.	

4.34 AT+CPBW Write phonebook entry

Test command AT+CPBW=?	The test command returns the location range supported by the current storage, the maximum length of <**number**> field, the range of supported <**type**> values and the maximum length of <**text**> field. Note: The length may not be available while SIM storage is selected. If storage does not offer format information, the format list should be empty parentheses. Response **+CPBW: <1-maxloc>**), <**nlength**>, (list of supported <**type**>**s**), <**tlength**> **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command.
Write command AT+CPBW= [<location>] [,<number> [[,<type>] [,<text>]]]	This command writes a phonebook entry to the memory location <**location**> of the active storage selected with AT+CPBS. If selected <storage>=”FD” (SIM fixed dialing numbers), PIN2 authentication has to be performed prior to write access. If no <location> is given, the first free entry will be used. If <location> is given as the only parameter, the phonebook entry specified by <location>is deleted. If writing fails, an indication ”+CME ERROR” is returned. Response **OK/ERROR/+CME ERROR** **<location>** (numeric) Location number within phonebook memory. The supported range is given in the test command response **<number>** (string) String type phone number in format specified by <type>. The number parameter must be present, although it may be an empty string. Alphabetic characters are not permitted in the number string. <number> may contain printable non-alphabetic characters from the standard GSM alphabet, including ”*”,”#” or ”+”, as dialstring modifiers. However if <number> contains modifiers other than ”*”,”#” or ”+”, the following constraints must be considered: - If no <type> was specified explicitly, all accepted modifiers from the GSM alphabet will be saved in the number string. The <type> parameter will be set to 209 (ASCII). Limitations as listed below for <type> 209 apply. - A <number> saved with parameter <type>= 209 requires double memory. In order to fit into a standard location, the number needs to be reduced to a maximum length of <nlength>/2, inluding all digits and dial string modifier(s). Extended locations may be used as stated below for parameter <nlength>

	<type>	(numeric) Type of address octet If parameter <type> is specified as 129 or 145, then any non-digit characters other than ”*”, ”#”, or ”+” will be removed from the number string. If the number string contains such characters, they can be saved with the number string by using <type> 209, see below. 145 Dialing string <number>includes international access code character ’+’ 209 Dialing string <number> contains printable non-alphabetic non-digit characters that should be saved with the number string. Remarks as under parameter <number> apply. For phonebook entries with this type, dialing from phonebook with ATD> is not possible. 129 Otherwise
	<text>	(string) Text assigned to the phone number. The maximum length for this parameter is given in test command response <tlength>. The text string must be entered in the character set as specified with AT+CSCS . When using an ASCII terminal, characters which are coded diferently in ASCII and GSM have to be entered via escape sequences as described in Chapter 1.5.
	<maxloc>	(numeric) Max. location for the currently selected storage. For phonebooks located on SIM, this value may vary with the SIM card used. See AT+CPBS for typical values.
	<nlength>	(numeric) Max. length of phone number for ”normal” locations. - Depending on the storage, a limited number of locations with extended memory is available per phonebook. These locations allow storing numbers with twice the standard length, which is 2*<nlength> digits for normal numbers, but only <nlength>digits for numbers saved with parameter <type>= 209. If all extended locations of the selected phonebook are used up, then any attempt to write a number which requires extended memory will be denied with CME ERROR 260: INVALID DIAL STRING.
	<tlength>	(numeric) Max. length of <text>assigned to the telephone number. The value indicated by the test command is given in octets. If the <text> string is given in GSM characters, each character corresponds to one octet. If the <text> string is given in UCS2, the maximum number of characters depends on the coding scheme used for the alpha field of the SIM according to GSM 11.11, Annex B. In the worst case, the number of UCS2 characters is less than half the number of GSM characters. For a detailed description see GSM 11.11, Annex B.
Reference	Note	
GSM 07.07	This command can be used only after the phonebook data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use any of the phonebook commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If	

	enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.
Example 1	To write a phonebook entry to the first free location number: AT+CPBW=,+431234567,145,"Charly" To delete a phonebook entry simply enter the location number: AT+CPBW=1

Example 2	The following examples are provided to illustrate the effect of writing phonebook entries with different types of dialstring modifiers included in the <number> string:
	`AT+CPBW=5,"12345678",,"Arthur"`
	`OK`
	`AT+CPBW=6,"432!+-765()&54*654#",,"John"`
	`OK`
	`AT+CPBW=7,"432!+-765()&54*654#",129,"Eve"`
	`OK`
	`AT+CPBW=8,"432!+-765()&54*654#",145,"Tom"`
	`OK`
	`AT+CPBW=9,"432!+-765()&54*654#",209,"Richard"`
	`OK`
	
	Reading the above entries with AT+CPBR=5,9 returns the following response:
	`+CPBR:5,"12345678",129,"Arthur"`
	`+CPBR:6,"432!+-765()&54*654#",209,"John"`
	`+CPBR:7,"432+76554*654#",129,"Eve"`
	`+CPBR:8,"+432+76554*654#",145,"Tom"`
	`+CPBR:9,"432!+-765()&54*654#",209,"Richard"`

4.35 AT+CPIN Enter PIN

Test command AT+CPIN=?	Response **OK**
Read command AT+CPIN?	Response TA returns an alphanumeric string indicating whether or not a password is required. **+CPIN: <code> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<code>** SIM PIN authentication READY — PIN has already been entered. No further entry needed. SIM PIN — ME is waiting for SIM PIN1. SIM PUK — ME is waiting for SIM PUK1 if PIN1 was disabled after three failed attempts to enter PIN1. SIM PIN2 — ME is waiting for PIN2, when the attempt to access PIN2 requiring features was acknowledged with +CME ERROR:17 (e.g. if client attempts to edit the FD phonebook). This is only applicable if the AT+CPIN read command also prompts for SIM PIN2. Normally, the AT+CPIN2 command is intended for SIM PIN2. SIM PUK2 — ME is waiting for PUK2 to unblock a disabled PIN2. Necessary if preceding command was acknowledged with error +CME ERROR:18 and only if the AT+CPIN read command also prompts for SIM PUK2. Normally, the AT+CPIN2 command is intended for SIM PUK2. Phone security locks: PH-SIM PIN — ME is waiting for phone-to-SIM card password if "PS" lock is active and user inserts other SIM card than the one used for the lock. ("PS" lock is also referred to as phone or antitheft lock). PH-SIM PUK — ME is waiting for Master Phone Code, if the above "PS" lock password was incorrectly entered three times. Factory set SIM locks PH-FSIM PIN — ME is waiting for phone-to-very-first-SIM card. Necessary when "PF" lock was set. When powered up the first time, ME locks itself to the first SIM card put into the card holder. As a result, operation of the mobile is restricted to this one SIM card (unless the PH-FSIM PUK is used as described below).

	PH-FSIM PUK	ME is waiting for phone-to-very-first-SIM card unblocking password to be given. Necessary when "PF" lock is active and other than first SIM card is inserted.
	PH-NET PIN	ME is waiting for network personalisation password
	PH-NET PUK	ME is waiting for network personalisation unblocking password
	PH-NS PIN	ME is waiting for network subset personalisation password
	PH-NS PUK	ME is waiting for network subset unblocking password
	PH-SP PIN	ME is waiting for service provider personalisation password
	PH-SP PUK	ME is waiting for service provider personalisation unblocking password
	PH-C PIN	ME is waiting for corporate personalisation password
	PH-C PUK	ME is waiting for corprorate personalisation unblocking password
	See Chapters 4.21 and 9.16 for information on lock types.	

Write command

AT+CPIN=<pin> [,<new pin>]

Response

The write command lets the ME store the entered password. This may be for example the SIM PIN1 to register to the GSM network, or the SIM PUK1 to replace a disabled PIN with a new one, or the PH-SIM PIN if the client has taken precautions for preventing damage in the event of loss or theft etc. See above for the list of passwords.

OK

If error is related to ME functionality:
+CME ERROR: <err>

If no PIN request is pending (for example if PIN authentication has been done and the same PIN is entered again) ME responds **+CME ERROR: operation not allowed**. No action is required from your part.

Parameter

<pin>	password (string type), for example SIM PIN or, if requested, one of the unblocking keys, such as SIM-PUK or PH-SIM PUK.
<new pin>	If the ME is waiting for an unblocking key, use <pin> to enter the unblocking key, followed by <newpin> to specify the password. See Chapter 4.35.1 for more information about when you may need to enter an unblocking key.

Reference

GSM 07.07

Note

- Caution: After entering a password with AT+CPIN all other commands that need access to data on the SIM card may be blocked for up to 30 seconds. The response in these cases will be “+CME Error: 14” (SIM busy). This applies for instance to phonebook related SMS commands.
  To notify the user when SIM data is accessible after SIM PIN authentication, the URC “^SSIM READY” can be be used. If enabled with AT^SSET=1, this URC will be delivered once the ME has completed reading data from the

	SIM card. For details see Chapter 9.47. • Successful PIN authentication only confirms that the entered PIN was recognized and correct. The output of the result code **OK** does not necessarily imply that the mobile is registered to the desired network. Typical example: PIN was entered and accepted with **OK**, but the ME fails to register to the network. This may be due to missing network coverage, denied network access with currently used SIM card, no valid roaming agreement between home network and currently available operators etc. AC45 offers various options to verify the present status of network registration: For example, the AT+COPS? (Chapter 4.30) command indicates the currently used network. With AT+CREG (Chapter 4.41) you can also check the current status and activate an unsolicited result code which appears whenever the status of the network registration changes (e.g. when the ME is powered up, or when the network cell changes). • Wait 10 seconds after PIN input before using SMS related commands. • <pin> and <new pin> can also be entered in quotation marks (e.g. ”1234”). • To check the number of remaining attempts to enter the passwords use the AT^SPIC command. See Chapter 9.39. • See also Chapter 10.2 “Summary of PIN requiring AT Commands“. • See Chapters 4.38 and 9.43 for information on passwords.

4.35.1 What to do if PIN or password authentication fails?

PIN1 / PUK1: After three failures to enter PIN1, the SIM card is blocked (except for emergency calls). +CME ERROR: 12 will prompt the client to unblock the SIM card by entering the associated PUK (= PIN Unblocking Key / Personal Unblocking Key). After ten failed attempts to enter the PUK, the SIM card will be invalidated and no longer operable. In such a case, the card needs to be replaced. PIN1 consists of 4 to 8 digits, PUK1 is an 8-digit code only.

To unblock a disabled PIN1 you have two options:
- You can enter AT+CPIN=PUK1,new PIN1.
- You can use the ATD command followed by the GSM code **05*PUK*newPIN*newPIN#;.

PIN2 / PUK2: PIN2 allows access to the features listed in Chapter 4.36. The handling of PIN2 varies with the provider. PIN2 may either be a specific code supplied along with an associated PUK2, or a default code such as 0000. In either case, the client is advised to replace it with an individual code. Incorrect input of PUK2 will permanently block the additional features subject to PIN2 authentification, but usually has no effect on PIN1. PIN2 consists of 4 digits, PUK2 is an 8-digit code only.

To unblock a disabled PIN2 you have two options:
- You can enter AT+CPIN2=PUK2,new PIN2.
- You can use the ATD command followed by the GSM code **052*PUK*newPIN*newPIN#;.

Phone lock: If the mobile was locked to a specific SIM card (= "PS" lock or phone lock), the PUK that came with the SIM card cannot be used to remove the lock. After three failed attempts to enter the correct password, ME returns +CPIN: PH-SIM PUK (= response to read command AT+CPIN?), i.e. it is now waiting for the Master Phone Code. This is an 8-digit device code associated to the IMEI number of the mobile which can only by obtained from the manufacturer of the AC45 module. When needed, contact Siemens AG and request the Master Phone Code of the specific module.

There are three ways to enter the Master Phone Code:
- You can enter AT+CPIN=Master Phone Code.
- You can enter AT+CPIN=Master Phone Code,new password.
- You can use the ATD command followed by the GSM code **0003*PUK*newPIN*newPIN#;.

Usually, the Master Phone Code will be supplied by mail or e-mail. The received number may be enclosed in the *# codes typically used for the ATD option. If you use the AT+CPIN command, it is important to crop the preceding *#0003* characters and the appended #.

Example: You may be given the string *#0003*12345678#. When prompted for the PH-SIM PUK simply enter 12345678.

If incorrectly input, the Master Phone Code is governed by a specific timing algorithm: (n-1)*256 seconds (see table below). The timing should be considered by system integrators when designing an individual MMI.

Table 17: Timing algorithm of incorrect password input

Number of failed attempts	Time to wait before next input is allowed
1st failed attempt	No time to wait
2nd failed attempt	4 seconds
3rd failed attempt	3 * 256 seconds
4th failed attempt	4 * 256 seconds
5th failed attempt	5 * 256 seconds
6th failed attempt and so forth	6 * 256 seconds and so forth

SIM locks: These are factory set locks, such as "PF", "PN", "PU", "PP", "PC". An 8-digit unlocking code is required to operate the mobile with a different SIM card, or to lift the lock. The code can only be obtained from the provider.

Failure to enter the password is subject to the same timing algorithm as the Master Phone Code (see Table 17).

Call barring: Supported modes are "AO", "OI", "OX", "AI", "IR", "AB", "AG", "AC". If the call barring password is entered incorrectly three times, the client will need to contact the service provider to obtain a new one.

Summary of related chapters: For further instructions and examples see Chapters 4.21 (AT+CLCK Facility lock), Chapter 4.21.1 (examples), 9.16 (AT^SLCK Facility lock, 4.38 (AT+CPWD Change password) and 9.43 (AT^SPWD Change password for a lock, 4.35 (AT+CPIN Enter PIN), 4.36 (AT+CPIN2 Enter PIN2)

A complete list of *# codes is provided in Chapter 10.4.

Related +CME errors are listed in Chapter 10.1.1.

To check the number of remaining attempts to enter the correct password use the AT^SPIC command. See Chapter 9.39.

4.36 AT+CPIN2 Enter PIN2

Test command AT+CPIN2=?	Response **OK**
Read command AT+CPIN2?	Response TA returns an alphanumeric string indicating whether some password is required or not. **+CPIN2: <code> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<code>** READY — ME is not pending for any password SIM PIN2 — ME is waiting for SIM PIN2. This **<code>** is returned only when PIN2 authentication has not yet been done or has failed (+CME ERROR:17). SIM PUK2 — ME is waiting for SIM PUK2. This **<code>** is returned only when PIN2 authentication has failed and ME is pending for SIM PUK2 (i.e. +CME ERROR:18).
Write command AT+CPIN2=<pin>[,<new pin>]	Response The write command lets the ME store the entered password. This may be for example the SIM PIN2 to benefit from the features listed below, or the SIM PUK2 to replace a disabled PIN2 with a new one. Note that PIN2 can only be entered if PIN1 authentication was done. **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<pin>** Password (string type), usually SIM PIN2 or, if requested, SIM PUK2 **<new pin>** If the ME is waiting for SIM PUK2, use <pin> to enter the SIM PUK2, followed by <newpin> to specify the new PIN2. See Chapter 4.35.1 for more information about when you may need to enter the PUK2.
Reference	Note Functions dependant on SIM PIN2 validation: • AT+CACM: Accumulated call meter (reset ACM value) • AT+CAMM: Accumulated call meter maximum (set ACMmax value) • AT+CLCK: Facility lock to "FD" (activate Fixed dialing phonebook) • AT^SLCK: Facility lock to "FD" (activate Fixed dialing phonebook) • AT+CPWD: Change "P2"password (specify new PIN2, unblock disabled PIN2) • AT^SPWD: Change "P2"password (specify new PIN2, unblock disabled PIN2) • AT+CPUC: Price per unit and currency table (change currency or units) • AT+CPIN2: Enter SIM PIN2 or SIM PUK2 if requested. • Edit Fixed dialing phonebook: PIN2 validation must be performed before write access to the “FD” phonebook is allowed. Once the required **<pin>** has been entered correctly, PIN2 authentication code changes to READY. After 300s, a repetition of the authentication process is required (PIN2 authentication code changes from READY to SIM PIN2).

Example 1	To change PIN2: `AT+CPWD="P2","0000","8888"` (where "0000" = old PIN2 and "8888" = new PIN2)

Example 2	To unblock a disabled PIN2.
	`AT+CPIN2?`
	`+CPIN2: SIM PUK2` PIN2 has been disabled, PUK2 must be entered to define a new PIN2.
	`OK`
	`AT+CPIN2=11223344","8888"` (where "11223344" = PUK2 and "8888" = new PIN2).

Example 3	To write to "FD" phonebook:
	`AT+CPBS="FD"`
	`OK`
	`AT+CPBW=2,"+493012345678",145,"Charly"`
	`+CME ERROR: SIM PIN2 required`
	or, in numeric format: `+CME Error 17` Access is denied due to missing PIN2 authentication. The error code appears, for example, when PIN2 has not been entered at all, or after PIN2 validation has expired.
	`AT+CPIN2=8888`
	`OK`
	`AT+CPBW=2,"+493012345678",145,"Charly"`
	`OK`

4.37 AT+CPUC Price per unit and currency table

Test command AT+CPUC=?	Response **OK**
Read command AT+CPUC?	Response Read command returns the current parameters of PUC. **+CPUC: <currency>, <ppu> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT+CPUC=<currency>,<ppu>[,<passwd>]	Response Write command sets the parameters of Advice of Charge related price per unit and currency table. SIM PIN2 is usually required to set the parameters. If error is related to ME functionality: **+CME ERROR: <err>**

	Parameter **<currency>** string type; three-character currency code (e.g. “GBP”, “EUR”); character set as specified with AT+CSCS. If the currency name is longer than three characters, all characters will be cut off after the third position. Before they are written to the SIM Card, these characters are converted to the standard GSM alphabet. **<ppu>** string type; price per unit; dot is used as a decimal separator (e.g. “2.66”). The length is limited to 20 characters. If the string length is exceeded, the command is terminated with an error. This string may only contain digits and a dot. Leading zeros are removed from the string. The minimum and maximum value are determined by the structure of the SIM-PUCT file. The maximum price per unit value is 999 999 999.00. When successfully entered, this value is rounded to maximum accuracy. Note: Due to storage in mantisse (range 0-4095) and exponent (-7 to 7) it is possible that rounding errors occur. **<passwd>** string type; SIM PIN2. String parameter which can contain any combination of characters. The maximum string length is limited to 8 characters. If this value is exceeded, the command terminates with an error message. If the PIN2 is incorrect, a CME error **(+CME ERROR: incorrect password)** is output.
Reference GSM 07.07	Note

Examples	To change currency and/or price per unit you have two ways:
	
	You can enter PIN2 along with the AT+CPUC command.
	`AT+CPUC="EUR","0.10",”8888”` (where “8888” = PIN2)
	`ok`
	
	Alternatively, you can first use the AT+CPIN2 command to enter PIN2. When you execute the AT+CPUC command, subsequently, take into account that PIN2 authentication expires after 300ms (see notes in Chapter 4.36).
	`AT+CPUC="EUR","0.10"`
	`Ok` Successful.
	
	`AT+CPUC="EUR","0.10"`
	`+CME ERROR: SIM PIN2 required` or, in numeric format: `+CME Error 17`
	Attempt not successful. PIN2 authentication has expired.

4.38 AT+CPWD Change password

Use this command when you want to
- change PIN1 or PIN2,
- change the password supplied from your provider for call barring,
- set individual phone security passwords,
- enter the unblocking key (Master Phone Code) to restore a disabled “PS” password.

See Chapters 4.21 (AT+CLCK) and 9.16 (AT^SLCK) for details on the various lock features. The AT^SPWD command is a Siemens defined command equivalent to AT+CPWD, see Chapter 9.43. See also AT+CPIN in Chapter 4.35 and AT+CPIN2 in Chapter 4.36. Chapter 4.35.1 provides instructions on how to proceed in case of failure to enter a password.

Test command	Response
AT+CPWD=?	TA returns a list of pairs which represent the available facilities and the maximum length of the associated password. **+CPWD:** (list of supported **(<facility>, <password length>)** **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<facility>** See write command **<password length>** Integer max. length of password

Write command	Response
AT+CPWD = <facility>, [<old password>], <new password>	TA sets a new password for the facility lock function. **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<facility>** Phone security locks: Primarily intended for the client to take safety precautions, the passwords ”SC” (SIM PIN) and ”P2” (SIM PIN2) are usually predefined, but can be configured individually. The password for lock facility ”PS” can be factory set or user defined. "SC" SIM (lock SIM card). SIM requests SIM PIN1 when ME is switched on and when this lock command is issued. <password length>: 4 to 8 digits. If the password is incorrectly entered three times, the SIM PUK1 is required to perform authentication. Input of the SIM PUK1 is possible only with AT+CPIN or ATD. "P2" SIM PIN2. Required to access the functions listed in Chapter 4.36 (AT+CPIN2). A typical example is the facility lock “FD” configured with AT+CLCK. <password length>: 4 to 8 digits. If the password is incorrectly entered three times, the SIM PUK2 is required to perform authentication. Input of the SIM PUK2 is possible only with AT+CPIN2 or ATD.

"PS" Phone locked to SIM (device code). ME requests password when other than current SIM card is inserted.
"PS" lock is frequently referred to as "phone lock", or "device lock". Accordingly, the password may be called "phone code" or "device code". The "PS" password is not associated with the PUK of the SIM card.
Password: Usually, user defined. It must be set before the “PS” lock can be activated with AT+CLCK or AT^SLCK. If set by factory (e.g. for a prepaid mobile), the password is supplied by the operator or provider.
<password length>: 4 digits.
If the password is incorrectly entered three times, the Master Phone Code is required to lift the lock. This is an 8-digit device code associated to the IMEI number of the mobile which can only by obtained from the manufacturer of the AC45 module. The unblocking procedure can be done as follows: You can use AT+CPWD=”PS”, Master Phone Code or, when setting a new “PS” lock at the same time, AT+CPWD=”PS”, Master Phone Code, new password. Mind that successful PIN authentication is a prerequisite for using AT+CPWD. If PIN authentication has not been completed, input of the Master Phone Code is possible only with AT+CPIN and ATD. See Chapter 4.35.1 and examples below for further details.
Once the Master Phone Code has been acctepted, the mobile is operational, and the "PS" lock is no longer active.

Factory set SIM locks:
Typical examples of factory set locks are prepaid phones or network locks used to restric the operation of a mobile to a specific provider or operator. The client should be aware that each of these lock types can only be unlocked if the associated password is available. For example, a mobile can be locked to accept only SIM cards from the respective provider, or even one single SIM card.
Once a different SIM card is inserted the ME will prompt the client to enter a specific code. This is not the PUK of the SIM card, but usually an 8-digit code which needs to be requested from the provider.
The locks can only be set by the manufacturer of the AC45 modules and need to be agreed upon between the parties concerned, e.g. provider, operator, distributor etc. on the one side and the manufacturer on the other side. For details contact your local dealer or Siemens AG.

"PF" Lock Phone to the very first SIM card
"PN" Network Personalisation
"PU" Network-subset Personalisation
"PP" Service-Provider Personalisation
"PC" Corporate Personalisation

Supplementary Service: Call barring
The Supplementary Service ”Call Barring” serves to specify conditions under which calls will be disallowed by the network.
The availability of the Supplementary Services varies with the network. To benefit from call barring services the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package.
Password: The Network Password needs to be supplied from the network provider or network operators.
<password length>: Usually there is one 4-digit password which applies to all call barring options. For details contact your provider.

	"AO" BAOC (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 "AG" All outGoing barring services "AC" All inComing barring services **<old password>** Password specified for the facility. Can be ignored if no old password was allocated to the facility. Take into account that a password may have already been set by factory, or that the service is subject to a password issued by the provider. See notes above or contact provider. **<new password>** New password. To delete a password use the following syntax: **AT+CPWD=<facility>,<old password>**
Reference GSM 07.07	Note
Example 1	To change PIN2: `AT+CPWD="P2","0000","8888"` (where "0000" = old PIN2 and "8888" = new PIN2)
Example 2	To set password used to enable or disable barring of all outgoing calls: `AT+CPWD="ao","0000","3333"`
Example 3	To change the "PS" lock password, using the correct old password: `AT+CPWD="PS","1111","2222"` (where 1111 = old "PS" password and 2222 = new password) To specify a new "PS" lock password, after the old password was disabled, e.g. after three failed attempts to enter the password (CAUTION: only if Master Phone Code is available): `AT+CPWD="PS","12345678","1111"` (where 12345678 is the Master Phone Code and 1111 is the new password. You may also use <new password> to restore the former disabled password). This operation deactivates the present phone lock and sets a new one. See also Chapter 4.35.1. Alternatively, without giving a new password: `AT+CPWD="PS","12345678"` Deactivates the present phone lock.

4.39 AT+CR Service reporting control

Test command AT+CR=?	Response +**CR**: (list of supported <**mode**>s) **OK** Parameter See write command
Read command AT+CR?	Response +**CR: <mode> OK** Parameter See write command
Write command AT+CR=<mode>	Response Configures the TA whether or not to transmit an intermediate result code +**CR: <serv>** to TE when a call is being set up. **OK** Parameter <**mode**> (numeric) 0 disable 1 enable The selected mode can be stored to the user profile (AT&W) and reset to its factory default (AT&F).
	Intermediate result code If enabled, an intermediate result code is transmitted at the point during connect negotiation when the TA has determined the speed and quality of service to be used, before any error control or data compression reports are transmitted, and before any final result code (e.g. CONNECT) appears. +**CR:<serv>** Parameter <**serv**> REL ASYNC asynchronous non-transparent GPRS GPRS
Reference GSM 07.07	Note • Setting the value of <mode> to 1 may lead to connection failure, if the application (e.g. WinFax) waits for default result code/URC.

4.40 AT+CRC Set Cellular Result Codes for incoming call indication

Test command AT+CRC=?	Response **+CRC:** (list of supported **<mode>**s) **OK** Parameter See write command
Read command AT+CRC?	Response **+CRC: <mode> OK** Parameter See write command
Write command AT+CRC= [<mode>]	Response Specifies whether or not to use the extended format of incoming call indication. **OK** Parameters **<mode>** (numeric) 0 disable extended format 1 enable extended format The selected mode can be stored to the user profile (AT&W) and reset to its factory default (AT&F).
	Unsolicited result code If enabled, the unsolicited result code **+CRING: <type>** replaces the normal RING code to indicate the incoming call and the type of the call. Parameter **<type>** REL ASYNC — asynchronous non-transparent FAX — facsimile VOICE — voice
Reference GSM 07.07	Note Setting the value of <mode> to 1 may lead to connection failure, if the application (e.g. WinFax) waits for default result code/URC.

4.41 AT+CREG Network registration

Test command AT+CREG=?	Response **+CREG:** (list of supported **<n>**s) **OK** Parameter See write command
Read command AT+CREG?	The read command returns the URC presentation mode <n> and an integer <stat> that shows the registration status of the ME. The location information elements <lac> and <ci> are returned only when <n>=2 and ME is registered to the network. Response **+CREG: <n>,<stat>[,<lac>,<ci>]** **OK/ERROR/+CME ERROR**
Write command AT+CREG= [<n>]	Use the write command to select the type of URC. There are two types of URCs are available, both explained below: if **<n>**=1: **+CREG: <stat>** if **<n>**=2: **+CREG: <stat>[,<lac>,<ci>]** Response **OK/ERROR/+CME ERROR** Parameter **<n >** 0 Disable URCs 1 Enable URC **+CREG:<stat>** to report status change of network registration 2 Enable URC **+CREG:<stat>**[,<lac>,<ci>] to report status change of network registration including location information. Please note that optional parameters will not be displayed during a call. **<stat>** 0 Not registered, ME is currently not searching for new operator. There is a technical problem. User intervention is required. Yet, emergency calls can be made if any network is available. Probable causes: • No SIM card inserted • No PIN entered. • No valid Home PLMN entry found on the SIM. 1 Registered to home network. 2 Not registered, but ME is currently searching for a new operator. The ME searches for an available network. Failure to log in until after more than a minute may be due to one of the following causes: • No network available or insufficient Rx level. • The ME has no access rights to the networks available. • Networks from the SIM list of allowed networks are around, but login fails due to one of the following reasons: - #11 ... PLMN not allowed

	- #12 ... Location area not allowed - #13 ... Roaming not allowed in this location area After this, the search will be resumed (if automatic network search is enabled). • The Home PLMN or an allowed PLMN is available, but login is rejected by the cell (reasons: Access Class or LAC). If at least one network is available emergency calls can be made. 3 Registration denied. • If automatic network search is enabled: Authentication or registration fails after Location Update Reject due to one of the following causes: - #2 ... IMSI unknown at HLR - #3 ... Illegal MS - #6 ... Illegal ME Either the SIM or the MS or the ME are unable to log into any network. User intervention is required. Emergency calls can be made, if any network is available. • Only if manual network search is enabled: Manual registration fails after Location Update Reject due to the following causes: - #2 ... IMSI unknown at HLR - #3 ... Illegal MS - #6 ... Illegal ME - #11 ... PLMN not allowed - #12 ... Location area not allowed - #13 ... Roaming not allowed in this location area. No further attempt is made to search or log into a network. Emergency calls can be made if any network is available. 4 Unknown (not used) 5 Registered, roaming The ME is registered to a foreign network (national or international network) **<lac>** String type; two byte location area code in hexadecimal format (e.g. "00C3" equals 193 in decimal) **<ci>** String type; two byte cell ID in hexadecimal format
Unsolicited result code	If **<n>=1** and there is a change in the ME network registration status: **+CREG: <stat>** If **<n>=2** and there is a change in the ME network registration status or a change of the network cell: **+CREG: <stat>[,<lac>,<ci>]**
Reference GSM 07.07	Note Optional parameters will not be displayed during a call.

Example	AT+CREG=2 OK	Activates extended URC mode.
	AT+COPS=0 OK	Forces ME to automatically search network operator.
	+CREG: 2 +CREG: 1,"0145","291A"	URC reports that ME is currently searching. URC reports that operator has been found.

4.42 AT+CRLP Select radio link protocol param. for orig. non-transparent data call

Test command AT+CRLP=?	Response TA returns values supported by the TA as a compound value. **+CRLP:** (list of supported **<iws>s**), (list of supported **<mws>s**), (list of supported **<T1>s**), (list of supported **<N2>s**) **OK** Parameter See write command
Read command AT+CRLP?	Response TA returns current settings for the supported RLP version 0. **+CRLP: <iws>,<mws>,<T1>,<N2>[,<verx>]** **OK** Parameter See write command
Write command AT+CRLP= [<iws> [,<mws> [,<T1> [,<N2 >]]]]	Response TA sets radio link protocol (RLP) parameters used when non-transparent data calls are originated. **OK** Parameter **<iws>** 0-61 Interworking window size (IWF to MS) **<mws>** 0-61 Mobile window size (MS to IWF) **<T1>** 48-78-255 Acknowledgement timer (T1 in 10 ms units) **<N2>** 1-6-255 Re-transmission attempts N2 **<verx>** 0 RLP version number in integer format; when version indication is not present it shall equal 0.
Reference GSM 07.07	Note • RLP version 0: single-link basic version; • RLP version 1: single-link extended version (e.g. extended by data compression); • RLP version 2: multi-link version. • Compression and multi-link are not supported. • The AT+CRLP command is not available multiplexer channels 2 and 3.

4.43 AT+CRSM Restricted SIM access

Test command AT+CRSM=?	Response **OK**
Write command AT+CRSM=<command>[,<fileId>[,<P1>,<P2>,<P3>[,<data>]]]	By using this command the TE has access to the SIM database. SIM access is restricted to the commands which are listed below. As response to the command the ME sends the current SIM information parameters and response data. ME error result code +CME ERROR may be returned if the command cannot be passed to the SIM, e.g. if the SIM is not inserted. However, errors related to SIM data are reported in <sw1> and <sw2> parameters as defined in GSM 11.11. This command requires PIN authentication. However, using **<command>** READ BINARY and **<command>** READ RECORD is possible before PIN authentication and if the SIM is blocked (after three failed PIN authentication attempts) to access the contents of the following Elementary Files: EF_{ICCID} (2FE2h, ICC Identification), EF_{ELP} (2F05h, Extended language preference), EF_{LP} (6F05h, Language preference), EF_{SPN} (6F46h, Service provider name), EF_{AD} (6FADh, Administrative data), EF_{Phase} (6FAEh, Phase Identification) and EF_{ECC} (6FB7h, Emergency call codes). Response **+CRSM: <sw1>, <sw2> [,<response>]** **OK / ERROR / +CME ERROR: <err>** Parameter **<command>** 176 READ BINARY 178 READ RECORD 192 GET RESPONSE 214 UPDATE BINARY 220 UPDATE RECORD 242 STATUS All other values are reserved; refer to GSM 11.11. **<fileId>** Integer type; this is the identifier for an elementary data file on SIM. Mandatory for every command except STATUS **<P1>,<P2>,<P3>** Integer type, range 0 - 255 parameters to be passed on by the ME to the SIM; refer to GSM 11.11. **<data>** Information which shall be written to the SIM (hexadecimal character format) **<sw1>, <sw2>** Integer type, range 0 - 255 status information from the SIM about the execution of the actual command. These parameters are delivered to the TE in both cases, on successful or failed execution of the command; refer to GSM 11.11. **<response>** Response of a successful completion of the previously issued command. STATUS and GET RESPONSE commands return data, which gives information about the current elementary datafield. This information includes the type of file and its size (refer to GSM 51.011). After READ BINARY or READ RE-

		CORD command the requested data will be returned. <response> is not returned after a successful UPDATE BINARY or UPDATE RECORD command.
Reference GSM 07.07 GSM 11.11	Note	

4.44 AT+CSCS Set TE character set

Test command AT+CSCS=?	Response +CSCS: (list of supported <chset>s) **OK**
Read command AT+CSCS?	Response **+CSCS: <chset>** **OK**
Write command AT+CSCS=[<chset>]	Response Write command informs TA which character set <chset> is used by the TE. TA is then able to convert character strings correctly between TE and ME character sets. **OK**
	Parameters **<chset>:** **"GSM"** GSM default alphabet (GSM 03.38 subclause 6.2.1); Note: This setting may cause software flow control problems since the codes used to stop and resume data flow (XOFF = decimal 19, (XON = decimal 17) are interpreted as normal characters. **"UCS2"** 16-bit universal multiple-octet coded character set (ISO/IEC10646 [32]); UCS2 character strings are converted to hexadecimal numbers from 0000 to FFFF; e.g. "004100620063" equals three 16-bit characters with decimal values 65, 98 and 99, $(AT R97)$
Reference GSM 07.07	Note • Also see Chapter 1.5 (“Supported character sets”). • When TA-TE interface is set to 8-bit operation and used TE alphabet is 7-bit, the highest bit will be set to zero.

4.45 AT+CSNS Single Numbering Scheme

The AT+CSNS command enables the ME to accept incoming calls when no bearer capability information is provided with the call, e.g. single numbering scheme calls or calls originitating from analog devices.

The command must be set before the call comes. By default, when you do not modify the settings, all calls received without bearer element are assumed to be voice.

Test command AT+CSNS=?	Response **+CSNS:** (list of supported **<mode>**s) **OK**
Read command AT+CSNS?	Response **+CSNS: <mode>** **OK**
Write command AT+CSNS=[<mode>]	Response Write command **OK** Parameters **<mode>:** 0 Voice — Each call received without bearer element is assumed to be speech. 2 Fax — Each call received without bearer element is assumed to be an incoming fax. 4 Data — Each call received without bearer element is assumed to be a data call. Please take into account that the bearer service parameters set with AT+CBST apply to all data calls including those received without bearer capability. To avoid conflicts see Chapter 4.5.
Reference GSM 07.07	Note The setting will be automatically saved when you power down the GSM engine with AT^SMSO, provided that PIN authentication has been done. This value will be restored when PIN authentication is done again.

4.46 AT+CSQ Signal quality

Test command AT+CSQ=?	Response **+CSQ:** (list of supported <**rssi**>s), (list of supported <**ber**>) **OK** Parameter See execute command
Execute command AT+CSQ	Response TA returns received signal strength indication <**rssi**> and channel bit error rate <**ber**> from the ME. **+CSQ: <rssi>, <ber> OK** Parameter <**rssi**> Receive level: 0 -113 dBm or less 1 -111 dBm 2...30 -109... -53 dBm 31 -51 dBm or greater 99 not known or not detectable <**ber**> Bit error rate: 0...7 as RXQUAL values in the table in GSM 05.08 section 8.2.4. 99 not known or not detectable. To check the bit error rate there must be a call in progress to obtain realistic values. If no call is set up, there is no BER to be determined. In this case the indicated value may be 0 or 99, depending on the SIM card.
Reference GSM 07.07	Note After using network related commands such as AT+CCWA, AT+CCFC, AT+CLCK, users are advised to wait 3s before entering AT+CQS. This is recommended to be be sure that any network access required for the preceding command has finished.

4.47 AT+CSSN Supplementary service notifications

Test command AT+CSSN=?	Response **+CSSN**: (list of supported <**n**>s), (list of supported <**m**>s)**OK** Parameter **<n>** 0 Suppresses the +CSSI messages 1 Activates the +CSSI messages **<m>** 0 Suppresses the +CSSU messages 1 Activates the +CSSU messages
Read command AT+CSSN?	Response **+CSSN: <n>,<m>OK** Parameter **<n>** See Test command **<m>** See Test command
Write command AT+CSSN=<n>[,<m>]	Response **OK** Parameter **<n>** See read command **<m>** See read command
	Unexpected message **+CSSI: <code1>** When **<n>=1** and a supplementary service notification is received after a mobile originated call setup, intermediate result code **+CSSI: <code1>** is sent to TE before any other MO call setup result codes **+CSSU: <code2>** When **<m>=1** and a supplementary service notification is received during a mobile terminated call setup or during a call, unsolicited result code **+CSSU: code2**>is sent to TE. Parameter **<code1>** Intermediate result code 3 Waiting call is pending **<code2>** Unsolicited result code 0 The incoming call is a forwarded call. 5 Held call was terminated
Reference GSM 07.07	Note The URCs will be displayed only if the call concerned is a voice call.

4.48 AT+CUSD Unstructured supplementary service data

Test command AT+CUSD=?	Response **+CUSD:** (list of supported **<n>**s) **OK** Parameter See write command
Read command AT+ CUSD?	Response TA returns the current <n> value. **+CUSD: <n> OK** If error is related to ME functionality: **+CME ERROR: <err>**
Write command AT+ CUSD= <n>[,<str>[,<dcs>]]	This command allows control of the **+CUSD:<m>[,<str>,<dcs>** according to GSM 02.90. Both network and mobile initiated operations are supported. Parameter **<n>** is used to disable/enable the presentation of an unsolicited result code (USSD response from the network, or network initiated operation) **+CUSD:<m>[,<str>,<dcs>]** to the TE. 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 a subsequent unsolicited **+CUSD** result code. The interaction of this command with other commands based on other GSM supplementary services is described in the GSM standard. Parameter **<n>** 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>** string type USSD-string (when <str> parameter is not given, network is not interrogated). If <dcs> indicates that GSM 03.38 default alphabet is used ME/TA converts GSM alphabet into current TE character set according to rules of GSM 07.05 Annex A. **<dcs>** GSM 03.38 Cell Broadcast Data Coding Scheme in integer format (default 15) **<m>** 0 no further user action required (network initiated USSD-Notify, or no further information needed after mobile initiated operation) 1 further user action required (network initiated USSD-Request, or further information needed after mobile initiated operation) 2 USSD terminated by network Response **OK** If error is related to ME functionality: **+CME ERROR: <err>**
Reference GSM 07.07	Note • For the write command **<dcs>**=15 is supported only. • On an unsolicited result code with parameter **<m>**=1 a '> ' is given for further user action. The user action is finished with a <ctrl-Z> or aborted with <ESC>.

4.49 AT+VTD=<n> Tone duration

Test command AT+VTD=?	This command refers to an integer **<duration>** that defines the length of tones transmitted with the +VTS command. Response **+VTD** (list of supported **<duration>**s) **OK** Parameter See write command
Read command AT+VTD?	Response **<duration> OK** Parameter See write command
Write command AT+VTD= <duration>	Response **OK** Parameter **<duration>** 1 – 255 duration of the tone in 1/10 second
Reference GSM 07.07	Note

4.50 AT+VTS DTMF and tone generation (<Tone> in {0-9, *, #, A, B, C, D})

Test command AT+VTS=?	Response **+VTS:** (list of supported **<dtmf>s**)[, (list of supported **<duration>s**)] **OK** Parameter See write command
Write command 1. AT+VTS=<dtmf-string> 2. AT+VTS=<dtmf>[,<duration>]	Response The Write command is intended for sending one or more ASCII characters which cause the MSC (Mobile Switching Center) to transmit DTMF tones to a remote subscriber. 1. Allows the user to send a sequence of DTMF tones with a duration that was defined with the AT+VTD command. 2. Allows the user to send a single DTMF tone. In this case, the duration can be indvidually determined during the call. **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<dtmfstring>** String of ASCII characters in the set 0-9,#,*,A, B, C, D. Maximal length of the string is 29. The string must be enclosed in quotation marks (””). **<dtmf>** ASCII character in the set 0-9,#,*, A, B, C, D. **<duration>** 1-255 duration of a tone in 1/10 second (if not specified the current setting of AT+VTD is used, which is 1 upon switch-on.)
Reference GSM 07.07	Note The Write command can only be used during an active voice call.

4.51 AT+WS46 Select wireless network

Test command AT+WS46=?	Response (list of supported <n>s) **OK**
Read command AT+WS46?	Response <n> **OK / ERROR / +CME ERROR**
	Parameter <n> 12 GSM digital cellular
Write command AT+WS46=[<n>]	Response **OK / ERROR / +CME ERROR**
Reference GSM 07.07	Note

5 AT commands originating from GSM 07.05 for SMS

The SMS related AT Commands are according to the GSM 07.05 specification issued by ETSI (European Telecommunications Standards Institute).

5.1 AT+CMGC Send an SMS command

Test command AT+CMGC=?	Response **OK**

Write command
if text mode (AT+CMGF=1):
AT+CMGC=<fo>,<ct>[,<pid>[,<mn>[,<da>[,<toda>]]]]<CR>
text is entered <ctrl-Z/ESC>
	Response
	if text mode (+CMGF=1) and sending successful:
	+CMGC: <mr>[,<scts>]
	if sending fails:
	+CMS ERROR: <err>

Write command
if PDU mode (AT+CMGF=0):
AT+CMGC=<length><CR>
PDU is given <ctrl-Z/ESC>
+CMGC=?
	Response
	if PDU mode (+CMGF=0) and sending successful:
	+CMGC: <mr>[,<ackpdu>]
	if sending fails:
	+CMS ERROR: <err>
	
	Parameter
	<length>Length of PDU
	<pdu> See "AT+CMGL"
	<mr> Message reference
	<fo> depending on the command or result code: first octet of GSM 03.40 SMS-DELIVER, SMS-SUBMIT (default 17), SMS- STATUS-REPORT, or SMS -COMMAND (default 2) in integer format
	<ct> GSM 03.40 TP-Command-Type in integer format (default 0)
	<pid> GSM 03.40 TP-Protocol-Identifier in integer format (default 0)
	<toda> GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of **<da>** is + (IRA 43) default is **145**, otherwise default is **129**)
	<da> GSM 03.40 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by **<toda>**
	<scts> GSM 03.40 TP-Service-Centre-Time-Stamp in time-string format (refer to **<dt>**)

Reference GSM 07.05	Note • After invoking the commands CMGW, CMGS, CMGC wait for the prompt ">" before entering text or PDU. After the prompt a timer will be started to observe the input. • At baudrates below 19200 bps it is recommended to use the line termination character only (refer to ATS3, default <CR>, Chapter 2.21) before entering the text/pdu. Use of the line termination character followed by the response formating character (refer to ATS4, default <LF>, Chapter 2.22) can cause problems.

5.2 AT+CMGD Delete SMS message

Test command AT+CMGD=?	Response **OK** Parameter
Execute command AT+CMGD=<index>	Response TA deletes message from preferred message storage <**mem1**> location <**index**>. **OK** If error is related to ME functionality: **+CMS ERROR <err>** Parameter <**index**> integer type; value in the range of location numbers supported by the associated memory
Reference GSM 07.05	Note If there is no SMS stored at the selected index, the response is OK too.

5.3 AT+CMGF Select SMS message format

Test command AT+CMGF=?	Response **+CMGF**: (list of supported <**mode**>**s**) **OK** Parameter See write command
Read command AT+CMGF?	Response **+CMGF: <mode> OK** Parameter See write command
Write command AT+CMGF=[<mode>]	Response The Write command specifies the input and output format of the short messages. **OK** Parameter <**mode**> 0 PDU mode 1 text mode
Reference GSM 07.05	Note

5.4 AT+CMGL List SMS messages from preferred store

Test command AT+CMGL=?	Response **+CMGL:** (list of supported **<stat>s**) **OK** Parameter See execute command
Execute command AT+CMGL Write command AT+CMGL= <stat>	Parameter 1) If text mode: **<stat>** "REC UNREAD" Received unread messages (default) "REC READ" Received read messages "STO UNSENT" Stored unsent messages "STO SENT" Stored sent messages "ALL" All messages 2) If PDU mode: **<stat>** 0 Received unread messages (default) 1 Received read messages 2 Stored unsent messages 3 Stored sent messages 4 All messages Response The write command returns messages with status value <stat> from message storage **<mem1>** to the TE. If status of the message is 'received unread', status in the storage changes to 'received read'. The execute command is the same as the write command with the given default for <stat>. Note: If the selected **<mem1>** can contain different types of SMs (e.g. SMS-DELIVERs, SMS- SUBMITs, SMS- STATUS-REPORTs and SMS-COMMANDs), the response may be a mix of the responses of different SM types. TE application can recognize the response format by examining the third response parameter.
	Response 1) If text mode (+CMGF=1) and command successful: for 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>[...]] OK** for SMS-STATUS-REPORTs: **+CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [<CR><LF>** **+CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [...]] OK**

for SMS-COMMANDs:
+CMGL: <index>,<stat>,<fo>,<ct>[<CR><LF>
+CMGL: <index>,<stat>,<fo>,<ct>[...]] OK

2) If PDU mode (+CMGF=0) and command successful:
for SMS- SUBMITs and/or SMS-DELIVERs:
+CMGL: <index>,<stat>,[<alpha>],<length><CR><LF><pdu>
[<CR><LF>+CMGL: <index>,<stat>,[alpha],<length><CR><LF><pdu>
[...]] OK

3) If error is related to ME functionality:
+CMS ERROR: <err>

Parameter

<alpha> string type alphanumeric representation of <da> or <oa> corresponding to the entry found in phonebook; implementation of this feature is manufacturer- specific

<ct> GSM 03.40 TP-Command-Type in integer format (default 0)

<da> GSM 03.40 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by **<toda>**

<data>
In case of SMS: GSM 03.40 TP-User-Data in text mode responses; format:
- if **<dcs>** indicates that GSM 03.38 default alphabet is used and <fo> indicates that GSM 03.40 TP-User-Data-Header-Indication is not set: ME/TA converts GSM alphabet into current TE character set according to rules of Annex A
- if **<dcs>** indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that GSM 03.40 TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into hexadecimal numbers containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))

Parameter

<dt> GSM 03.40 TP-Discharge-Time in time-string format: “yy/MM/dd,hh:mm:ss±zz”, where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone. For example, 6th of May 1994, 22:10:00 GMT+2 hours equals “94/05/06,22:10:00+08”

<fo> depending on the command or result code: first octet of GSM 03.40 SMS-DELIVER, SMS-SUBMIT (default 17), SMS- STATUS-REPORT, or SMS -COMMAND (default 2) in integer format

<length> integer type value indicating in the text mode (+CMGF=1) the length of the message body <data> (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)
If the short message format is text mode (AT+CMGF =1) and the character set is set to ”UCS2” (see AT+CSCS) and the short message is also coded in UCS2 then the length is given in octets instead of characters. This needs to be taken into account when using

	the commands AT+CMGL, AT+CMGR and AT^SMGL. **<index>** integer type; value in the range of location numbers supported by the associated memory **<mr>** GSM 03.40 TP-Message-Reference in integer format **<oa>** GSM 03.40 TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tooa> **<pdu>** In the case of SMS: GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into hexadecimal numbers containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)). In the case of CBS: GSM 03.41 TPDU in hexadecimal format. **<ra>** GSM 03.40 TP-Recipient-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tora> **<scts>** GSM 03.40 TP- Service-Centre-Time-Stamp in time-string format (refer <dt>) **<st>** GSM 03.40 TP-Status in integer format **<toda>** GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129) **<tooa>** GSM 04.11 TP-Originating-Address Type-of-Address octet in integer format (default refer<toda>) **<tora>** GSM 04.11 TP-Recipient-Address Type-of-Address octet in integer format (default refer<toda>)
Reference GSM 07.05	Note • The parameters **<ra>** and **<tora>** will only be displayed if AT^SSCONF=1 has been set before. • See Chapter 9.45 for details on AT^SSCONF. • This command can be used only after SMS data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use one of the SMS read commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.

5.5 AT+CMGR Read SMS message

Test command AT+CMGR=?	Response OK
Execute command AT+CMGR=<index>	Parameter **<index>** integer type; value in the range of location numbers supported by the associated memory Response TA returns SMS message with location value <index> from message storage <mem1> to the TE. If status of the message is 'received unread', status in the storage changes to 'received read'. 1) If text mode (+CMGF=1) and command successful: for SMS-DELIVER: **+CMGR: <stat>,<oa>,[<alpha>],<scts> [,<tooa>,<fo>,<pid>,<dcs>, <sca>,<tosca>,<length>]<CR><LF><data>** for SMS-SUBMIT: **+CMGR: <stat>,<da>,[<alpha>] [,<toda>,<fo>,<pid>,<dcs>,[<vp>], <sca>,<tosca>,<length>]<CR><LF><data>** for SMS-STATUS-REPORT: **+CMGR: <stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>** for SMS- COMMAND: **+CMGR: <stat>,<fo>,<ct> [,<pid>,[<mn>],[<da>],[<toda>],<length> <CR><LF><cdata>]** 2) If PDU mode (+CMGF=0) and command successful: **+CMGR: <stat>,[<alpha>],<length><CR><LF><pdu> OK** 3)If error is related to ME functionality: **+CMS ERROR: <err>** Parameter **<alpha>** string type alphanumeric representation of **<da>** or **<oa>** corresponding to the entry found in phonebook; implementation of this feature is manufacturer specific **<stat>** integer type in PDU mode (default 0), or string type in text mode (default "REC UNREAD"); indicates the status of message in memory: defined values: 0 "REC UNREAD" received unread message (i.e. new message) 1 "REC READ" received read message 2 "STO UNSENT" stored unsent message (only applicable to SMs) 3 "STO SENT" stored sent message (only applicable to SMs)

<ct> GSM 03.40 TP-Command-Type in integer format (default 0)

<da> GSM 03.40 TP- Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <toda>

<data>

In case of SMS: GSM 03.40 TP-User-Data in text mode responses; format:

-if <dcs> indicates that GSM 03.38 default alphabet is used and <fo> indicates that GSM 03.40 TP-User-Data-Header-Indication is not set: ME/TA converts GSM alphabet into current TE character set according to rules covered in Annex A

-if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that GSM 03.40 TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into hexadecimal numbers containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)

<dcs> depending on the command or result code: GSM 03.38 SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme in integer format

<cdata> GSM 03.40 TP-Command-Data in text mode responses; ME/TA converts each 8-bit octet into two IRA character long hexadecimal numbers (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))

<dt> GSM 03.40 TP-Discharge-Time in time-string format: ”yy/MM/dd,hh:mm:ss±zz”, where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone. For example, 6th of May 1994, 22:10:00 GMT+2 hours equals ”94/05/06,22:10:00+08”

<fo> depending on the command or result code: first octet of GSM 03.40 SMS- DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2) in integer format

<length> integer type value indicating in text mode (+CMGF=1) the length of the message body <data> (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length).
If the short message format is text mode (AT+CMGF =1) and the character set is set to ”UCS2” (see AT+CSCS) and the short message is also coded in UCS2 then the length is given in octets instead of characters. This needs to be taken into account when using the commands AT+CMGL, AT+CMGR and AT^SMGL.
In text mode, the maximum length of an SMS depends on the used coding scheme: It is **160** characters if the 7 bit GSM coding scheme is used, and **140** characters according to the 8 bit GSM coding scheme.

<index> integer type; value in the range of location numbers supported by the associated memory

<mr> GSM 03.40 TP-Message-Reference in integer format

<oa> GSM 03.40 TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tooa>

<pdu> In the case of SMS: GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into hexadecimal numbers containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)). In the case of CBS: <ra> GSM 03.40 TP-Recipient-Address Ad-

		dress-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tora>
	<pid>	GSM 03.40 TP-Protocol-Identifier in integer format (default 0)
	<ra>	GSM 03.40 TP-Recipient-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted to characters of the currently selected TE character set (refer command AT+CSCS Select TE character set.); type of address given by <tora>
	<sca>	GSM 04.11 RP SC address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted to characters of the currently selected TE character set (refer command AT+CSCS Select TE character set); type of address given by <tosca>
	<scts>	GSM 03.40 TP-Service-Centre-Time-Stamp in time-string format (refer <dt>)
	<st>	GSM 03.40 TP-Status in integer format
	<toda>	GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)
	<tooa>	GSM 04.11 TP-Originating-Address Type-of-Address octet in integer format (default refer<toda>)
	<tora>	GSM 04.11 TP-Recipient-Address Type-of-Address octet in integer format (default refer<toda>)
	<tosca>	GSM 04.11 RP SC address Type-of-Address octet in integer format (default refer <toda>)
	<vp>	depending on SMS-SUBMIT <fo> setting: GSM 03.40 TP-Validity-Period either in integer format (default 167) or in time-string format (refer <dt>)
Reference GSM 07.05	Note • Response if AT+CMGR is used to read an empty record index: +CMGR: 0,,0 • Response if AT+CMGR is used to read a non-existant record index: +CMS ERROR: invalid memory index. • The parameters **<ra>** and **<tora>** will only be displayed if AT^SSCONF=1 has been set before. See Chapter 9.45 for details on AT^SSCONF. • This command can be used only after SMS data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use one of the SMS read commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.	

5.6 AT+CMGS Send SMS message

Test command	Response
AT+CMGS=?	**OK**

Write command	Response
1) If text mode (+CMGF=1): AT+CMGS=<da>[,<toda>]<CR> text is entered <ctrl-Z/ESC> 2) If PDU mode (+CMGF=0): AT+CMGS=<length><CR> PDU is given <ctrl-Z/ESC> ESC aborts message	The write command serves to transmit SMS from TE to network (SMS-SUBMIT). Message reference value **<mr>** is returned to TE on successful message delivery. Value can be used to identify message upon unsolicited delivery status report result code. 1) If text mode (+CMGF=1) and sending successful: **+CMGS: <mr>[,scts>] OK** 2) If PDU mode (+CMGF=0) and sending successful: **+CMGS: <mr>[,ackpdu>] OK** If sending fails, the error code depends on the current setting of the parameter **<CmgwMode>** specified with **AT^SM20** (see Chapter 9.18): • If **AT^SM20=x,1** (factory default): When sending fails due to timeout: **+CMS ERROR: Unknown error**. Otherwise (for example, if a message is too long or contains an invalid character): **OK** Users should be aware that, despite the OK response, the message will not be sent. • If **AT^SM20=x,0**: Failure to send a message is always followed by **+CMS ERROR: <err>** For example, if a message was too long <err> code 305 (“Invalid text mode parameter”) is returned. Parameter **<da>** GSM 03.40 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by **<toda>** **<toda>** GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of **<da>** is + (IRA 43) default is **145**, otherwise default is **129**) **<length>** integer type value indicating in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length). **<mr>** GSM 03.40 TP-Message-Reference in integer format **<scts>** GSM 03.40 TP-Service-Centre-Time-Stamp in time-string format (refer **<dt>**) **<dt>** GSM 03.40 TP-Discharge-Time in time-string format: “yy/MM/ dd,hh:mm:ss±zz”, where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone. For example, 6th of May 1994, 22:10:00 GMT+2 hours equals “94/05/06,22:10:00+08” **<ackpdu>** GSM 03.40 RP-User-Data element of RP-ACK PDU; format is same as for **<pdu>** in case of SMS, but without GSM 04.11 SC address field and parameter shall be enclosed in

		double quote characters like a normal string type parameter
	<pdu>	For SMS: GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into hexadecimal numbers containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)). In the case of CBS: GSM 03.41 TPDU in hexadecimal format.

Reference

GSM 07.05

Note

- After invoking the commands CMGW, CMGS, CMGC wait for the prompt ">" and then start to send text to the module. After the prompt a timer will be started to observe the input.
- To send the message simply enter <CTRL-Z>. See Execute command for possible responses.
- Sending can be aborted by entering <ESC>. Of course, the message will not be sent, though the operation is acknowledged with OK.
- When sending e-mails via SMS check that, depending on the provider, the @ symbol will be recognized and correctly interpreted. If not, make sure what character to use instead. A widely used alternative is typing "*".
- At baudrates lower than 19200 it is recommended to use the line termination character only (refer to ATS3, default <CR>, Chapter 2.21) before entering the text/pdu. Use of the line termination character followed by the response formating character (refer to ATS4, default <LF>, Chapter 2.22) can cause problems.
- All characters entered behind the ">" prompt will be recognized as GSM characters. For example, "Backspace" (ASCII character 8) does not delete a character, but will be inserted into the SMS as an additional physical character. As a result, the character you wanted to delete still appears in the text, plus the GSM code equivalent of the Backspace key. See also Chapter 10.5 which provides the supported alphabet tables.
- In text mode, the maximum length of an SMS depends on the used coding scheme: It is **160** characters if the 7 bit GSM coding scheme is used, and **140** characters according to the 8 bit GSM coding scheme.

5.7 AT+CMGW Write SMS message to memory

Test command AT+CMGW=?	Response **OK**
Execute command AT+CMGW<CR> text is entered <Ctrl-Z/ESC> <ESC> aborts message. Write command 1) If text mode (+CMGF=1): AT+CMGW=<oa> / <da> [,[<tooa> / <toda>][, <stat>]] <CR> text is entered <Ctrl-Z/ESC> <ESC> aborts message. 2) If PDU mode (+CMGF=0): AT+CMGW=<length> [, <stat>] <CR> PDU is entered <Ctrl-Z/ESC> <ESC> aborts message.	Response The write / execute command serves to transmit SMS (either SMS-DELIVER or SMS-SUBMIT) from TE to memory storage <mem2>. Memory location <index> of the stored message is returned. Message status will be set to 'stored unsent' unless otherwise given in parameter <stat>. Note: SMS-COMMANDs and SMS-STATUS-REPORTs cannot be stored in text mode. If writing is successful: **+CMGW: <index> OK** If writing fails, the error code depends on the current setting of the parameter **<m>** specified with **AT^SM20** (see Chapter 9.18): • If **AT^SM20=x,1** (factory default): When writing fails due to timeout: **+CMS ERROR: Unknown error**. Otherwise (for example, if a message is too long or contains an invalid character): **OK** Users should be aware that, in these cases, the message will not be written to the selected SMS storage. • If **AT^SM20=x,0**: Failure to write a message is always followed by **+CMS ERROR: <err>** For example, if a message was too long <err> code 305 ("Invalid text mode parameter") is returned. Parameter **<oa>** GSM 03.40 TP-Originating-Address Address value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by **<tooa>** **<da>** GSM 03.40 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by **<toda>** **<tooa>** GSM 04.11 TP-Originating-Address Type-of-Address octet in integer format (default refer **<toda>**) **<toda>** GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of **<da>** is + (IRA 43) default is **145**, otherwise default is **129**) **<length>** integer type value indicating in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length). **<stat>** integer type in PDU mode (default 2), or string type in text mode (default "STO UNSENT"); indicates the status of message in memory; defined values:

	0 "REC UNREAD" Received unread messages 1 "REC READ" Received read messages 2 "STO UNSENT" Stored unsent messages (default) 3 "STO SENT" Stored sent messages **<pdu>** In the case of SMS: GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into hexadecimal numbers containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)). In the case of CBS: GSM 03.41 TPDU in hexadecimal format. **<index>** Index of message in selected storage **<mem2>**
Reference GSM 07.05	Note • After invoking the commands CMGW, CMGS, CMGC wait for the prompt ">" and then start to send text to the module. After the prompt a timer will be started to observe the input. • To store the message simply enter <CTRL-Z>. See Execute command for possible responses. • Writing can be aborted by entering <ESC>. Of course, the message will not be stored, though the operation is acknowledged with OK. • When sending e-mails via SMS the @ character may be replaced with "*" as defined in GSM 03.40 (3GPP TS 23.040). • At baudrates lower than 19200 it is recommended to use the line termination character only (refer to ATS3, default <CR>, Chapter 2.21) before entering the text/pdu. Use of the line termination character followed by the response formating character (refer to ATS4, default <LF>, Chapter 2.22) can cause problems. • All characters entered behind the ">" prompt will be recognized as GSM characters. For example, "Backspace" (ASCII character 8) does not delete a character, but will be inserted into the SMS as an additional physical character. As a result, the character you wanted to delete still appears in the text, plus the GSM code equivalent of the Backspace key. See Chapter 10.5 which provides the supported alphabet tables. Also refer to Chapter 1.5 for general remarks on character sets. • In text mode, the maximum length of an SMS depends on the used coding scheme: It is **160** characters if the 7 bit GSM coding scheme is used, and **140** characters according to the 8 bit GSM coding scheme.

5.8 AT+CMSS Send SMS message from storage

Test command AT+CMSS=?	Response **OK** Parameter
Write command 1) If text mode (+CMGF=1) AT+CMSS= <index>[,<da>[,<toda>]] 2) If PDU mode (+CMGF=0): AT+CMSS= <index>[,<da>[,<toda>]]	Response The write command sends message with location value **<index>** from message storage **<mem2>** to the network (SMS-SUBMIT or SMS-COMMAND). If new recipient address **<da>** is given for SMS-SUBMIT, it shall be used instead of the one stored with the message. Reference value **<mr>** is returned to the TE on successful message delivery. Values can be used to identify message upon unsolicited delivery status report result code. 1) If text mode (+CMGF=1) and send successful: **+CMSS: <mr>[,scts>] OK** 2) If PDU mode (+CMGF=0) and send successful: **+CMSS: <mr>[,ackpdu>] OK** 3) If error is related to ME functionality: **+CMS ERROR: <err>** Parameter **<ackpdu>** GSM 03.40 RP-User-Data element of RP-ACK PDU; format is same as for <pdu> in case of SMS, but without GSM 04.11 SC address field and parameter shall be bounded by double quote characters like a normal string type parameter. **<index>** integer type; value in the range of location numbers supported by the associated memory **<da>** GSM 03.40 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by **<toda>** **<scts>** GSM 03.40 TP-Service-Centre-Time-Stamp in time-string format. **<toda>** GSM 04.11 TP-Destination-Address Type-of-Address octet in integer format (when first character of **<da>** is + (IRA 43) default is **145**, otherwise default is **129**) **<mr>** GSM 03.40 TP-Message-Reference in integer format
Reference GSM 07.05	Note

5.9 AT+CNMA New SMS message acknowledge to ME/TE, only phase 2+

Test command	Response
AT+CNMA=?	1) If text mode (+CMGF=1): **OK** 2) If PDU mode (+CMGF=0): +**CNMA:** (list of supported <**n**>s) **OK** Parameters See execute command
Execute command AT+CNMA Write command Only for PDU mode: AT+CNMA=<n>	Response The write / execute command confirms successful receipt of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE. TA shall not send another +CMT or +CDS result code to TE until previous one is acknowledged. If ME does not receive acknowledgment within required time (network timeout), ME sends RP-ERROR to the network. TA shall automatically disable routing to TE by setting both <**mt**> and <**ds**> values of +CNMI to zero. Note: The command shall o n l y be used when +CSMS parameter <**service**> equals **1** (= phase 2+). 1) If text mode: **OK** 2) If PDU mode: **OK** 3) If error is related to ME functionality: +**CMS ERROR:** <**err**> Parameters **<n>** 0 command operates similarly as defined for the text mode
Reference GSM 07.05	Note If multiplex mode is activated (+CMUX=0) the +CNMI parameter will be set to zero on all channels, if one channel fails to acknowledge an incoming message within the required time.

5.10 AT+CNMI New SMS message indications

Test command AT+CNMI=?	Response **+CNMI**: (list of supported **<mode>s**), (list of supported **<mt>s**), (list of supported **<bm>s**), (list of supported **<ds>s**), (list of supported **<bfr>s**) **OK** Parameter See set command
Read command AT+CNMI?	Response **+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr> OK** Parameter See set command
Write command AT+CNMI = [<mode>] [,<mt>][,<bm>] [,<ds>][,<bfr>]	Response The write command selects the procedure how the receipt of new SMS messages from the network is indicated to the TE when TE is active, e.g. DTR signal is ON. If TE is inactive (e.g. DTR signal is OFF), the reception of messages shall be performed as specified in GSM 03.38. Note1: If the DTR signal is not available or the state of the signal is ignored (V.25ter command &D0), reliable message transfer can be ensured by using +CNMA acknowledgment procedure. Note2: The rules **<mt>=2** and **<mt>=3** for storing received SM are possible only if phase 2+ compatibility is activated with **+CSMS=1** Note3: The parameter **<ds>=1** is only available in phase 2+ **OK** If error is related to ME functionality: **+CMS ERROR: <err>** Parameter **<mode>** [0] Buffer unsolicited result codes in the TA. If TA result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications. 1 Discard indication and reject new received message unsolicited result codes when TA-TE link is reserved (e.g. in on-line data mode). Otherwise forward them directly to the TE. 2 Buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation. Otherwise forward them directly to the TE. 3 Forward unsolicited result codes directly to the TE. TA-TE link specific inband technique used to embed result codes and data when TA is in on-line data mode. **<mt>** Rules for storing received SMS depend on the relevant data coding method (refer to GSM 03.38 [2]), preferred memory storage (+CPMS) setting and this value Note: If AT command interface is acting as the only display device, the ME must support storage of class 0 messages and messages in the message waiting indication group (discard message) [0] No SMS-DELIVER indications are routed to the TE. 1 If SMS-DELIVER is stored in ME/TA, indication of the memory location is routed to the TE using unsolicited result code: **+CMTI: <mem>,<index>**

		2	SMS-DELIVERs, except class 2 messages and messages in the message waiting indication group (store message) are routed directly to the TE using unsolicited result code: **+CMT: ,<length><CR><LF><pdu>** (PDU mode enabled) **+CMT: <oa>,, <scts> [,<tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>] <CR> <LF> <data>** (text mode enabled)
		3	Class 3 SMS-DELIVERs are routed directly to the TE using unsolicited result codes defined in **<mt>=2**. Messages of other data coding schemes result in indication as defined in **<mt>=1**.
	<bm>		Rules for storing received CBMs depend on the relevant data coding method (refer to GSM 03.38 [2]), the setting of Select CBM Types (+CSCB) and this value:
		[0]	No CBM indications are routed to the TE.
		2	New CBMs are routed directly to the TE using unsolicited result code: **+CBM: <length><CR><LF><pdu>** (PDU mode enabled) or **+CBM: <sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data>** (text mode enabled).
		3	Class 3 CBMs are routed directly to TE using unsolicited result codes defined in <bm>=2.
	<ds>	[0]	No SMS-STATUS-REPORTs are routed to the TE.
		1	SMS-STATUS-REPORTs are routed to the TE using unsolicited result code: **+CDS: <length><CR><LF><pdu> (PDU mode enabled)** or **+CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>, <st>** (text mode enabled)
		2	If SMS-STATUS-REPORT is routed into ME/TA, indication of the memory location is routed to the TE using unsolicited result code: **+CDSI: <mem>,<index>**
	<bfr>	[1]	TA buffer of unsolicited result codes defined within this command is cleared when **<mode> 1...3** is entered.
Unsolicited result code	Syntax of responses output when SMS is received: <mt>=1: +CMTI: <mem3>, <index> Indicates that new message has been received <mt>=2 (PDU mode enabled): +CMT: <length> <CR><LF><pdu> Indicates that new message has been received <mt>=2 (text mode enabled): +CMT: <oa>, <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>] <CR><LF><data> Indicates that new message has been received <bm>=2 (PDU mode enabled): +CBM: <length> <CR><LF><pdu> Indicates that new cell broadcast message has been received		

	<bm>=2 (text mode enabled): +CBM: <sn>, <mid>, <dcs>, <page>, <pages> <CR><LF><data> Indicates that new cell broadcast message has been received <ds>=1 (PDU mode enabled): +CDS: <length> <CR><LF><pdu> Indicates that new SMS status report has been received <ds>=1 (text mode enabled): +CDS: <fo>, <mr>[, <ra>][, <tora>], <scts>, <dt>, <st> Indicates that new SMS status report has been received <ds>=2: +CDSI: <mem3>, <index> Indicates that new SMS status report has been received
Reference GSM 07.05	General remarks: • Each time an SMS or Cell Broadcast Message is received, the Ring Line goes Logic "1" for one second. • Parameters <**mt**>=**2,3** and <**ds**>=**1** are only available with GSM phase 2+ (see +**CSMS=1**). Incoming SMs or Status Reports have to be acknowledged with AT+CNMA=0 when using these phase 2+ parameters. • The parameters <**ra**> and <**tora**> will only be displayed if AT^SSCONF=1 has been set before. See Chapter 9.45 for details on AT^SSCONF. • If either a short message or a Status Report is not acknowledged, all +CNMI parameters will be set to zero on all channels. • The indication commands AT+CNMI and AT^SSDA as well as AT+CMER can be only switched on at the same instance. Handling of Class 0 short messages: • If the host application is provided with a display and AT^SSDA=1 has been set Class 0 short messages can be displayed immediately. Refer to Chapter 9.46 for details. • If the host application does not include a display, ME handles Class 0 short messages as though there was no message class, i.e. it will ignore bits 0 and 1 in the TP-DCS and normal rules for exceeded memory capacity shall apply. This approach is compliant with GSM 03.38. Requirements specific to Multiplex mode: • In multiplex mode (AT+CMUX=0) only one channel can use a phase 2+ parameter. The parameter for <**mt**> and <**ds**> on the other channels have to be set to zero.

5.11 AT+CPMS Preferred SMS message storage

Test command AT+CPMS=?	Response **+CPMS:** (list of supported **<mem1>s**), (list of supported **<mem2>s**), (list of supported **<mem3>s**) Parameter See write command
Read command AT+CPMS?	Response **+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>, <mem3>,<used3>,<total3> OK** If error is related to ME functionality: **+CMS ERROR** Parameter See write command
Write command AT+CPMS= <mem1> [,<mem2> [,<mem3>]]	Response The write command selects memory storages **<mem1>, <mem2> and <mem3>** to be used for reading, writing, etc. **+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> OK** If error is related to ME functionality: **+CMS ERROR:<err>** Parameter **<mem1>** Memory to be used when listing, reading and deleting messages: "SM" SIM message storage "ME" Mobile Equipment message storage "MT" Sum of "ME" and "SM" storages **<mem2>** Memory to be used when writing and sending messages: "SM" SIM message storage "ME" Mobile Equipment message storage "MT" Sum of "ME" and "SM" storages **<mem3>** Received messages will be placed to this storage if routing to TE is not set. See AT+CNMI command with parameter **<mt>=2** (Chapter 5.10). "SM" SIM message storage "MT" Sum of "ME" and "SM" storages **<usedx>** Number of messages currently in **<memx>** **<totalx>** Number of messages storable in **<memx>**
Reference GSM 07.05	Note General remarks • The Mobile Equipment storage "ME" offers space for 25 short messages. • "MT" is the sum of the storages "ME" (= 25) and "SM" (capacity varies with SIM card). The indices (**<index>**) of the "MT" storage are dependent on the order selected with AT^SSMSS (see Chapter 9.48). Incoming Class 1 short messages (ME specific) will be preferably stored to "ME" and may be transferred to the "SM" storage if "ME" is used up. Incoming Class 2 messages (SIM specific) will be stored to the SIM card only, no matter whether or not there is free "ME" space. As a result, the ^SMGO: 2 indication (see AT^SMGO in Chapter 9.21) may be presented without prior indication of ^SMGO: 1. For more information regarding

SIM and ME specific message classes refer to <**dcs**> and the following specifications: GSM 03.38 and 3GPP TS 23.038.

- <**mem1**>, <**mem2**> and <**mem3**> are saved in the non-volatile memory.

Handling of <**mem3**> storage:

- When <mem3> is switched over from “MT” to “SM” all free “ME” locations will be filled with dummy short messages. This procedure can take up to 35 seconds, until all the 25 records are written.
  If switching from “MT” to “SM” was not finished due to error or user break, the value of <mem3> remains “MT”, but some of the dummy records remain in the “ME” storage. These records have to be deleted manually.
  When <mem3> equals “SM”, do not delete the dummy messages in the “ME” storage. They will be automatically deleted when you switch back from “SM” to MT”. Again, this may take up to 35 seconds.
  If switching from “SM” to “MT” was not finished due to an error or user break, the value of <mem3> remains “SM”, but the “ME” storage will no longer be filled with dummy records. New incoming short messages may now be written to the “ME” storage, if “SM” is already full. To avoid this, repeat the AT+CPMS command as soon as possible to switch <mem3> back to “MT”. As an alternative, you can manually delete the dummy records and issue AT+CPMS=MT,MT,MT.
- In Multiplex mode, the parameter <mem3> will be the same on all instances, but the settings of <mem1> and <mem2> may vary on each channel.
- While <mem3> equals “SM” and <mem1> equals “ME” it is possible that, after deleting short messages from “ME”, the freed space on “ME” is reclaimed for new incoming short messages, when there is no space left on the “SM” storage. As it is often the client’s concern to have received short messages stored only to the SIM card, inconsistent settings should be generally avoided. This can be achieved simply by using the same parameter for all <memx>.

5.12 AT+CSCA SMS service centre address

Test command AT+CSCA=?	Response **OK**
Read command AT+CSCA?	Response **+CSCA: <sca>,<tosca> OK** Parameter See write command
Write command AT+CSCA=<sca> [,<tosca>]	The write command updates the SMSC address, through which mobile originated SMs are transmitted. In text mode, setting is used by send and write commands. In PDU mode, setting is used by the same commands, but only when the length of the SMSC address coded into <pdu> parameter equals zero. Note: This command writes the service centre address to non-volatile memory. Response **OK** Parameter **<sca>** GSM 04.11 RP SC address Address value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by **<tosca>** Maximum length of address: 20 characters **<tosca>** Service centre address format GSM 04.11 RP SC address Type-of-Address octet in integer format (default refer **<toda>**)
Reference GSM 07.05	Note If no parameter is entered after AT+CSCA= the content of **<sca>** will be deleted. The SMS service centre address should be entered as specified by the service provider.

5.13 AT+CSCB Select cell broadcast messages

Test command AT+CSCB=?	Response +**CSCB**: (list of supported <**mode**>s) Parameter See write command
Read command AT+CSCB?	Response +**CSCB: <mode>,<mids>,<dcss>** Parameter See write command
Write command AT+CSCB=[<mode>[,<mids>[,<dcss>]]]	Parameter <**mode**> [0] Accepts messages that are defined in <**mids**> and <**dcss**> 1 Forbid messages that are defined in <**mids**> and <**dcss**> <**mids**> Cell Broadcast Message ID specification (string) For <mode>=0: Six different possible combinations of CBM IDs (e.g. ”0,1,5,320-478,922,2000-3000”). Default is empty string (“”). In certain configurations, e.g. if using SIM cards that contain data in Elementary File EF-CBMID (Cell Broadcast Message Identifier for Data download) less than six combinations may be available. To access a SIM’s Elementary File data refer to command AT+CRSM in Chapter 4.43. For <mode>=1: One CBM ID or range of IDs (e.g. ”320-478”). Default is empty string (“”). <**dcss**> CBM data coding scheme specification (string) All different possible combinations of CBM data coding schemes (e.g. ”0-3,5”). Default is empty string (“”). This allows the reception of CBMs independently of their dcss. A given <dcss> replaces any former value and is used for consecutive requests.
Reference GSM 07.05	Note

5.14 AT+CSDH Show SMS text mode parameters

Test command AT+CSDH=?	Response **+CSDH**: (list of supported **<show>**s) **OK** Parameter See write command
Read command AT+CSDH?	Response **+CSDH:<show> OK** Parameter See write command
Write command AT+CSDH= <show>	Response TA sets whether or not detailed header information is shown in text mode result codes. **OK** Parameter **<show>** [0] do not show header values defined in commands +CSCA and **+CSMP (<sca>, <tosca>, <fo>, <vp>, <pid> and <dcs>)** nor **<length>, <toda>** or **<tooa>** in **AT+CNMI, AT+CMGL, AT+CMGR** result codes for SMS-DELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in **AT+CMGR** result code, do not show **<pid>, <mn>, <da>, <toda>, <length>** or **<cdata>** 1 show the values in result codes
Reference GSM 07.05	Note

5.15 AT+CSMP Set SMS text mode parameters

Test command AT+CSMP=?	Response **OK**
Read command AT+CSMP?	Response **+CSMP:<fo>,<vp/scts>,<pid>,<dcs> OK** Parameter See set command
Set command AT+CSMP=<fo>[,<vp/scts>[,<pid>[,<dcs>]]]	Response TA selects values for additional parameters needed when SM is sent to the network or placed in a storage when text format message mode is selected. It is possible to set the validity period starting from when the SM is received by the SMSC (**<vp>** is in range 0... 255) or define the absolute time of the validity period termination (**<vp>** is a string). The format of **<vp>** is given by **<fo>.** If TA supports the enhanced validity period format, see GSM 03.40), it shall be given as a hexadezimal coded string (refer e.g. **<pdu>**) with quotes. Note: When storing a SMS_DELIVER from the TE to the preferred memory storage in text mode (refer write command to Message Memory **+CMGW),** **<vp>** field can be used for **<scts>** Parameter **<fo>** depending on the command or result code: first octet of GSM 03.40 SMS-DELIVER, SMS-SUBMIT (default 17), or SMS-COMMAND (default 2) in integer format **<scts>** GSM 03.40 TP-Service-Centre-Time-Stamp in time-string format (refer **<dt>**) **<vp>** depending on SMS-SUBMIT <fo> setting: GSM 03.40 TP-Validity-Period either in integer format (default 167)), in time-string format (refer **<dt>**), or if is supported, in enhanced format (hexadecimal coded string with quotes) **<pid>** Protocol-Identifier in integer format (default 0), refer GSM 03.40 **<dcs>** SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme in integer format depending on the command or result code: GSM 03.38
Reference GSM 07.05	Note The command writes the parameters to the non-volatile memory.

5.16 AT+CSMS Select Message Service

Test command AT+CSMS=?	Response **+CSMS**: (list of supported **<service>**s) **OK** Parameter See write command
Read command AT+CSMS?	Response **+CSMS: <service>,<mt>,<mo>,<bm> OK** Parameter See write command
Write command AT+CSMS= <service>	Response **+CSMS: <mt>,<mo>,<bm> OK** If error is related to ME functionality: **+CMS ERROR: <err>** Parameter **<service>** [0] GSM 03.40 and 03.41 (the syntax of SMS AT commands is compatible with GSM 07.05 Phase 2 version 4.7.0; Phase 2+ features which do not require new command syntax may be supported, e.g. correct routing of messages with new Phase 2+ data coding schemes) 1 GSM 03.40 and 03.41 (the syntax of SMS AT commands is compatible with GSM 07.05 Phase 2+ version; the requirement of <service> setting 1 is mentioned under corresponding command descriptions). **<mt>** Mobile Terminated Messages: 0 Type not supported [1] Type supported **<mo>** Mobile Originated Messages: 0 Type not supported [1] Type supported **<bm>** Broadcast Type Messages: 0 Type not supported [1] Type supported
Reference GSM 07.05	Note • If CSMS Mode is switched from Phase 2+ to Phase 2 and one or more CNMI parameters are Phase 2+ specific a '+CMS ERROR: unknown error' will appear. It is recommended to switch the CNMI parameters to Phase 2 specific values before entering Phase 2. • Phase 2+ (AT+CSMS=1) must be set before the following features can be used: - Configuring procedures for indicating received short messages with the AT+CNMI parameters <mt>=2 or 3 and <ds>=1. - Acknowledging incoming short messages (+CMT:…) with AT+CNMA. - Receiving Status Reports (+CDS:…) and acknowledging them with AT+CNMA. • Related chapters: 5.9 (AT+CNMA), 5.10 (AT+CNMI).

6 GPRS AT commands

This chapter provides GPRS specific AT commands. For additional information on using GPRS commands in multiplex mode see Chapter 4.28. Detailed step-by-step procedures for starting and using GPRS are described in [2].

6.1 GPRS AT commands in accordance with GSM 07.07

This clause defines commands that a TE (Terminal Equipment, i.e. an application running on a controlling PC) may use to control a GPRS MT (Mobile Termination, the Wireless Module). Refer to Chapter 6.4 for selected examples of using GPRS AT commands.

6.1.1 AT+CGACT PDP context activate or deactivate

Test command AT+CGACT=?	The test command is used for requesting information on the supported PDP context activation states. Response **+CGACT:** (list of supported **<state>**s) **OK / ERROR / +CME ERROR** Parameter **<state>** See write command
Read command AT+CGACT?	The read command returns the current activation states for all the defined PDP contexts. Response **+CGACT: <cid>, <state> [<CR><LF>+CGACT: <cid>, <state>...]** **OK / ERROR / +CME ERROR** Parameter **<cid>** See write command **<state>** See write command
Write command AT+CGACT= [<state>[,<cid>[,<cid>[,...]]]]	The write command is used to activate or deactivate the specified PDP context(s). After the command has completed, the MT remains in V.25ter command state. If any PDP context is already in the requested state, the state for that context remains unchanged. 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. If no <cid>s are specified the activation/deactivation form of the command activates/deactivates all defined contexts. If the MT is not able to activate a context because of a failed attach, command returns “ERROR” or ”+CME ERROR: unknown” after 385 seconds (timer T3310 expired). If the MT is attached but is not able to activate a context for more than 160 seconds (timer T3380 expired), command returns “ERROR” or ”+CME ERROR: unspecified GPRS error. In this case AT+CEER returns “+CEER: 51,3,0”. If the MT is in dedicated mode, command returns “ +CME ERROR: operation temporary not allowed”.

	Response **OK / ERROR / +CME ERROR** Parameter **<state>** Indicates the state of PDP context activation 0 deactivated [1] activated **<cid>** PDP Context Identifier is a numeric parameter which specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. Note: The range of supported cids is returned by AT+CGDCONT=? Response **+CGACT:** (list of supported **<state>**s) **OK / ERROR / +CME ERROR**
Reference GSM 07.07	Note • ATH deactivates any PDP context. See Chapters 2.12 and 6.3.3 for more details. • A maximum of 2 contexts can be activated at the same time, no matter on which interface. Trying to activate more than 2 contexts will cause ”+CME ERROR: operation temporary not allowed”. Note that, depending on the provider, the number of activated contexts may be further restricted. In such cases ”+CME ERROR: unspecified GPRS error” will be returned and AT+CEER returns ”+CEER: 50,26,0”. Remember that contexts may be activated implicitly by using the ATD*98 or ATD*99 GPRS compatibility commands without specifying a <cid>.

6.1.2 AT+CGATT GPRS attach and detach

Test command AT+CGATT=?	The test command is used for requesting information on the supported GPRS service states. Response **+CGATT:** (list of supported **<state>s**) **OK / ERROR / +CME ERROR** Parameter **<state>** See write command
Read command AT+CGATT?	The read command returns the current GPRS service state. Response **+CGATT: <state>** **OK / ERROR / +CME ERROR** Parameter **<state>** See write command
Write command AT+CGATT= [<state>]	The write command enables the MT to get attached to or detached from the GPRS service. After the command has completed, the MT remains in V.25ter command state. If the MT is already in the requested state, the command is ignored and the OK response is returned. Any active PDP contexts will be automatically deactivated when the attachment state changes to detached. If the MT is not able to attach for more than 5 minutes, the command returns “ERROR” or ”+CME ERROR: unknown”, though the MT is still trying to attach. If the MT is not able to detach for more than 1 minute, command returns “ERROR” or ”+CME ERROR: unknown”, but MT is still trying to detach. If an attach is issued during a running detach, command returns “ERROR” or “+CME ERROR: unspecified GPRS error”. If the MT is in dedicated mode, command returns “ +CME ERROR: operation temporary not allowed”. Parameter **<state>** indicates the state of GPRS attachment 0 detach(ed) (power-on default) [1] attach(ed) Response **OK / ERROR / +CME ERROR**
Reference GSM 07.07	Note: When the module is attached and a PLMN reselection occurs to a non-GPRS capable network or to a network where the SIM is not subscribed to for using GPRS, the resulting GMM (GPRS mobility management) state according to GSM 24.008 is REGISTERED/NO CELL, meaning that the read command will still show the status “attached”.

6.1.3 AT+CGDATA Enter data state

Test command AT+CGDATA=?	The test command is used for requesting information on the supported layer 2 protocols to be used between the TE and MT. Response **+CGDATA:** (list of supported **<L2P>s**) **OK / ERROR / +CME ERROR** Parameter **<L2P>** See write command
Write command +CGDATA=[<L2P>, [<cid>[,<cid>,…]]]]	The write command causes the MT to perform all actions necessary to establish a 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. Commands following +CGDATA command in the AT command line will not be processed by the MT. If no <cid> is given or if there is no matching context definition, the MT will attempt to activate the context with PDP type IP and all other context parameters set to their default values (see AT+CGDCONT, AT+CGQREQ, AT+CGQMIN). If the <L2P> parameter is omitted, the layer 2 protocol is unspecified and PPP will be used. Parameter **<L2P>** Layer 2 protocol to be used between TE and MT (string) ["PPP"] for Layer 2 protocol PPP "1" for Layer 2 protocol PPP **<cid>** Parameter specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. 1 … 2 Responses If the write command is successful, the MT issues the intermediate result code CONNECT and enters V.25ter online data state: **CONNECT** After data transfer is complete, and the layer 2 protocol termination procedure has completed successfully, the command state is re-entered and the MT returns the final result code **OK** If the **<L2P>** parameter value is unacceptable to the MT, the MT returns an ERROR or +CME ERROR response: **ERROR/+CME ERROR** In the event of erroneous termination or a failure to start up, the command state is re-entered and the MT returns **NO CARRIER** or, if enabled, **+CME ERROR**

	If the MT is in dedicated mode, command returns **"+CME ERROR: operation temporary not allowed".**
Reference GSM 07.07	Note It is possible to leave the GPRS data mode and enter the command mode by using the V.25ter command +++. By using the command AT+CGDATA again, the data mode is reentered. Which context is used to return to data mode, depends on the supplied parameter <cid>. If no <cid> is specified, this is equivalent to using the V.25ter command ATO, which is usable for the GPRS connections too. In this case the first context is used, which is active and which was already in data mode since it was activated (the internal context, which is used for GPRS connection without explicitly specifiying a context identifier, has the highest priority). It ist possible, to use AT+CGDATA to enter the data mode for a context, which was not in data mode since it was activated. With ATO this is not possible.

6.1.4 AT+CGDCONT Define PDP Context

Test command AT+CGDCONT=?	The test command returns values supported as a compound value. Response **+CGDCONT:** (range of supported **<cid>**s), **<PDP_type>**,,,(list of supported **<d_comp>**s), (list of supported **<h_comp>s) [<CR><LF>+CGDCONT: ...]** **OK / ERROR / +CME ERROR**
Read command AT+CGDCONT?	The read command returns the current settings for each defined context. Response **+CGDCONT: <cid>, <PDP_type>, <APN>, <PDP_addr>, <d_comp>, <h_comp> [<CR><LF>+CGDCONT: ...]** **OK / ERROR / +CME ERROR** Parameter **<cid>** See write command **<PDP_type>** See write command **<APN>** See write command **<PDP_addr>** See write command **<d_comp>** Data compression (numeric) Controls PDP data compression (applicable for Sub-network Dependent Convergence Protocol (SNDCP only) 3GPP TS 44.065) [0] off **<h_comp>** Header compression (numeric) Controls the PDP header compression 3GPP TS 44.065, 3GPP TS 25.323 [0] off
Write command AT+CGDCONT=[<cid>[,<PDP_type>[,<APN>[,<PDP_addr>]]]]	This command specifies the parameters for a PDP context identified by the (local) context identification parameter, <cid>. The number of contexts that may be in a defined state at the same time is given by the range returned by the test command. A special form of the set command, +CGDCONT= <cid> causes the values for context number <cid> to become undefined. AT&F and ATZ will undefine every context which is not active or not online. Parameter **<cid>** PDP Context Identifier (numeric) Parameter specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is also used in other PDP context-related commands. 1 … 2 **<PDP_type>** Packet Data Protocol type (string) Specifies the type of packet data protocol: IP Internet Protocol (IETF STD 5) **<APN>** Access Point Name (string). Logical name that is used to select the GGSN or the external packet data network. If the value is null or omitted, then the subscription value will be requested.

	<PDP_addr> Packet Data Protocol address (string) String parameter that identifies the MT in the address space applicable to the PDP (e.g. IP V4 address for PDP type IP). 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. The read command will continue to return the null string even if an address has been allocated during the PDP startup procedure. The allocated address may be read using AT+CGPADDR. Response **OK / ERROR / +CME ERROR**
Reference GSM 07.07	Note: The MT supports PDP type IP only.

6.1.5 AT+CGPADDR Show PDP address

Test command AT+CGPADDR=?	The test command returns a list of defined <cid>s. Response **+CGPADDR:** (list of supported **<cid>**s) Parameter See write command
Write command AT+CGPADDR =[<cid> [,<cid> [,…]]]	The write command returns a list of PDP addresses for the specified context identifiers. Response **+CGPADDR: <cid>, <PDP_addr> [<CR>>LF>+CGPADDR: <cid>,<PDP_addr>[...]]** Parameter **<cid>:** a numeric parameter which specifies a particular PDP context definition (see +CGDCONT command). **<PDP_address>:** a string that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic.
Reference GSM 07.07	Note If no <cid> is specified, the write command will return a list of all defined contexts.

6.1.6 AT+CGQMIN Quality of Service Profile (Minimum acceptable)

Test command AT+CGQMIN=?	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. Response **+CGQMIN: <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 / ERROR / +CME ERROR** Parameter **<PDP_type>** String parameter of Packet Data Protocol type IP **<precedence>** See write command **<delay>** See write command **<reliability>** See write command **<peak>** See write command **<mean>** See write command
Read command AT+CGQMIN?	Response The read command returns the current settings for each defined context. If no minimum profile was explicitly specified for a context, simply **OK** will be returned, but default values will be used for that context. **+CGQMIN: <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>** **[<CR><LF>+CGQMIN: ...]** **OK / ERROR / +CME ERROR** Parameter **<cid>** See write command **<precedence>** See write command **<delay>** See write command **<reliability>** See write command **<peak>** See write command **<mean>** See write command
Write command AT+CGQMIN= [<cid>[,<precedence>[,<delay>[,<reliability>[,<peak>[,<mean>]]]]]]	This command allows the TE to specify a minimum acceptable profile which is checked by the MT against the negotiated profile returned in the Activate PDP Context Accept message. The write command specifies a profile for the context identified by the (local) context identification parameter, <cid>. A special form of the set command, +CGQMIN= <cid> causes the minimum acceptable profile for context number <cid> to become undefined. In this case no check is made against the negotiated profile. AT&F and ATZ will undefine the minimum QoS profiles of every context which is not active or not online. Response **OK / ERROR / +CME ERROR**

Parameter

<cid> (numeric)
Parameter specifies a particular PDP Context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands.
1 … 2

<precedence> Precedence class (numeric)
[0] network subscribed value
1 High Priority
Service commitments shall be maintained ahead of precedence classes 2 and 3
2 Normal priority
Service commitments shall be maintained ahead of precedence class 3
3 Low priority
Service commitments shall be maintained

<delay> Delay class (numeric)
The Delay parameter defines ent-to-end transfer delay incurred in the transmission of SDUs through GPRS network(s).
[0] network subscribed value

SDU size: 128 octets:

Delay Class	*Mean Transfer Delay*	*95 percentile Delay*
1 (Predictive)	<0.5	<1.5
2 (Predictive)	< 5	< 25
3 (Predictive)	< 50	< 250
4 (Best Effort)	Unspecified	

SDU size: 1024 octets:

Delay Class	*Mean Transfer Delay*	*95 percentile Delay*
1 (Predictive)	<0.5	<1.5
2 (Predictive)	< 5	< 25
3 (Predictive)	< 50	< 250
4 (Best Effort)	Unspecified	

<reliability> Reliability class (numeric)
[0] network subscribed value
1 Non real-time traffic , error-sensitive application that cannot cope with data loss
2 Non real-time traffic, error-sensitive application that can cope with infrequent data loss
3 Non real-time traffic, error-sensitive application that can cope with data loss, GMM/SM, and SMS
4 Real-time traffic, error-sensitive application that can cope with data loss
5 Real-time traffic, error non-sensitive application that can cope with data loss

	<peak> (numeric) Peak throughput class (in octets per second) [0] network subscribed value *Peak Throughput Class* — *Peak Throughput (in octets per second)* 1 — Up to 1 000 (8 kbit/s) 2 — Up to 2 000 (16 kbit/s) 3 — Up to 4 000 (32 kbit/s) 4 — Up to 8 000 (64 kbit/s) 5 — Up to 16 000 (128 kbit/s) 6 — Up to 32 000 (256 kbit/s) 7 — Up to 64 000 (512 kbit/s) 8 — Up to 128 000 (1 024 kbit/s) 9 — Up to 256 000 (2 048 kbit/s) **<mean>** （numeric) Mean throughput class [0] network subscribed value *Mean Throughput Class* — *Mean Throughput (in octets per hour)* 1 — 100 (~0.22 bit/s) 2 — 200 (~0.44 bit/s) 3 — 500 (~1.11 bit/s) 4 — 1 000 (~2.2 bit/s) 5 — 2 000 (~4.4 bit/s) 6 — 5 000 (~11.1 bit/s) 7 — 10 000 (~22 bit/s) 8 — 20 000 (~44 bit/s) 9 — 50 000 (~111 bit/s) 10 — 100 000 (~0.22 kbit/s) 11 — 200 000 (~0.44 kbit/s) 12 — 500 000 (~1.11 kbit/s) 13 — 1 000 000 (~2.2 kbit/s) 14 — 2 000 000 (~4.4 kbit/s) 15 — 5 000 000 (~11.1 kbit/s) 16 — 10 000 000 (~22 kbit/s) 17 — 20 000 000 (~44 kbit/s) 18 — 50 000 000 (~111 kbit/s) 31 — best effort.
Reference GSM 07.07	Note: • If parameters are not defined, the parameter default values depend on the HLR-stored subscribed default values. • Definitions of parameters in GSM 02.60 and GSM 03.60 paragraph 15.2 “Quality of Service Profile“.

Examples	If some of the QoS parameters are omitted, they will keep their current value (or the default value if not specified so far), e.g.: at+cgdcont=1,”ip” OK at+cgqmin= OK at+cgqmin? OK at+cgqmin=1,0 OK at+cgqmin? +CGQMIN:1,0,0,0,0,0 OK at+cgqmin=1,0,0,0,1 OK at+cgqmin? +CGQMIN:1,0,0,0,1,0 OK at+cgqmin=1,1 OK at+cgqmin? +CGQMIN:1,1,0,0,1,0 OK

6.1.7 AT+CGQREQ Quality of Service Profile (Requested)

Test command AT+CGQREQ=?	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. Response **+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 / ERROR / +CME ERROR** Parameter **<PDP_type>** String parameter of Packet Data Protocol type IP **<precedence>** See write command **<delay>** See write command **<reliability>** See write command **<peak>** See write command **<mean>** See write command
Read command AT+CGQREQ?	The read command returns the current settings for each defined context. If no requested profile was explicitly specified for a context, simply **OK** will be returned, but default values will be used for that context. Response **+CGQREQ: <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>** **[<CR><LF>+CGQREQ: ...]** **OK / ERROR / +CME ERROR** **<cid>** See write command **<precedence>** See write command **<delay>** See write command **<reliability>** See write command **<peak>** See write command **<mean>** See write command
Write command AT+CGQREQ= [<cid>[,<precedence> ,<delay>[,<reliability>[,<peak>[,<mean>]]]]]]	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 write command specifies a profile for the context identified by the (local) context identification parameter, <cid>. A special form of the set command, +CGQREQ= <cid> causes the requested profile for context number <cid> to become undefined. AT&F and ATZ will undefine the QoS profiles of every context which is not active or not online. Response **OK / ERROR / +CME ERROR**

Parameter

<cid> (numeric)
Parameter specifies a particular PDP Context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands.
1 … 2

<precedence> Precedence class (numeric)
[0] network subscribed value
1 High Priority
Service commitments shall be maintained ahead of precedence classes 2 and 3
2 Normal priority
Service commitments shall be maintained ahead of precedence class 3
3 Low priority
Service commitments shall be maintained

<delay> Delay class (numeric)
The Delay parameter defines the end-to-end transfer delay incurred in the transmission of SDUs through the GPRS network(s).
[0] network subscribed value

SDU size: 128 octets:

Delay Class	*Mean Transfer Delay*	*95 percentile Delay*
1 (Predictive)	<0.5	<1.5
2 (Predictive)	< 5	< 25
3 (Predictive)	< 50	< 250
4 (Best Effort)	Unspecified	

SDU size: 1024 octets:

Delay Class	*Mean Transfer Delay*	*95 percentile Delay*
1 (Predictive)	<0.5	<1.5
2 (Predictive)	< 5	< 25
3 (Predictive)	< 50	< 250
4 (Best Effort)	Unspecified	

<reliability> Reliability class (numeric)
[0] network subscribed value
1 Non real-time traffic, error-sensitive application that cannot cope with data loss
2 Non real-time traffic, error-sensitive application that-can cope with infrequent data loss
3 Non real-time traffic, error-sensitive application that can cope with data loss, GMM/SM, and SMS
4 Real-time traffic, error-sensitive application that can cope with data loss
5 Real-time traffic, error non-sensitive application that can cope with data loss

	<peak>	Peak throughput class (numeric) [0] network subscribed value

Peak Throughput Class	*Peak Throughput (in octets per second)*
1	Up to 1 000 (8 kbit/s).
2	Up to 2 000 (16 kbit/s).
3	Up to 4 000 (32 kbit/s).
4	Up to 8 000 (64 kbit/s).
5	Up to 16 000 (128 kbit/s).
6	Up to 32 000 (256 kbit/s).
7	Up to 64 000 (512 kbit/s).
8	Up to 128 000 (1 024 kbit/s).
9	Up to 256 000 (2 048 kbit/s).

<mean> numeric parameter for the mean throughput class
[0] network subscribed value

Mean Throughput Class	*Mean Throughput (in octets per hour)*
1	100 (~0.22 bit/s)
2	200 (~0.44 bit/s)
3	500 (~1.11 bit/s)
4	1 000 (~2.2 bit/s)
5	2 000 (~4.4 bit/s)
6	5 000 (~11.1 bit/s)
7	10 000 (~22 bit/s)
8	20 000 (~44 bit/s)
9	50 000 (~111 bit/s)
10	100 000 (~0.22 kbit/s)
11	200 000 (~0.44 kbit/s)
12	500 000 (~1.11 kbit/s)
13	1 000 000 (~2.2 kbit/s)
14	2 000 000 (~4.4 kbit/s)
15	5 000 000 (~11.1 kbit/s)
16	10 000 000 (~22 kbit/s)
17	20 000 000 (~44 kbit/s)
18	50 000 000 (~111 kbit/s)
31	best effort.

Reference GSM 07.07	Note: • If parameters are not defined, the parameter default values depend on the HLR-stored subscribed default values. • Definitions of parameters in GSM 02.60 and GSM 03.60 paragraph 15.2 “Quality of Service Profile“.

Examples	If some of the QoS parameters are omitted, then they will keep their current value (or the default value if not specified so far), e.g. at+cgdcont=1,”ip” OK at+cgqreq= OK at+cgqreq? OK at+cgqreq=1,0 OK at+cgqreq? +CGQREQ:1,0,0,0,0,0 OK at+cgqreq=1,0,0,1 OK at+cgqreq? +CGQREQ:1,0,0,1,0,0 OK at+cgqreq=1,1 OK at+cgqreq? +CGQREQ:1,1,0,1,0,0 OK

6.1.8 AT+CGREG GPRS network registration status

Test command AT+CGREG=?	Response **+CGREG:** (list of supported <**n**>s) **OK**
Read command AT+CGREG?	The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. Response **+CGREG: <n>,<stat>** **OK** Parameter **<n>** See write command. **<stat>** 0 Not registered, ME is not currently searching an operator to register to. The MS is in GMM state GMM-NULL or GMM-DEREGISTERED-INITIATED. The GPRS service is disabled, the MS is allowed to attach for GPRS if requested by the user. 1 Registered, home networkThe MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED INITIATED on the home PLMN. 2 Not registered, but ME is currently trying to attach or searching an operator to register to. The MS is in GMM state GMM-DEREGISTERED or GMM-REGISTERED-INITIATED. The GPRS service is enabled, but an allowable PLMN is currently not available. The MS will start a GPRS attach as soon as an allowable PLMN is available 3 Registration denied. The MS is in GMM state GMM-NULL. The GPRS service is disabled, the MS is not allowed to attach for GPRS if requested by the user. 4 unknown 5 Registered, roaming. The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED on a visited PLMN
Write command AT+CGREG =[<n>]	The write command controls the presentation of an unsolicited result code +CGREG: <stat>. Parameter **<n>** 0 Disable network registration unsolicited result code 1 Enable network registration unsolicited result code “+CGREG:”
Unsolicited Result code	**+CGREG: <stat>** Indicates a change in the MT’s GPRS network registration status.
Reference GSM 07.07	Note • Parameter <n> cannot be stored using AT&W. • When the module is attached and a PLMN reselection to a non-GPRS capable network occurs or to a network where the SIM is not subscribed for GPRS usage, the resulting GMM (GPRS mobility management) state according to GSM 24.008 is REGISTERED/NO CELL, meaning that the read command will still show the module to be attached.

6.1.9 AT+CGSMS Select service for MO SMS messages

Test command AT+CGSMS=?	The test command lists the services and service preferences which can be selected with the AT+CGSMS write command. Response **+CGSMS:** (list of supported **<service>**s **OK** Parameter **<service>** See write command
Read command AT+CGSMS?	The read command returns the currently selected service or service preference. Response **+CGSMS: <service>** **OK / ERROR / +CME ERROR** **<service>** See write command
Write command AT+CGSMS= [<service>]	The write command specifies what service or service preference the MT shall use when sending MO SMS messages. If parameter <service> is not given, the current value remains unchanged. Parameter **<service>** A numeric parameter which indicates the service or service preference to be used. 0 GPRS 1 circuit switched 2 GPRS preferred (use circuit switched if mobile is not GPRS attached or during a CS call) [3] circuit switched preferred (use GPRS if circuit switched is not available) Response **OK / ERROR / +CME ERROR**
Reference GSM 07.07	Note: • Power-on default value is 3 (circuit switched preferred). • Parameter cannot be stored to user profile (AT&W).

6.2 Siemens defined GPRS AT commands

6.2.1 AT^SGACT Query all PDP context activations

Test command AT^SGACT=?	Response **^SGACT**: (range of supported <**ifc**>s),(list of supported <**state**>s) **OK**
Read command AT^SGACT=?	The read command lists the activation states for all activated PDP contexts of the ME. Contexts which are created internally by the GPRS modem compatibility commands will be displayed only if activated. The output of this command is unsorted. Response **^SGACT**: <**ifc**>,<**cid**>,<**state**> […]] **OK** Parameters **<ifc>** Interface (numeric) Specifies the interface on which a particular PDP context was definied. Every PDP context defined with AT+CGDCONT or internally by the GPRS modem compatibility commands is identified one-to-one by its (local) context identifier and the interface on which it was defined. The range of supported interfaces is returned by the test command. 0 – ASC0 or Multiplex channel 1 1 – Multiplex channel 2 2 – Multiplex channel 3 **<cid>** PDP context identifier (numeric) The interface local identifier which was used to define a PDP context using the AT+CGDCONT or which was created internally by using the GPRS modem compatibility commands. The range of supported values is returned by the AT+CGDCONT test command. Value "0" is used by the GPRS modem compatibility commands if no context identifier was specified as the command was invoked. **<state>** PDP context activation state (numeric) Indicates the state of the PDP context activation. 0 – deactivated 1 - activated
Execute command AT^SGACT	The execute command returns the sum of all activated PDP contexts of the ME. Response **^SGACT**: <**sum**> **OK** Parameters **<sum>** The sum of all activated PDP contexts of the ME (numeric)
Reference Siemens	Note

6.2.2 AT^SGAUTH Set type of authentication for PPP connection

Test command AT^SGAUTH=?	Response **^SGAUTH:** (list of supported **<auth>**s) **OK / ERROR / +CME ERROR** Parameter **<auth>** indicates types of supported authentication 0 None 1 PAP 2 CHAP 3 PAP and CHAP
Read command AT^SGAUTH?	Response **+SGAUTH: <auth>** **OK/ ERROR/ + CME ERROR** Parameter See test command
Write command AT^SGAUTH= <auth>	Response **OK/ ERROR/ + CME ERROR** Parameter See test command
Reference Siemens	Note: • Power on default value is 3 (PAP and CHAP) • Parameter cannot be stored using AT&W

6.2.3 AT^SGCONF Configuration of GPRS related Parameters

Test command AT^SGCONF =?	Response **^SGCONF**: (list of supported <**llc_pdu_length**>s),(list of supported <**class**>es) Parameter See write command
Read command AT^SGCONF?	Response **^SGCONF:** <**llc_pdu_length**>,<**class**> **OK** Parameter See write command
Write command AT^SGCONF= [<llc_pdu_length>] [,<class>]	The write command allows to set GPRS parameters. Response **OK /ERROR/+CME ERROR** Parameter **<llc_pdu_length>** LLC-PDU-length (numeric) 0 no negotiation with network (500 will be used) 140...1520 (lower values diminish performance) Power on default is 1520. **<class>**: GPRS Multislot Class (numeric). The parameter can be changed only when the MT is detached, otherwise “CME ERROR: operation temporary not allowed” will be returned. The value can be one of the classes indicated with the test command.
Reference Siemens	Note +CME ERROR: invalid index: Parameter is out of range +CME ERROR: operation temporary not allowed: The command is blocked as long as GPRS is already in use (as long as mobile is GPRS attached). Writing to user profile with AT&W and restoring with AT&F are not supported.

6.3 Modem compatibility commands for MTs supporting GPRS

This subclause describes how existing AT commands, designed for use with a modem, may be used to control a GPRS MT. This is to provide backwards compatibility with existing communications software.

6.3.1 ATD *99# Request GPRS service

Execute command ATD*99[*[<called_address>][*[<L2P>][*[<cid>]]]]#	This command causes the MT to perform whatever actions are necessary to establish communication between the TE and the external PDN. The V.25ter 'D' (Dial) command causes the MT to enter the V.25ter online data state and, with the TE, to start the specified layer 2 protocol. No further commands may follow on the AT command line. GPRS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not yet been performed using the AT+CGACT (see Chapter 6.1.1) and AT+CGATT (see Chapter 6.1.2) commands. If the context to be used is already activated, it will be deactivated first. This ensures that the right context parameters will be used (e.g. QoS changes since the last context activation or the called address specified by ATD). Examples on how to use this command are provided in Chapter 6.5. Response To confirm acceptance of the command to entering the V.25ter online data state: **CONNECT** When the layer 2 protocol has terminated, either as a result of an orderly shutdown of the PDP or an error, the MT enters V.25ter command state and returns **NO CARRIER** If the MT is in dedicated mode, command returns +CME ERROR: phone busy". Parameter **<called_address>** (string) IP V4 address in the format w.x.y.z, see Chapter "Using the GPRS dial command ATD", pg. 212 which identifies the called party; if it is provided, the MT will automatically set up a virtual call to the specified address after the context has been activated. This parameter is currently not used and needs not be specified. **<L2P>** (string). Layer 2 protocol to be used between TE and MT ["PPP"] Layer2 protocol PPP "1" Layer 2 protocol PPP **<cid>:** (numeric). Parameter specifies a particular PDP context definition (see +CGDCONT command). If no context is specified, an internal context 0 with default properties is used. See AT+CGDCONT (Chapter 6.1.4, AT+CGQMIN (Chapter 6.1.6) and AT+CGQREQ (see Chapter 6.1.7). 1 … 2
Reference GSM 07.07	Note ATD is used as a standard V.25ter AT Command, too.

6.3.2 ATD *98# Request GPRS IP service

Execute command ATD*98[*<cid>]#	This command causes the MT to perform whatever actions are necessary to establish a communication between the TE and the external PDN. The V.25ter 'D' (Dial) command causes the MT to enter the V.25ter online data state and, with the TE, to start the layer 2 protocol. GPRS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not yet been performed using the +CGACT (see Chapter 6.1.1) and +CGATT (see Chapter 6.1.2) commands. If the context to be used is already activated, it will be deactivated first. This ensures that the right context parameters will be used (e.g. QoS changes since the last context activation). Note: An example of how to use this command can be seen in Chapter 6.5 Response To confirm acceptance of the command to entering the V.25ter online data state: **CONNECT** When the layer 2 protocol has terminated, either as a result of an orderly shut down of the PDP or an error, the MT enters V.25ter command state and return **NO CARRIER** If the MT is in dedicated mode, command returns +CME ERROR: phone busy". Parameter **<cid>**: (numeric). Parameter which specifies a particular PDP context definition (see +CGDCONT command). If no context is specified, an internal context 0 with default properties is used. See AT+CGDCONT (Chapter 6.1.4, AT+CGQMIN (Chapter 6.1.6) and AT+CGQREQ (see Chapter 6.1.7). 1 … 2
Reference GSM 07.07	Note: ATD is used as a standard V.25ter AT command, too.

6.3.3 ATH	Manual rejection of a network request for PDP context activation
Execute command ATH	Response The V.25ter 'H' or 'H0' (On-hook) command may be used to deactivate all PDP contexts which are active or online on the same interface. The MT responds with **OK**
Reference GSM 07.07	Note • In contrast to GSM 07.07 it is possible to cancel a connection with ATH after a break. This is done for compatibility reasons due to the “dial-up network“ (“DFÜ-Netzwerk“) drivers of Microsoft© Windows®. • ATH is used as a standard V.25ter AT Command, too. See Chapter 2.12.

6.4 Using GPRS AT commands (examples)

Defining and using a Context Definition Id (CID):
Every time a CID is used as a parameter for a GPRS command the CID has to be defined before by the AT+CGDCONT command. To get the parameter of a CID use the AT+CGDCONT read option. If the response of 'AT+CGDCONT?' is OK only, there is no CID defined.

AT+CGDCONT?
OK // there is no CID defined

All parameters of the CID are initiated by NULL or not present values and the CID itself is set to be undefined. To define a CID use the AT+CGDCONT Command with at least one CID parameter. At the moment the mobile supports CID 1 and CID 2 by using the AT+CGDCONT command.

Examples:

AT+CGDCONT=1, "IP"
OK // defines CID 1 and sets the PDP type to IP
// access point name and IP address aren't set

AT+CGDCONT=2, "IP", "internet.t-d1.gprs", "111.222.123.234"
OK // defines CID 2 and sets PDP type, APN and IP addr

A following read command will respond
AT+CGDCONT?
+CGDCONT:1, "IP","","",0,0
+CGDCONT:2, "IP"," internet.t-d1.gprs","111.222.123.234"
OK

AT+CGDCONT=1
OK // sets the CID 1 to be undefined

A following read command will respond
AT+CGDCONT?
+CGDCONT:2, "IP", "internet.t-d1.gprs","111.222.123.234"
OK

Quality of Service (QoS) is a special parameter of a CID which consists of several parameters itself. The QoS consists of

- the precedence class
- the delay class
- the reliability class
- the peak throughput class
- the mean throughput class

and is devided in "requested QoS" and "minimum acceptable QoS".

All parameters of the QoS are initiated by default to the "network subscribed value (= 0)" but the QoS itself is set to be undefined. To define a QoS use the AT+CGQREQ or AT+CGQMIN command.

Examples:

```
AT+CGQREQ=1,2
OK                  // overwrites the precedence class of QoS of CID 1 and sets
                    // the QoS of CID 1 to be present
```

A following read command will respond

```
AT+CGQREQ?
+CGQREQ: 1,2,0,0,0,0
OK                  // all QoS values of CID 1 are set to network subscribed
                    // except precedence class which is set to 2
```

```
AT+CGQREQ=1
OK                  // set the QoS of CID 1 to not present
```

Once defined, the CID it can be activated. To activate a CID use

```
AT+CGACT=1,2
OK                  // activate CID 2
```

If the CID is already active, the mobile responds OK at once.

If no CID is given, all defined CIDs will be activated by

```
AT+CGACT=           // NO CID and NO STATE given
OK                  // all defined CIDs will be activated
```

If no CID is defined the mobile responds +CME ERROR: invalid index

Remark: If the mobile is NOT attached by AT+CGATT=1 before activating, the attach is automatically done by the AT+CGACT command.

After defining and activating a CID it may be used to get online by

```
AT+CGDATA="PPP",1
CONNECT             // the mobile is connected using the parameters of CID 1
```

```
AT+CGDATA=
CONNECT             // the mobile is connected using defaults "PPP" and CID 0
```

The mobile supports Layer 2 Protocol (L2P) PPP only.

Remark: If the mobile is NOT attached by AT+CGATT=1 and the CID is NOT activated before connecting, attaching and activating is automatically done by the AT+CGDATA command.

Some providers (e.g. D2 or E-Plus) require to use an APN to establish a GPRS connection. So if you use the Microsoft Windows Dial-Up Network and ATD*9... to connect to GPRS you must provide the context definition as part of the modem definition (Modem properties/Connection/Advanced.../Extra settings). As an alternative, you can define and activate the context in a terminal program (e.g. Microsoft Hyperterminal) and then use the Dial-Up Network to send the ATD command only.

6.5 Using the GPRS dial command ATD

In addition to the GPRS AT Commands you can use the "D" command to dial into to the GPRS network.

There are two GPRS Service Codes for the ATD Command: Values 98 and 99.
Examples:

```
ATD*99#
CONNECT          // establish a connection by service code 99

ATD*99*123.124.125.126*PPP*1#
CONNECT          // establish a connection by service code 99, IP address 123…
                 //and L2P = PPP and using CID 1.
                 // The CID has to be defined by AT+CGDCONT

ATD*99**PPP#
CONNECT          // establish a connection by service code 99 and L2P = PPP

ATD*99***1#
CONNECT          // establish a connection by service code 99 and using CID 1

ATD*99**PPP*1#
CONNECT          // establish a connection by service code 99 and L2P = PPP and
                 // using CID 1. The CID has to be defined by AT+CGDCONT

ATD*98#
CONNECT          // establish an IP connection by service code 98

ATD*98*1#
CONNECT          // establish an IP connection by service code 98 using CID 1
                 // The CID has to be defined by AT+CGDCONT
```

7 AT Commands for SIM Application Toolkit (GSM 11.14)

SIM Application Toolkit (SAT) is a technology that lets the SIM card execute a great variety of additional applications. Conventionally, SIM cards are intended to store user specific data, such as phonebooks, secure user identification codes and messages, but they can also hold a lot of value-added mobile applications.

The SAT functionality integrated in AC45 allows to execute network specific applications implemented on the SIM card. Typical examples are online banking and information services.

The commands exchanged between SAT and the SIM application fall into two categories:

- Proactive commands – sent from the SIM application to the module's SAT, e.g. DISPLAY TEXT.
- Envelope commands – sent from the module's SAT to the SIM application, e.g. MENU SELECTION.

The SAT implementation supports SAT class 3, GSM 11.14 Release 98, support of letter class "c".
GSM 11.14 describes Proactive and Envelope Commands in detail.

Note: To give you an idea, this chapter contains a brief overview of the AT commands and responses related to the SIM Application Toolkit (SAT) implementation. The full set of SAT specific AT commands and a detailed descripton of the SAT functions is provided in [4].

7.1 AT^SSTA Remote-SAT Interface Activation

Test command AT^SSTA=?	Response ^SSTA:(list of supported <state>s), (list of supported <alphabet>s) Parameter description see below.
Read command AT^SSTA?	The read command can be used to request the current operating status and the used alphabet of the Remote-SAT interface. Response ^SSTA:<state>,<alphabet>,<allowedInstance>,<SatProfile> <state> device state: <allowedInstance> 0 SAT is already used on another instance (logical channel in case of the multiplex protocol). Only test and read commands can be used. 1 SAT may be started on this instance via the write version of this command (see below). <SatProfile> SAT profile according to GSM 11.14. The profile tells the SIM application which features are supported by the SIM Application Toolkit implemented by the ME.
Write command AT^SSTA=<mode>[,<Alphabet>]	The write command is used to activate the AT command interface to the SIM Application Toolkit in the ME, and must be issued after every power on. However, removing and inserting the SIM does not affect the activation status. SAT commands which are not using the AT interface (non MMI related SAT commands , e.g. PROVIDE LOCAL INFORMATION) may be executed without activating Remote-SAT. Response OK Parameter <mode> 1 Activate Remote-SAT (to enter state IDLE) <Alphabet> 0 ANSI character set Input of a character requests one byte , e.g. “Y”. 1 UCS2 To display the 16 bit value of characters represented in UCS2 alphabet a 4 byte string is required, e.g. “0059” is coding the character “Y”. For details please refer to ISO/IEC 10646.
Reference Siemens	Note

7.2 ^SSTN Remote-SAT Notification

Proactive Commands	Every time the SIM application issues a proactive command, via the ME, the TA will receive a notification. This indicates the type of proactive command issued. **AT^SSTGI** must then be used by the TA to request the parameters of the proactive command from the ME. Upon receiving the ^SSTGI response from the ME, the TA must send **AT^SSTR** to confirm the execution of the proactive command and provide any required user response, e.g. selected menu item. Unsolicited result code ^SSTN: <cmdType> Parameters <cmdType> Proactive command ID
Terminate Proactive Command	When the SIM application has issued a proactive command, via the ME, to the TA, it is possible that this command must be terminated. The ^SSTN Unsolicited Result Code is sent but with a different command type to indicate the termination of the specified command. Unsolicited result code ^SSTN: <cmdTerminateValue> Parameters <cmdTerminateValue> Terminate proactive command ID
SIM Application returns to main menu	Notification to the TA when the SIM Application has finished a command cycle and again enters its main menue. This URC should be used to open this menue on the sreen. Unsolicited result code ^SSTN: <254>
Reference Siemens	Note

7.3 AT^SSTGI Remote-SAT Get Information

Test command AT^SSTGI=?	Response ^SSTGI:(list of supported <state>s), (list of supported <cmdType>s) OK
Read command AT^SSTGI?	Response ^SSTGI: <state>, <cmdType> OK Parameters <state> Remote-SAT interface states (refer to AT^SSTA) <cmdType> Ongoing proactive command
Write command AT^SSTGI= <cmdType>	Regularly this write command is used upon receipt of an URC ^SSTN:<cmdType>. The TA is expected to acknowledge the ^SSTGI response with AT^SSTR to confirm that the proactive command has been executed. AT^SSTR will also provide any user information, e.g. a selected menu item. The command type value is returned to the ME to identify which ^SSTN is being responded to.
Reference Siemens	Note

7.4 AT^SSTR Remote-SAT Response

Test command AT^SSTR=?	Response ^SSTR:(list of supported <state>s), (list of supported <cmdType>s) OK
Read command AT^SSTR?	Response ^SSTR: <state>, <cmdType> OK Parameters <state> Remote-SAT interface state <cmdType> Ongoing Proactive Command
Write command AT^SSTR=<cmdType>,<status>[,<itemId>][,<inputString>]	The TA is expected to acknowledge the ^SSTGI response with AT^SSTR to confirm that the proactive command has been executed. AT^SSTR will also provide any user information, e.g. a selected menu item. Response OK Parameters <cmdType> Number related to proactive command or event type <status> Command status return regarding the type of action that has taken place, e.g. action performed by the user. <itemId> id of menu item selected by user <inputString> string response entered by user
Reference Siemens	Note

8 AT Commands for Remote SIM Access

This chapter describes AT commands and responses related to the Remote SIM Access (RSA) feature of AC45. RSA allows AC45 to use a SIM card via its serial interface in addition to the SIM card locally attached via the dedicated lines on the interface connector. For more detailed information please refer to [14].

Figure 1 illustrates a possible RSA scenario:

- AC45 is built in a car as part of and controlled by a car application, e.g. telematic or telemetry system.
- A cellular phone including a SIM card is connected to the car application using a car cradle or a wireless link.

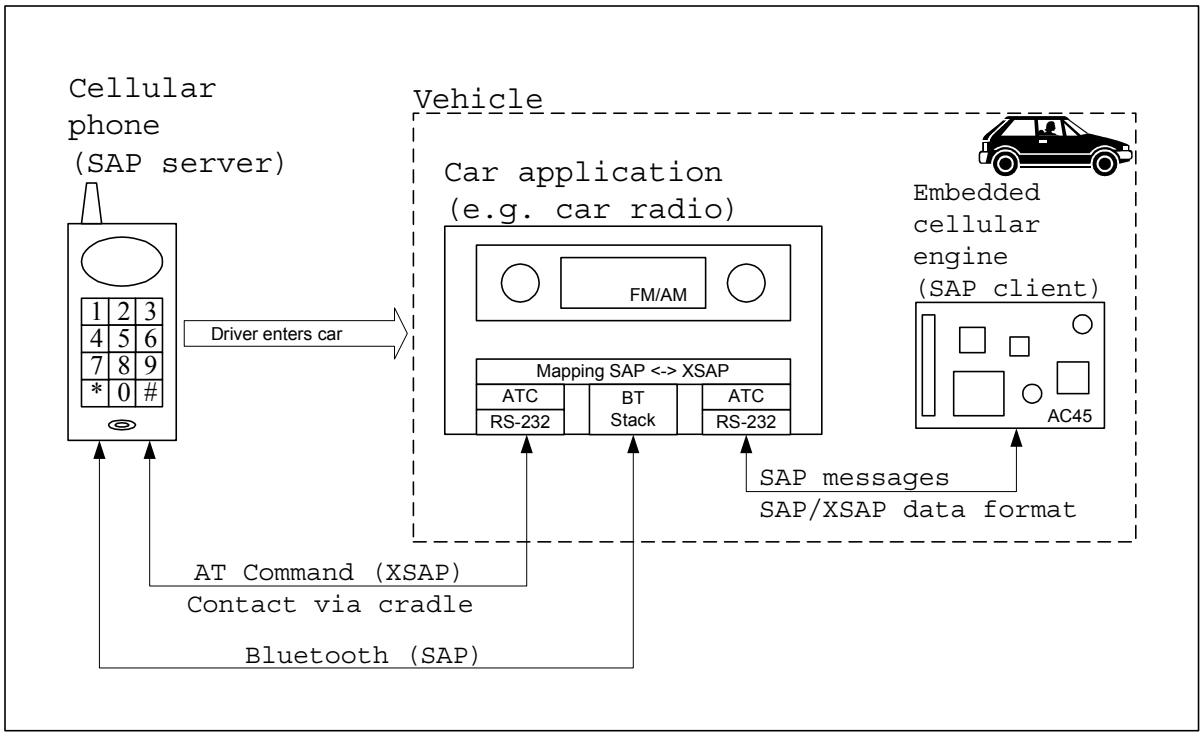

Figure 1: Basic Remote SIM Access usage scenario

The necessary protocols and procedures are implemented according to the “SIM Access Profile Interoperability Specification”, Revision 0.95c of the Bluetooth Special Interest Group (see [15] for details).

As stated there, this profile enables the user to personalize the car-embedded phone with a SIM card in an external device, which is connected via a wireless link. The external device can either be a SIM card reader or a portable phone, which is brought into the car.

The SIM Access Profile builds on the well-defined interface between the mobile phone and the SIM card, see “Specification of the Subscriber Identity Module” (GSM 11.11).

Please note that AC45 does not support Bluetooth wireless links, the SIM communication is routed via a serial channel. Therefore, the external application has to ensure the mapping of these data to any suitable path, e.g. to a car cradle or a Bluetooth modem, for example the SIEMOS BT-Module.

To obtain the Siemens Bluetooth modem, contact your local Siemens dealer or visit the Siemens Website: http://www.siemens.at/bluetooth

The following two roles are defined for the RSA profile:

SAP Server

The SIM Access server has direct access to a SIM. It operates as a SIM card reader, which assists the client in accessing and controlling the SIM via the serial link. Typical examples of a server are a SIM card reader or a cellular phone integrated in the car environment, see Figure 1.

SAP Client

The SIM Access client is connected via a serial link to the SIM Access server. The Client accesses and controls the SIM inside the Server via the serial link. The typical example of a client is a cellular phone which uses a SIM card in the server for connecting to the GSM network, see Figure 1. Additional AT commands enable the AC45 to use either an external or the physically attached (local) SIM card during a GSM connection.

Please note that the ME supports both roles.

8.1 AT^SRSA Remote SIM Access Activation

Test command AT^SRSA=?	Response ^SRSA: (list of supported **<devId>**s), (list of supported **<sapRole>**s), (list of supported **<muxChan>**s) , (list of supported **<dataForm>**s), (list of supported **<beaconPer>**s), (list of supported **<discType>**s) OK
Read command AT^SRSA?	The read command can be used to request the current RSA settings. The TA returns all available RSA connections. Response [^SRSA: **<devId>**, **<sapRole>**, **<connState>**, **<muxChan>**, **<dataForm>**, **<beaconPer>]** OK
Write command AT^SRSA= <devId> ,<sapRole> [,<muxChan> [,<dataForm> [,<beaconPer> [,<discType>]]]]	The write command allows selecting the AC45's SIM usage scheme as well as the related configuration parameters. Response ^SRSA: **<actResult>** OK Parameter **<actResult>** RSA activation command result. 0 No error Parameter valid, SAP mode change initiated. Mode change will be displayed via URC ^SRSA, see below. Other results indicating invalid activation requests. No SAP mode change is initiated. 1 Error unspecified 2 Error activation command is busy 3 Error activation started with serial multiplex mode is off 4 Error activation started on invalid serial multiplex channel 5 Error device ID is already known 6 Error SAP mode is already active 7 Error invalid parameter **<devId>** Device identification (numeric) Arbitrary number assigned on RSA activation by the user. This parameter will be used for all subsequent RSA communication (AT commands and URCs) related to the activated connection. It is recommended to use different numbers for the SAP server and client. 1…100 **<sapRole>** SIM usage profile of the AC45 (numeric) Users should be aware that switching straight from SAP server to SAP client mode, and vice versa, is not supported. 0 Local SIM If this parameter value is used with write command, meaning depends on parameter **<discType>**.

1 SAP server
Enables Remote SIM Access usage where AC45 operates as SIM Access server. After receiving the SAP message CONNECT_REQ AC45 disconnects from the network and will be used as a SIM card reader. However, please note that under the following circumstances AC45 will not respond to any CONNECT_REQ messages:

- During ongoing calls (voice or data)
- If a GPRS context is activated
- If the Remote SAT interface is activated (AT^SSTA) and a proactive command is ongoing (a detailed description of proactive commands can be found in GSM 11.14)

2 SAP client
Enables Remote SIM Access usage where AC45 operates as SIM Access client. AC45 starts sending the SAP message CONNECT_REQ periodically, refer to parameter **<beaconPer>**. If the same conditions as stated above apply to AC45, it will neither send CONNECT_REQ messages nor a SIM switch will be initiated. In the case that a local SIM card was used the client deregisters from the network and switches to a remote SIM when:

- SAP message CONNECT_RESP is received
- SAP message STATUS_IND is received
- SAP message ATR_RESP is received after the appropriate request has been issued by the client

(See [15] for a detailed description of all SAP message parameter types).

<muxChan> Serial multiplexer channel number (numeric).
Ensure that the multiplex mode has been enabled before RSA activation, for details refer to Chapter 4.28 AT+CMUX
Multiplexer channels 2 and 3 can be reserved for RSA traffic.

Note: After establishing the multiplexer mode according to the multiplexer protocol (see [5] for details) up to three logical channels are available. The selected multiplex channel is dedicated for RSA communication. Please note that logical channel 1 cannot be reserved for RSA traffic because only channel 1 supports the full range of functionality, e.g. CSD calls can only be set up on this channel.

<dataForm> SAP message data format (numeric)

0 XSAP ATC/URC format
SAP messages will be translated into ASCII coded strings and transmitted as parameters of the AT command AT^SRSM and URC “^SRSM”. AT commands which are not related to RSA should not be used after RSA activation on the selected serial multiplexer channel.

1 SAP transparent binary format
The SAP messages will be transmitted as coded in the SAP specification.

<beaconPer> Beacon period (numeric)
Determines the period between sending the CONNECT_REQ messages. A ”0” value leads to a one-time connection request. This parameter is applicable for SAP client activation only.
0…6…100 seconds

	<discType> Type of SAP disconnection (numeric) This parameter is only applicable if **<sapRole>** equals 0. Before deactivating an RSA connection it is recommended to query the status of calls issuing AT+CLCC, see Chapter 4.20 for details. A list of current calls will be returned. Due to the missing SIM access all calls or active GPRS connections will be terminated. 0 Hold SAP role SAP connection will be disabled. The AC45 remains in SAP mode and is ready to (re)establish a SAP connection. If a SAP connection was ongoing an URC **"^SRSA**: **<devId>**, **<sapRole>**, **<connState>** with **<connState>** = 0" is issued. • A server exclusively sends a SAP message DISCONNECT_IND (type "Graceful") to the client. • The client saves data temporarily stored in the AC45 memory to the remote SIM and sends the SAP message DISCONNECT_REQ to the server. The client restarts sending CONNECTION_REQ messages on request. In the case that a local SIM is attached the ME will use it to register to the GSM network until a server offers its SIM again. 1 Terminating the SAP operation SAP connection is disabled, ME returns to local SIM mode and an URC "**^SRSA**: **<devId>**,**<sapRole>**, **<connState>** with **<sapRole>** = 0 and **<connState>**= 0" will be displayed. • A Server sends a SAP message DISCONNECT_IND (type "Immediate") to the client and returns to local SIM mode immediately. SIM data, temporarily stored in the client's memory will not be saved. • A client exclusively sends SAP message DISCONNECT_REQ to the server. Without saving temporary data to a remote SIM or waiting for DISCONNECT_RESP the client returns to local SIM mode immediately. **<connState>** Current SAP connection state (numeric) 0 No SAP connection established 1 SAP connection ongoing, i.e. peer exchange messages
Unsolicited Result Code	This URC will be generated if either the SIM usage scheme or the SAP connection status has changed due to SAP message communication or AT command control. **^SRSA: <devId> ,<sapRole>, <connState>**
Reference Siemens	Note • If **AT^SRSA** with **<dataForm>** set to 1 (SAP) will be issued on the same logical multiplex channel as specified with parameter **<muxChan>** the SAP data transfer mode is entered immediately. In this case AC45 will not issue a command response. • If AC45 operates as SAP client and has been switched to a remote SIM it starts accessing the remote SIM. In the case that during this time AT commands are used which need access to the SIM card (e.g. AT+CPIN?) AC45 responds „+CME ERROR: SIM blocked" or "+CME ERROR: SIM busy". Retry until SIM is fully accessible. • If AC45 operates as SAP server and the SIM card has been released to a client, AC45 considers its SIM as not usable for own services. AT commands requiring SIM access will be rejected and AC45 returns "+CME ERROR: SIM not inserted".

8.2 AT^SRSM Remote SIM Access Message

This command is used to transfer SAP messages between cellular devices acting as SAP server or client. It is applicable for XSAP data format only, for details refer to AT^SRSA, paramter **<dataForm>**.

Test command AT^SRSM=?	Response OK
Write command AT^SRSM = <RsaDevId>, <RsaMsgId> [,<RsaMsgData> [,<RsaMsgLen> [,<RsaMsgRc>]]]	The write command is intended to send SAP messages to an ME acting as SAP server or client. Response OK Parameter **<RsaDevId>** Device identification (numeric) Number assigned by the host on RSA activation via AT^SRSA, parameter **<devId>.** **<RsaMsgId>** RSA message identification (numeric). For details see chapters 8.2.1 and 8.2.2. **<RsaMsgData>** RSA message data (string). For details see chapters 8.2.1 and 8.2.2. **<RsaMsgLen>** RSA message data length (numeric). For details see chapters 8.2.1 and 8.2.2. **<RsaMsgRc>** RSA message result code (numeric). For details see chapters 8.2.1 and 8.2.2. **<MaxMsgSize>** SAP parameter MaxMsgSize (numeric). Handling of this parameter is as follows: • If AC45 operates as SAP client the requested value of **<MaxMsgSize>** is 300. During SAP connection setup this value may be negotiated with the server to the minimal value 274, which is calculated by 256 data bytes as part of a TRANSFER_APDU_RESP message plus a 16 byte SAP header and two status bytes. If the server does not accept this value no SAP connection will be established. • If the AC45 is acting as SAP server this requires that a **<MaxMsgSize>** value of 276 will be accepted by a connected client. **<ConnStatus>** SAP parameter connection status (numeric) **<DiscType>** SAP parameter disconnection type (numeric) **<CmdApdu>** SAP parameter command APDU (string) **<CmdApduLen>** SAP parameter command APDU length (string) **<RspApdu>** SAP parameter response APDU (string) **<RspApduLen>** SAP parameter response length (numeric) **<ATR>** SAP parameter APR (string) **<AtrLen>** SAP parameter ATR length (numeric) **<ResCode>** SAP parameter result code (numeric) **<CardRdStatus>** SAP parameter card reader status (numeric) **<StatusChange>** SAP parameter status change (numeric)

Unsolicited Result Code	This URC will be issued by the ME operating as SAP server or client in order to transfer SAP message data. **^SRSM: <RsaDevId>, <RsaMsgId>[, <RsaMsgData> [,<RsaMsgLen> [,<RsaMsgRc>]]]**
Reference Siemens	Note

8.2.1 SAP request message parameters

The following table describes all SAP request messages used if:

- the URC "^SRSM:" is displayed by an ME acting as SAP client, then
- the AT^SRSM write command transfers data to an ME acting as SAP server.

Table 18: SAP request message parameter mapping

SAP Request Message Parameter Table		
SAP Message		SAP parameter mapping to AT^SRSA parameters **<RsaMsgId>** [,**<RsaMsgData>** [,**<RsaMsgLen>** [, **<RsaMsgRc>**]]]
Id	Name	
0	CONNECT_REQ	0,, **<MaxMsgSize>**
2	DISCONNECT_REQ	2
5	TRANSFER_APDU_REQ	5, **<CmdApdu>**, **<CmdApduLen>**
7	TRANSFER_ATR_REQ	7
9	POWER_SIM_OFF_REQ	9
11	POWER_SIM_ON_REQ	11
13	RESET_SIM_REQ	13
15	TRANSFER_CARD_READER_STATUS_REQ	15

8.2.2 SAP response message parameters

The table below lists all SAP response and indication message parameters used if:

- the URC "^SRSM:" is issued by the ME operating as SAP server, then
- the AT^SRSM write command sending data to an ME acting as SAP client

Table 19: SAP response message parameter mapping

SAP Response and Indication Message Parameter Table		
SAP Message		SAP parameter mapping to AT^SRSM parameters **<RsaMsgId>** [,**<RsaMsgData>** [,**<RsaMsgLen>** [,**<RsaMsgRc>**]]]
Id	Name	
1	CONNECT_RESP	1,, **<MaxMsgSize>**, **<ConnStatus>**
3	DISCONNECT_RESP	3
4	DISCONNECT_IND	4,, , **<DiscType>**
6	TRANSFER_APDU_RESP	6, **<RespApdu>**, **<RespApduLen>**, **<ResCode>**
8	TRANSFER_ATR_RESP	8, **<ATR>**, **<AtrLen>**, **<ResCode>**
10	POWER_SIM_OFF_RESP	10,,, **<ResCode>**
12	POWER_SIM_ON_RESP	12,,, **<ResCode>**
14	RESET_SIM_RESP	14,,, **<ResCode>**
16	TRANSFER_CARD_READER_STATUS_RESP	16,, **<CardRdStatus>**, **<ResCode>**
17	STATUS_IND	17,,, **<StatusChange>**
18	ERROR_RESP	18

9 Siemens defined AT commands for enhanced functions

Self-defined commands do not have to be implemented in accordance with the official syntax. The "+C" string can therefore be replaced by "^S" ("^" = 0x5E). If a self-defined command with the same syntax will be included in future in the GSM recommendations, the command can be addressed with both strings.

9.1 AT+CXXCID Display card ID (identical to AT^SCID)

Test command AT+CXXCID=?	Response **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter
Execute command AT+CXXCID	Response TA returns the card identification number in SIM (SIM file EF ICCID, see GSM 11.11 Chap.10.1.1) as string type. See **^SCID** Parameter See **^SCID**
Reference Siemens	Note

9.2 AT^MONI Monitor idle mode and dedicated mode

Cell information can be issued in the form of periodic outputs (depending on <**period**> set with the Write command), or it can be queried directly using the Execute command.

Test command AT^MONI=?	Response ^MONI: (list of supported < **period** >s) **OK**
Write command AT^MONI =<period>	This command can be used to retrieve information of the serving/dedicated cell *automatically* every *n* seconds. To stop the presentation type any character. Note: The two header lines (see below) are output after every ten data lines. Response See execute command Parameter **<period>** 1 – 254 Display period in seconds
Execute command AT^MONI	This command can be used to retrieve the cell parameters of the serving/dedicated cell *on request*. Note: The length of following output lines exceeds 80 characters. Therefore a terminal program may draw a carriage return on a screen. However, this is not part of the response.

Response (Examples)

MS is not connected:

a) MS is camping on a cell and registered to the network:

```
Serving Cell                                          I Dedicated channel
chann rs  dBm MCC MNC  LAC cell NCC BCC PWR RXLev  C1 I chann TS timAdv PWR  dBm Q ChMod
1013  21  -71 001  01 1001 0103   7   7  33  -105  33 I    No connection
```

b) MS is camping on a cell but not registered to the network (only emergency call allowed):

```
Serving Cell                                          I Dedicated channel
chann rs  dBm MCC MNC  LAC cell NCC BCC PWR RXLev  C1 I chann TS timAdv PWR  dBm Q ChMod
 477  21  -71 123 456 A123 B456   5   3  33  -105  33 I    Limited Service
```

c) MS is camping on a cell but searching for a better cell (cell reselection)

```
Serving Cell                                          I Dedicated channel
chann rs  dBm MCC MNC  LAC cell NCC BCC PWR RXLev  C1 I chann TS timAdv PWR  dBm Q ChMod
1013   4 -106 001  01 1001 0103   7   7  33  -105  -1 I    Cell Reselection
```

d) MS is searching, could not (yet) find a suitable cell

```
Serving Cell                                          I Dedicated channel
chann rs  dBm MCC MNC  LAC cell NCC BCC PWR RXLev  C1 I chann TS timAdv PWR  dBm Q ChMod
  Searching
```

MS is connected:

```
Serving Cell                                          I Dedicated channel
chann rs  dBm MCC MNC  LAC cell NCC BCC PWR RXLev  C1 I chann TS timAdv PWR  dBm Q ChMod
1013  19  -76 001  01 1001 0103   7   7  33  -105  33 I 1015   1      0   5  -76 0 S_HR
```

Parameters

Serving Cell:

chann	ARFCN (Absolute Frequency Channel Number) of the BCCH carrier
rs	RSSI value 0 – 63 (RSSI = Received signal strength indication)
dBm	receiving level of the BCCH carrier in dBm
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
LAC	location area code, see note below.
cell	cell ID, see note below.
NCC	PLMN colour code
BCC	base station colour code
PWR	maximal power level used on RACH channel in dBm
RXLev	minimal receiving level (in dBm) to allow registration
C1	cell selection criterion

Dedicated channel:

chann	ARFCN (Absolute Frequency Channel Number) of the TCH carrier Note: <**chann**> = **h** indicates frequency hopping.
TS	timeslot number
timAdv	timing advance in bits
PWR	current power level
dBm	receiving level of the traffic channel carrier in dBm
Q	receiving quality (0–7)
ChMod	channel mode (S_HR: Half rate, S_FR: Full rate, S_EFR: Enhanced Full Rate)

Depending on the service state, an additional textual output is generated (refer also to the response examples):

'Searching' - The MS is searching, but could not (yet) find a suitable cell. This output appears after restart of the MS or after loss of coverage.

'No connection' - The MS is camping on a cell and registered to the network. The service state is 'idle', i.e. there is no connection established or a dedicated channel in use.

'Cell Reselection' - The MS has not yet lost coverage but is searching for a better cell, since the cell reselection criterion is fulfilled.

'Limited Service' - The MS is camping on a cell but not registered to the network. Only emergency calls are allowed. The MS enters this state, for example, when

- no SIM card is inserted, or PIN has not been given,
- neither Home PLMN nor any other allowed PLMN are found,
- registration request was not answered or denied by the network (use command AT+CREG to query the registration status),
- authentication failed.

Reference	Note
Siemens	• The parameters **LAC** and **cell** are presented as hexadecimal digits, the remaining parameters are composed of decimal digits. • If the radio cell changes during a connection, the parameters **PWR**, **RXLev** and **C1** of the 'Serving Cell' part are not available under certain conditions and therefore, are displayed as "-" (for conditions see also **+CREG**, pg 147). This is because the MS does not update the cell selection and reselection parameters since, in this mode, they are not relevant for operation. When the connection ends, and the mobile is back to IDLE mode, correct values will be given. If the radio cell changes during a connection, it normally takes 1 or 2 seconds to update the parameters **cell**, **NCC** and **BCC**. Until the information is received from the new base station, the default values will be shown instead: cell="0000", NCC="-", BCC="-". • If the BS supports frequency hopping during a connection, the dedicated channel (parameter **chann**) is not stable. This mode is indicated by **chann** = '**h**'. • To some extent, the cell monitoring command AT^SMONC covers the same parameters. The receiving level, for example, can be queried with both commands. Yet the resulting values may be slightly different, even though obtained over a time period of a few seconds. This is quite normal and nothing to worry about, as the cell information is permanently updated.

9.3 AT^MONP Monitor neighbour cells

Cell information can be issued in the form of periodic outputs (depending on <**period**> set with the Write command), or it can be queried directly using the Execute command.

Test command AT^MONP=?	Response **^MONP:** (list of supported < **period** >s) **OK**
Write command AT^MONP =<period>	This command can be used to retrieve information of up to six neighbour cells *automatically* every *n* seconds. To stop the presentation type any character. Response See execute command Parameter **<period>** 1 – 254 Display period in seconds
Execute command AT^MONP	This command can be used to obtain information of up to six neighbour cells *on request*. Parameters **Chann** ARFCN (Absolute Frequency Channel Number) of the BCCH carrier **rs** RSSI value 0 – 63 (RSSI = Received signal strength indication) **dBm** Receiving level in dBm **MCC** Mobile Country Code (first part of the PLMN code) **MNC** Mobile Network Code (second part of the PLMN code) **BCC** Base Station colour code **C1** cell selection selection criterion **C2** cell reselection criterion

Example	AT^MONP
	`chann rs dBm MCC MNC BCC C1 C2`
	`504 18 -78 262 03 1 27 27`
	`476 15 -83 262 03 3 22 22`
	`421 13 -88 262 03 1 17 17`
	`440 10 -93 262 03 7 12 12`
	`446 9 -95 262 03 7 10 10`
	`417 8 -97 262 03 4 8 8`
	OK

Reference Siemens	Note Due to the fact that not all necessary information of the neighbour cells can be decoded during a connection, there are several constraints to be considered: • Only neighbour cells that have already been visible in IDLE mode will be further updated, as long as they are still included in the list. • Though new neighbour cells can be added to the list (e.g. due to handover), their C1 and C2 parameters cannot be displayed until the connection is released. In this case "-" is presented for C1 and C2. • To some extent, the cell monitoring command AT^SMONC covers the same parameters. The receiving level, for example, can be queried with both commands. Yet the resulting values may be slightly different, even though obtained over a time period of a few seconds. This is quite normal and nothing to worry about, as the cell information is permanently updated.

9.4 AT^SACM Advice of charge and query of ACM and ACMmax

Test command AT^SACM=?	Response **^SACM**: (list of supported **<n>**s) **OK** Parameter See write command
Execute command AT^SACM	The execute command can be used to query the current mode of the Advice of Charge supplementary service, the SIM values of the accumulated call meter (ACM) and accumulated call meter maximum (ACMmax). Response **^SACM: <n>,<acm>,<acm_max> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<n>** See write command **<acm>** ACM, string type; three bytes of the current ACM value in hexadecimal format (e.g. “00001E” indicates decimal value 30) 000000–FFFFFF **<acm_max>** ACMmax, string type; three bytes of the max. ACM value in hexadecimal format (e.g. “00001E” indicates decimal value 30) 000000 disable ACMmax feature 000001-FFFFFF **<ccm>** string type; three bytes of the current CCM value in hexadecimal format (e.g. “00001E” indicates decimal value 30); bytes are coded in the same way as ACMmax value in the SIM 000000-FFFFFF
Write command AT^SACM=<n>	The write command enables or disables the presentation of unsolicited result codes to report the call charges. Response **OK** or if error is related to ME functionality: **+CME ERROR: <err>** Parameter **<n>** 0 suppress unsolicited result code 1 display unsolicited result code When you power down or reset the ME with AT+CFUN=1,1 the URC presentation mode will be reset to its default. To benefit from the URC it is recommended to have the setting included in the user profile saved with AT&W, or to select **<n>=1** every time you reboot the ME. Unsolicited result code When activated, an unsolicited result code is sent when the CCM value changes, but not more often than every 10 seconds **+CCCM: <ccm>**
Reference Siemens	Note See also GSM07.07: AT+CACM, AT+CAMM, AT+CAOC

9.5 AT^SAD Antenna diagnosis

The command can be used to perform a diagnosis of the antenna status. To benefit from this feature a resistor must be placed close to the antenna connector or integrated into the antenna. For details please refer to [1].

Free use of the technology in view of intellectual property rights is not guaranteed.

Test command AT^SAD=?	The Test command returns a list of the supported diagnostic responses. Response **^SAD:** (list of supported **<diag>**s) Parameter See write command
Execute command AT^SAD	The execute command can be executed no matter whether the ME is registered to the network or deregistered. The displayed <diag> value is the result of measurements taken at varying intervals, depending on the ME's operating mode: Duration increases to about 30 seconds, if the ME is deregistered, and decreases when it is registered. Minimum time is required in TALK/DATA mode. This means, the displayed value will never be older than 30 seconds. Users are advised to wait for a brief moment (for example until network registration has been completed) before entering the command once again. Response If the measurement is successful: **^SAD: <diag>** **OK** Parameter **<diag>** Antenna diagnosis value (numeric) 0 Normal operation, antenna connected (resistor available). 1 Antenna connector short-circuited to ground. 2 Antenna connector short-circuited to supply voltage (12V or 24V) (i.e. any external applied voltage higher than +2.5V) 3 Antenna not connected or no resistor available in antenna circuit.
Reference Siemens	Note The antenna diagnosis delivers the present status of the antenna connection by measuring the resistance of the antenna circuit. It does not give a clear conclusion on whether the mobile is capable to set up or continue a call.

9.6 AT^SAIC Audio Interface Configuration

Test command AT^SAIC =?	Response **^SAIC:** (list of supported **<io>**s), (list of supported **<mic>**s), (list of supported **<ep>**s) Parameter See write command
Read command AT^SAIC?	Response **^SAIC: <io>,<mic>,<ep> OK** Parameter See write command
Write command AT^SAIC=<io>[,<mic>[,<ep>]]	This command configures the interface connections of the active audio mode. Response **OK** Parameter **<io>** Input and output 1 Not supported. 2 Type of audio interface: Analog **<mic>** Selects the microphone input (if parameter is not specified, the current value is used) 1 Selects the microphone 1 connected to analog interface 1. 2 Selects the microphone 2 connected to analog interface 2. **<ep>** Selects differential earpiece amplifier (if parameter is not specified, the current value is used) 1 Selects the earpiece amplifier 1. 2 Selects the earpiece amplifier 2. 3 Selects both amplifiers. Note that both amplifiers are connected in parallel and therefore, get the same output power if <ep>=3.
Reference Siemens	Note • The AT^SAIC Write command is usable only in audio modes 2 – 6. If AT^SNFS=1, any attempt to use the AT^SAIC Write command returns “+CME ERROR: operation not allowed”. This is because all default parameters in audio mode 1 are determined for type approval and are not adjustable. • For use after restart of AC45, you are advised to store the settings of AT^SAIC and AT^SNFS to the audio profile set with AT^SNFW. Otherwise, audio mode 1 (AT^SNFS=1) and audio interface 2 (AT^SAIC=2,1,1) will be active each time AC45 is powered up. • The factory defaults of AT^SAIC vary with the selected audio mode. If AT^SNFS=1 or 4 or 5, then AT^SAIC=2,1,1 If AT^SNFS=2 or 3 or 6, then AT^SAIC=2,2,2 AT^SNFD can be used to reset the factory defaults. • To allocate a specific audio mode to each analog audio interface, first select the audio mode with AT^SNFS and then choose the interface using AT^SAIC. • See Chapter 9.27 for SNFD, Chapter 9.32 for AT^SNFS and Chapter 9.34 for AT^SNFW.

9.7 AT^SBC Battery charge and charger control

Test command AT^SBC=?	Response ^SBC: (list of supported <bcs>s),(list of supported <bcl>s),<mpc> module power consumption
Read command AT^SBC?	The Read command can be used to query the average current consumption of the module. Response **^SBC: <bcs>,<bcl>,<mpc>** Parameter <bcs> Connection status of charging adapter. Not relevant for AC45. 0 No charging adapter is connected. <bcl> Battery capacity. Not relevant for AC45. 0 Indicates that no battery is available. <mpc> Average power consumption. 0 – 5000 ME's power consumption in mA averaged over a couple of seconds.
Write command AT^SBC=<n>	The Write command determines the presentation of Unsolicited Result Codes used to indicate undervoltage conditions. Response **OK** Parameter <n> 0 Disables presentation of Undervoltage URC 1 Enables presentation of Undervoltage URC
	Unsolicited result code **^SBC: Undervoltage** The URC will be sent if undervoltage is detected. If the module is in IDLE mode it takes typically one minute to deregister from the network and to switch off.
Reference Siemens	Note

9.8 AT^SCID Display SIM card identification number

Test command AT^SCID=?	Response **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter
Execute command AT^SCID	Response TA returns the identification number of the SIM card (see GSM 11.11 Chapter 10.1.1). **^SCID: <cid> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<cid>** string type: card identification number of SIM card
Reference Siemens	Note

9.9 AT^SCKS Query SIM and chip card holder status

This command queries the connection status of the SIM and the card holder tray and controls the URC presentation mode.

The query can be used for the locally attached and remote SIM cards. For details regarding Remote SIM Access refer to the AT^SRSA command described in Chapter 8.1.

Test command AT^SCKS=?	Response **^SCKS:** (list of supported **<modes>**s) **OK** Parameter See write command
Read command AT^SCKS?	The read command returns the URC presentation mode and the status of the SIM card connection. Response **^SCKS: <mode>, <SimStatus> OK** Parameter See write command
Write command AT^SCKS= <mode>	The write command enables or disables the presentation of URCs to report whether or not the SIM card is connected. When the ME is powered down with AT^SMSO or reset with AT+CFUN=n,1 the presentation mode **<mode>** will not be retained. To benefit from the URCs, it is recommended to save the setting **<mode>=1** to the user profile (AT&W), or activate it every time you reboot the ME. Response **OK / ERROR / +CME ERROR <err>** Parameter **<mode>** 0 Suppress unsolicited result codes 1 Output unsolicited result codes **<SimStatus>** 0 Card holder tray removed or SIM card connection error 1 SIM card inserted (see note below) 2 The SIM interface hardware has been deactivated to prevent possible damage (e.g. if a SIM with invalid or unsupported electrical specifications has been detected). The SIM interface can be reactivated only with the restart of the module (e.g. with AT+CFUN=n,1). Unsolicited result code When the ME's SIM connection status has changed, an unsolicited result code is sent to the TE. **^SCKS: <SimStatus>**

Reference	Note
Siemens	Note that <**SimStatus**> reflects the status of the SIM and the card holder tray. If an empty SIM card tray is inserted, two URCs will be output, indicating the status 1 and 0, as shown in the example below.
Example	`at^scks=1` Activates the presentation of unsolicited result codes: `OK` Now, after inserting an empty card tray the following URCs appear: `^SCKS: 1` Tray connected `^SCKS: 0` No SIM card found.

9.10 AT^SCNI List Call Number Information

Test command AT^SCNI=?	Response **OK**
Execute command AT^SCNI	Response TA returns a list of current calls of ME. **[^SCNI: <id1>[,<cs>[,<number>,<type>]]]** **[^SCNI: <id2>[,<cs>[,<number>,<type>]]]** **[...] OK** If error is related to ME functionality: **+CME ERROR: <err>**
	Parameter **<idx>** 1–7 integer type; call identification number as described in GSM 02.30[19] subclause 4.5.5.1; this number can be used in +CHLD command operations **<cs>** Call status of respective call number (first parameter) 0 call hold 1 call in progress 2 Waiting call **<number>** string type phone number in format specified by <type> **<type>** type of address octet in integer format; 145 when dialing string includes international access code character “+”, otherwise 129
Reference Siemens	Note See also GSM 07.07: AT+CLCC

9.11 AT^SCTM Set critical operating temperature presentation mode or query temperature

This command can be used to monitor the temperature of the module.

CAUTION: During a guard period of two minutes after power-up, the module will not switch off, even if the critical temperature is exceeded. This allows the user to make emergency calls, or to call a predefined <phone number>, before the module switches off. During the guard period the modules operates in an automatic mode: URCs can be always displayed regardless of the selected mode <n>.

Test command AT^SCTM=?	Response If parameter <**p**> = **0**: **^SCTM:** (list of supported <**n**>s) **OK** If parameter <**p**> = **1**: **^SCTM:** (list of supported <**n**>s),(range of <**temp**> in degrees Celsius) **OK**
Read command AT^SCTM?	TA returns the following parameters • URC presentation mode • Information about the current temperature range of the module. • The board temperature in degrees Celsius if <**p**>=**1**. • Phone number, if defined. If <phone number> is not defined, the parameter will be let out. Response If no <phone number> is defined and parameter <**p**> = **0**: **^SCTM: <n>, <m>** **OK** If no <phone number> is defined and parameter <**p**> = **1**: **^SCTM: <n>, <m>, <temp>** **OK** If <phone number> is defined and parameter <**p**> = **0**: **^SCTM: <n>, <m>, <phone number>** **OK** If <phone number> is defined and parameter <**p**> = **1**: **^SCTM: <n>, <m>, <temp>, <phone number>** **OK** Parameters **<n>** See write command. **<m>** -2 Low temperature limit is exceeded (causes switch-off except in cases described in Chapter 9.11.1) -1 Board is close to low temperature limit 0 Normal operating temperature 1 Board is close to high temperature limit 2 High temperature limit is exceeded (causes switch-off except in cases described in Chapter 9.11.1)

	<temp>	Current board temperature in degrees Celsius. The value is comprised between lowest and upper temperature limits.
	<phone number>	See write command
Write command AT^SCTM=<n>[, <p>[, <phone number>]]	The write command serves to control the URC presentation mode, to specify a phone number and to select modes of temperature indication in the test/read command. The parameters <n> and <p> will not be stored upon Power Down, i.e. after re-start or reset, the defaults <n>=0 and <p>=0 will be restored. To benefit from the URCs <n>=1 needs to be selected every time you reboot the module. The same applies to <p>=1. AT&F resets <n>=0 and <p>=0. Response **OK \ ERROR \ CME ERROR** Parameters **<n>** 0 Presentation of URCs disabled (except for <m> equal to –2 or +2). 1 Presentation of URCs enabled. **<p>** 0 Suppress output of <temp> in test and read command. 1 Enable presentation of <temp> in test and read command. **<phone number>** User defined phone number for deferred switch-off (string). One phone number (in international format) that can be called even if a critical temperature limit is exceeded. The number will be stored permanently in the ME. Please refer to Chapter 9.11.1 for more information about the deferred temperature switch-off. The phone number must be in international format, i.e. it must begin with the international access character ”+”. If the use of call modifiers (such as ”G”,”I” or ”*31#”) is possible when starting a call to <phone number>, the modifiers must be stored together with the number, and entered every time the number is called. Otherwise, the number may not be recognized, so a temperature switch-off will not be deferred by the active call. The maximum length for the number is 41 digits including the mandatory ”+” sign. If parameter <phone number> left out, an already stored number will remain unchanged. If parameter <phone number> is invalid, an already stored number will be erased. In order to ”orderly” erase a number previously stored as <phone number>, enter an empty string ”” as parameter value.	
Unsolicited result code	URCs will be automatically sent to the TA when the temperature reaches or exceeds the critical level, or when it is back to normal. **^SCTM_B: <m>** Temperature range of the AC45 board. See read command for defined values.	

Reference Siemens	Note • Please refer to [1] for specifications on critical temperature ranges. • To avoid damage the module will shut down once the critical temperature is exceeded. For exceptions Chapter 9.11.1. The shutdown procedure is equivalent to the power-down initiated with AT^SMSO. • URCs indicating the alert level "1" or "-1" are intended to enable the user to take appropriate precautions, such as protect the module or battery from exposure to extreme conditions, or save or back up data etc. The presentation of "1" or "-1" URCs depends on the settings selected with the write command: If <n>=0: Presentation is enabled during the two minute guard period after the module was switched on. After expiry of the two minute guard period, the presentation will be disabled, i.e. no URCs with alert levels “1” or “-1” will be generated. If <n>= 1: Presentation of "1" or "-1" URCs is always enabled. • Level "2" or "-2" URCs are followed by immediate shutdown except in cases described in Chapter 9.11.1. The presentation of these xURCs is always enabled, i.e. they will be output even though the factory setting AT^SCTM=0 was never changed. • If the temperature limit is exceeded while an emergency call is in progress the module continues to measure the temperature and to deliver alert messages, but deactivates the shutdown functionality. Once the call is terminated full temperature control will be resumed. If the temperature is still out of range AC45 switches off immediately.
Examples	URCs issued when the board temperature is out of range: `^SCTM_B: 1` Caution: Board is close to upper temperature limit. `^SCTM_B: 2` Alert: Board exceeds upper temperature limit and switches off. `^SCTM_B: -1` Caution: Board close to low temperature limit. `^SCTM_B: -2` Alert: Board exceeds low temperature limit and switches off.
Example	URC issued when board temperature is back to normal `^SCTM_B: 0`

9.11.1 Deferred shutdown

In the following cases, shutdown will be deferred if a critical temperature limit is exceeded:

- while an emergency call is in progress
- while a call to predefined number <phone number> is in progress
- during a two minute guard period after powerup. This guard period has been introduced in order to allow the user to make an emergency call or a call to <phone number>. The start of any one of these calls extends the guard period until the end of the call. Any other network activity may be terminated by shutdown upon expiry of the guard time.

While in a ”deferred shutdown” situation, the engine continues to measure the temperature and to deliver alert messages, but deactivates the shutdown functionality. Once the guard period is expired or the call is terminated, full temperature control will be resumed. If the temperature is still out of range, ME switches off immediately (without another alert message).

CAUTION! Automatic shutdown is a safety feature intended to prevent damage to the module. Extended usage of the deferred shutdown facilities provided may result in damage to the module, and possibly other severe consequences.

9.12 AT^SDLD Delete the "last number redial" memory

Test command AT^SDLD=?	Response **OK**
Execute command AT^SDLD	The execute command deletes all numbers stored in the LD memory. Response **OK / ERROR / +CME ERROR**
Reference Siemens	Note

9.13 AT^SHOM Display Homezone

Test command AT^SHOM=?	Response **OK** Parameter See execute command		
Execute command AT^SHOM	Response TA returns homezone state. Result is valid only if network registration state <stat> is 1 (registered). See AT+CREG in Chapter 4.41 for details. The feature is available only for supported network operators (O_2, One2One, Orange and LCI) and requires a suitable SIM card. If the homezone feature is not supported by the network operator or SIM card, result is always 0. **^SHOM: <homezonestate> OK** Parameters **<homezonestate>**	0 1	ME is out of Homezone ME is within the Homezone
Reference Siemens	Note		

9.14 AT^SIND Extended Indicator Control

AT^SIND is a Siemens defined command for extended indicator control. Its major benefit is to give you greater flexibility than the standard command AT+CIND described in Chapter 4.19: For example, AT^SIND offers a further indicator. Another advantage over AT+CIND is that you can easily view the current status of all indicators supported by AT+CIND and AT^SIND. Also, you can use the AT^SIND write command to register or deregister the indicators of both commands.

All indicator event reports are displayed to the TE via +CIEV URCs. To control the presentation mode of these URCs use the AT+CMER command described in Chapter 4.26.

Test command AT^SIND=?	Response **^SIND: (<indDescr>**,(list of supported **<indValue>**s)) [,(**<indDescr>**,(list of supported **<indValue>**s))[,...]], (list of supported **<mode>**s) Parameters See read command
Read command AT^SIND?	ME provides a list of all indicators supported by AT+CIND and AT^SIND. Each indicator is represented with its registration mode and current value. Response **^SIND: <indDescr>, <mode>, <indValue>** **OK** If error is related to ME functionality **+CME ERROR: <err>** Parameters See write command
Write command AT^SIND= <indDescr>, <mode>	The write command can be used to select a single indicator in order to modify its registration and to view the current value. Response **^SIND: <indDescr>, <mode>, <indValue>** **OK** If error is related to ME functionality **+CME ERROR: <err>** Parameters **<indValue>** Integer type value in the range stated below for the corresponding **<indDescr>** **<indDescr>** String values and their **<indValue>** ranges: All indicators supported by AT+CIND are accessible with this command, too. For a detailed description of these indicators refer to Chapter 4.19. The following indicators are accessible via AT^SIND only: "netlost" 1 Network registration or location update failed because of bad uplink connection. 0 Network registration or location update succeeded.

	"ciphcall" Indication of ciphering status change As stated in GSM specifications 02.07 and 02.09 the ciphering indicator feature allows the ME to detect that ciphering is not switched on and to indicate this to the user. The ciphering indicator feature may be disabled by the home network operator setting data in the ”administrative data” field (EF_{AD}) in the SIM, as defined in GSM 11.11. If this feature is not disabled by the SIM, then whenever a connection is in place, which is, or becomes unenciphered, an indication shall be given to the user. This enables the user’s decision how to proceed. The read command returns a valid ciphering status only if a call is in progress or active. If EF_{AD} setting disables the ciphering indicator feature the read command always indicates a ciphered link and no URC presentaion will take place. Note: If unciphered mobile originated SMS is performed AT^SIND ”ciphcall” URCs on the same serial channel will be issued after the related ”OK” and indicate the ciphering state at this time. 0 Current call is not ciphered. 1 Current call in ciphered. <**mode**> (integer type value) 0 Indicator is deregistered (no indicator event report enabled). 1 Indicator is registered. This means that indicator event report is enabled and can be switched on or off with AT+CMER. Indicators supported by AT+CIND are registered each time the ME is powered up. Indicators defined by AT^SIND only remain deregistered until explicitly enabled. 2 Query the registration status and the current value of a single indicator type.
Reference Siemens	Note

9.15 AT^SLCD Display Last Call Duration

Test command AT^SLCD=?	Response **OK** Parameter See execute command
Execute command AT^SLCD	Response TA returns last call duration or current call duration **^SLCD: <time> OK** Parameter **<time>** string type value; format is "hh:mm:ss", where characters indicate hours, minutes, seconds; e.g. 22:10:00 “22:10:00", max values are 9999:59:59
Reference Siemens	Note

9.16 AT^SLCK Facility lock

Test command AT^SLCK=?	Response **^SLCK**: (list of supported **<facility>**) **OK** Parameter See write command.
Write command AT^SLCK= <facility>,<mode> [,<password> [,<class>]]	Use this command to lock, unlock or interrogate a ME or a network facility **<facility>**. The command can be aborted when network facilities are being set or interrogated. Response If **<mode>** ≠ **2** and command is successful **OK** If **<mode>** = **2** and command is successful **^SLCK: <status>[,<class1>[<CR><LF>** **^SLCK: <status>, class2....]] OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<facility>** Phone security locks: Primarily intended for the client to take safety precautions, ”SC”, “PS” and “FD” can be configured individually. “PS” may also be factory set. “SC” SIM (lock SIM cards). SIM requests password upon ME power-up and when this lock command is issued. <password>: SIM PIN1. The password can be modified with AT+CPWD or AT^SPWD (see Chapters 4.38 and 9.43). If the password is incorrectly entered three times, the SIM PUK1 is required to perform authentication. Input of the SIM PUK1 is possible only with AT+CPIN or ATD. “PS” Phone locked to SIM card. ME requests password when other than current SIM card is inserted. "PS" lock is frequently referred to as "phone lock", or "device lock". Accordingly, the password may be called "phone code" or "device code". <password>: Usually, user defined password. It is needed before the first use of <facility>”PS” and, therefore, must first be specified with AT+CPWD or AT^SPWD, if it has not been predefined by factory settings. If set by factory (e.g. for a prepaid mobile), the password is supplied by the provider or operator. The "PS" password is not associated with the PUK of the SIM card. If it is incorrectly entered three times, the Master Phone Code is required to lift the lock. This is an 8-digit device code associated to the IMEI number of the mobile which can only by obtained from the manufacturer of the AC45 module. Once the Master Phone Code has been acctepted, the mobile is operational, and the "PS" lock is no longer active. In case of failure to enter correct “PS” password see Chapter 4.35.1.

“FD” SIM fixed dialing memory: If the mobile is locked to "FD", only the phone numbers stored to the "FD" memory can be dialed (depending on the SIM card, usually up to 7 numbers).
<password>: SIM PIN2
If a lock on the SIM fixed dialing memory is active, the following applies:

- Outgoing voice, data or fax calls can be made only to numbers stored in "FD" phonebook. Result code depends on the type of the call: For voice calls, indication is "+CME Error 257: Call barred". For data and fax calls, indication is "NO CARRIER".
- Access to defined Supplementary Services such as Call barring, Call waiting, Call forwarding, Call hold and Multiparty is possible only if the exact corresponding public MMI *# code for the desired service is stored in the fixed dialing number phonebook, and used with ATD. AT commands for supplementary service control are barred while "FD" lock is active. Indication is "+CME Error 257: Call barred".
- Access to Unstructured supplementary services ("USSD") is possible only if the exact desired USSD string is stored in the fixed dialling number phone book, and used with ATD. AT commands for USSD are barred while "FD" lock is active. Indication is "+CME Error 257: Call barred".
- SMS can be sent only to phone numbers which are stored in the "fixed dialing numbers" phonebook "FD". Indication is "+CMS Error 302: operation not allowed".
- GPRS commands can be used only if the "fixed dialing numbers" phonebook "FD" contains an entry with phone number "*99#". This single entry enables all GPRS commands, including AT commands and modem compatibility commands like "ATD*99***1#" or "ATD*98***1#".
  Indication is "+CME Error 257: Call barred".

Factory set SIM locks

Typical examples of factory set SIM locks are prepaid phones or network locks, used to restrict the operation of a mobile to a specific provider or operator. The end user should be aware that each of these lock types can only be unlocked if the associated password is available. For example, a mobile can be locked to accept only SIM cards from the respective provider, or even one single SIM card. Once a different SIM card is inserted the ME will prompt the client to enter a specific code. This is not the PUK of the SIM card, but usually an 8-digit code which needs to be requested from the provider.
The locks can only be set by the manufacturer of the AC45 modules and need to be agreed upon between the parties concerned, e.g. provider, operator, distributor etc. on the one side and the manufacturer on the other side. For details contact your local dealer or Siemens AG.
See Chapter 4.35 and 4.35.1 for further instructions.
<password>: Factory set password.

“PF” lock Phone to the very First SIM card
“PN” Network Personalisation
“PU” Network subset Personalisation
“PP” Service Provider Personalisation
“PC” Corporate Personalisation

Supplementary Service: Call barring:
The Supplementary Service "Call Barring" serves to specify conditions under which calls will be disallowed by the network.
The availability of the Supplementary Services varies with the network. To benefit from call barring services the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package. Call barring is protected by a password supplied from the provider or operator. Usually there is one password which applies to all call barring options. For details contact your provider. With AT+CPWD or AT^SPWD the default password can be changed individually. After 3 failed attempts to enter the correct password, the client is required to contact the provider.
When you attempt to set a <facility> or <class> which is not provisioned, not yet subscribed to, or not supported by the module, the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example "OK", "Operation not allowed", "Operation not supported" etc.). To make sure check the call barring status with <mode>=2 and use AT+CEER to view the the extended error response.
<password>: Network dependent password.

"AO" BAOC (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 barring services (applicable only for <mode>=0)
"AC" All inComing barring services (applicable only for <mode>=0)

<mode>
0 unlock
1 lock
2 query status

<password> Password string used to lock or unlock a <facility>. The length of a password and the authority depend on the <facility>. Passwords can be modified with AT+CPWD (Chapter 4.38) or AT^SPWD (Chapter 9.43).

<class> integer or sum of integers each representing a **<class>** of information:

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
x	combination of some of the above classes. For example, the default setting 7 represents the sum of the integers 1, 2 and 4 (call barring for voice, data and fax). The value 255 covers all classes. If the **<class>** parameter is omitted, the default value 7 is used.

See examples in Chapter 4.21.3 for correct handling of class numbers.

<class> 2 (data) comprises all those <class> values between 16 and

	128, that are supported both by the network and the MS. This means, a setting made for <class> 2 applies to all remaining data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate call barring for all data classes, but deactivate it for a specific data class. **<status>** 0 off 1 on
Reference GSM 07.07 GSM 02.04, GSM 02.88, GSM 03.88, GSM 04.88	Note • If an outgoing international voice call is rejected due to active call barring supplementary service, the call will be terminated with result code NO DIALTONE. Under the same conditions, an outgoing fax or data call will be terminated with result code NO CARRIER. • The command has been implemented with the full set of <class> parameters according to GSM 07.07. For actual applicability of a specific <facility> to a specific service or service group (a specific <class> value) please consult table A.1 of GSM 02.04. • See also specification of AT+CLCK in GSM 07.07 and further details in Chapter 4.21. AT^SLCK and AT+CLCK are using the same parameters.

9.17 AT^SLMS List Memory Storage

Test command AT^SLMS=?	Response **OK**
Execute command AT^SLMS	This command lists the used and total storages for short messages. Response **^SLMS: "SM",<total1>,<used1>** **^SLMS: "ME",<total2>,<used2>** **^SLMS: "MT",<total3>,<used3>** **OK** If error is related to ME functionality: **ERROR** **+CMS ERROR** Parameter <total1> (numeric) Available storage entries of SIM message storage (physical storage) <total2> (numeric) Available storage entries of Mobile Equipment message storage (physical storage) <total3> (numeric) Available storage entries of SIM ("SM") and Mobile Equipment ("ME") <used1> (numeric) Number of messages currently used in SIM message storage (physical storage) <used2> (numeric) Number of messages currently used in Mobile Equipment message storage (physical storage) <used3> (numeric) Concatenated logical storage of SIM ("SM") and Mobile Equipment message storage ("ME")
Reference Siemens	Note

9.18 AT^SM20 Set M20 Compatibility

Test command AT^SM20=?	Response **OK**
Read command AT^SM20?	Response **^SM20: <n>,<m>** **OK** Parameters See write command
Write command AT^SM20=<n>	Response M20 is an earlier, widely used SIEMENS GSM engine. The AT^SM20 command selects different modes of responses returned upon execution of the two commands ATD and AT+CMGW. Please note that the AT^SM20 command has no effect on any other features and is not intended to adjust other differences between M20 and AC45. **OK** Parameters **<CallMode>** Call setup response mode (numeric). Applies only to voice calls. 0 Set compatibility to Siemens mobile phones. ME will return “OK” immediately after attempting a call with the ATD command. In case of failure, additional call release indications, such as “NO DIAL TONE, “NO CARRIER”, “BUSY” will follow. 1 Default call setup mode, compatible to M20. ME will return “OK" in case of a successful connection, otherwise one of the call release indications “NO DIAL TONE, “NO CARRIER”, “BUSY” are indicated. Note: If ATD is used while there is already an active call, then “OK” will always be presented immediately after dialing was completed, regardless of the settings selected with AT^SM20. See notes and example given in Chapter 2.6. **<CmgwMode>** Response mode for sending and writing short messages (numeric). Applies to the commands AT+CMGS and AT+CMGW command. See also Chapters 5.6 and 5.7 for more details. 0 Set compatibility to Siemens mobile phones. ME will return +CMS ERROR: <err> when writing or sending of short messages fails. See Chapter 10.1.3 for a list of result codes. 1 Default mode for sending and writing short messages, compatible to M20. ME will return “OK”, no matter whether or not AT+CMGS or AT+CMGW was successfully executed.
Reference Siemens	Note

9.19 AT^SMGL List SMS messages from preferred storage

Test command AT^SMGL=?	Response See command AT+CMGL Parameters See command AT+CMGL
Execute/Write command AT^SMGL [=<stat>]	Response TA returns messages with status value <**stat**> from message storage <**mem1**> to the TE. The status of the messages is u n c h a n g e d (unread remains unread). Otherwise: See command AT+CMGL Parameters See command AT+CMGL
Reference Siemens	Note • See Chapter 5.4 for AT+CMGL. • See also GSM 07.05: AT+CMGL • This command can be used only after SMS data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use one of the SMS read commands will result in "+CME Error: 14" (SIM busy). We recommend to take advantage of the "^SSIM READY" URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.

9.20 AT^SMGR Read SMS message without set to REC READ

Test command	Response
AT^SMGR=?	**OK**
Execute command AT^SMGR= <index>	Parameter See command AT+CMGR
Reference GSM 07.05	Note • The AT^SMGR command is a specific Siemens command with the same syntax as “AT+CMGR Read SMS message”. The only difference is that the status “REC_UNREAD” of a short message is not overwritten to “REC_READ”. • This command can be used only after SMS data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use one of the SMS read commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card • See Chapter 5.5 for AT+CMGR.

9.21 AT^SMGO Set or query SMS overflow presentation mode or query SMS overflow

Test command AT^SMGO=?	Response **^SMGO**: (list of supported <**n**>s) **OK** Parameter See write command
Read command AT^SMGO?	Response TA returns overflow presentation mode and SMS overflow status **^SMGO: <n>,<mode> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT^SMGO=<n>	Response TA sets overflow presentation mode **OK** Parameter <**n**> SMS overflow presentation mode [0] disable 1 enable <**mode**> SMS overflow status 0 space available 1 SMS buffer full (buffer for received short messages is <**mem3**>. See AT+CPMS in Chapter 5.11. 2 Buffer full and new message waiting in SC for delivery to ME
	Unsolicited result code When the SIM overflow status changes, a URC is sent to TE. **^SMGO: <mode>** Parameter See write command
Reference Siemens	Note • Indication during data transfer via break (100 ms). • Incoming Class 1 short messages (ME specific) will be preferably stored to “ME” and may be transferred to the “SM” storage if “ME” is used up. Incoming Class 2 messages (SIM specific) will be placed to the “SM” storage only. If messages with different classes are received, the **^SMGO: 2** indication may be presented, without prior indication of **^SMGO: 1**. The indication **^SMGO: 1** means that both buffers ("ME" and "SM") are full. See also Chapter 5.11. • For more information regarding SIM and ME specific message classes refer to <**dcs**> and the following specifications: GSM 03.38 and 3GPP TS 23.038.

9.22 AT^SMONC Cell Monitoring

Test command AT^SMONC=?	Response **OK**
Execute command AT^SMONC	Response **^SMONC: <MCC>1 , <MNC>1 , <LAC>1 , <cell>1 , <BSIC>1 , <chann>1 , <RSSI>1 , <C1>1 , <C2>1 , <MCC>2 , <MNC>2 , <LAC>2 , <cell>2 , <BSIC>2 , <chann>2 , <RSSI>2 , <C1>2 , <C2>2 , ...** **OK** / If error is related to ME functionality: **+CME ERROR: <err>** Parameters The output contains 9 values from a maximum of 7 base stations. The first base station is the serving cell. Values for one base station in output order: **MCC** Mobile country code, 3 decimal digits, e.g. 232 Value 000: not decoded **MNC** Mobile network code, 2 or 3 decimal digits, e.g. 03 Value 000: not decoded **LAC** Location area code, 4 hexadecimal digits, e.g. 3010 Value 0000: not decoded **cell** Cell ID, 4 hexadecimal digits, e.g. 4EAF Value 0000: not decoded **BSIC** Base station identity code, 2 decimal digits, e.g. 32 Value 00: not decoded **chann** ARFCN (Absolute Frequency Channel Number) of the BCCH carrier, decimal, e.g. 82. Value 0: not decoded. In this case, all remaining parameters related to the same channel are neither decoded. For example, a non-existing cell appears as follows: **000,000,0000,0000,00,0,0,-,-** **RSSI** Received signal level of the BCCH carrier, decimal value from 0 to 63. The indicated value is composed of the measured value in dBm plus an offset. This is in accordance with a formula specified in 3GPP TS 05.08. **C1** Coefficient for base station reselection, decimal, e.g. 30 **C2** Coefficient for base station reselection, decimal, e.g. 30
Example (response)	AT^SMONC ^SMONC: 232,03,3010,4EAF,32,82,38,30,30,232,03,3010,0000,36,88,26,18,18,232,03,3010,4EC3,32,112,23,15,15,232,03,3010,4BDA,34,90,17,9,9,232,03,3010,0000,32,99,15,7,7,232,03,2010,00C0,35,113,9,1,1,232,03,3520,0000,32,85,8,0,0
Reference Siemens	Note • In dedicated mode, under certain conditions the parameters C1 and C2 cannot be updated. In such cases, a **'-'** is presented for C1 and C2. • To some extent, the cell monitoring commands AT^MONI, AT^MONP and AT^SMONC cover the same parameters. The receiving level, for example, can be queried with all three commands. Yet the resulting values may be slightly different, even though obtained over a time period of a few seconds. This is quite normal and nothing to worry about, as the cell information is permanently updated.

9.23 AT^SMONG GPRS Monitor

Test command AT^SMONG=?	Response **^SMONG:** (list of supported <**table**>s,(list of supported **period** >s) **OK**
Write command AT^SMONG=<table>[,<period>]	This command can be used to retrieve GPRS specific cell information *directly on request* or *automatically* every *n* seconds. To stop the presentation type any character. Response **Cell Info Table** **OK / ERROR / +CME ERROR** Parameters **<table>** 1 Cell Info Table **<period>** 1 – 100 Display period in seconds If <period> is omitted the cell data will be presented only once on a single line (as if Execute command was issued). If <period> is given, the cell data will be listed repeatedly on 10 data lines. Every 10th data line is followed by the header, simply to repeat the column titles. Values displayed by <**table**>: **BCCH** ARFCN of BCCH carrier **G** GPRS supported (“1”) or not supported “-“ **PBCCH** If PBCCH is present, indication of ARFCN, else "-" or if Frequency Hopping is used "H" **PAT** Priority Access Threshold (GSM Rec. 04.08 / 10.5.2.37b) 0 Packet access is not allowed in the cell 1 Spare, shall be interpreted as "000" (packet access not allowed) 2 Spare, shall be interpreted as "000" (packet access not allowed) 3 Packet access is allowed for priority level 1 4 Packet access is allowed for priority level 1 to 2 **MCC** Mobile Colour Code **MNC** Mobile Network Code **NOM** Network Operation Mode (1 …3) **TA** Timing Advance Value **RAC** Routing Area Code (as hexadecimal value)
Execute command AT^SMONG	This command can be used to retrieve GPRS specific cell information *directly on request*. The cell data will be output only once on a single line. Response **Cell Info Table** **OK / ERROR / +CME ERROR**
Example (response	AT^SMONG GPRS Monitor BCCH G PBCCH PAT MCC MNC NOM TA RAC # Cell # 0637 1 - 4 234 05 2 00 0B OK
Reference Siemens	Note

9.24 AT^SMSO Switch off mobile station

Test command AT^SMSO=?	Response **OK**
Execute command AT^SMSO	The execute command initiates the power-off procedure. Response **^SMSO: MS OFF** **OK** Unsolicited Result Code **^SHUTDOWN** The URC indicates that all essential data have been stored non-volatile and that AC45 turns off within less than 1 second. Low level of the module's VDD pin verifies that the procedure has completed and AC45 has entered the POWER DOWN mode. Be sure not to disconnect the supply voltage before the URC has been issued or the VDD signal has gone low. Otherwise, you run the risk of losing data. For further details on how to turn off the module see [1].
Reference Siemens	Note • Do not send any further AT command after AT^SMSO. • If AT^SMSO is entered on one of the Multiplexer channels the ME closes the Multiplexer channels, terminates the Multiplexer and deactivates all other functions. Then, the URC "^SHUTDOWN" will be issued on the physical serial interface (ASC0). The URC will be transmitted at the bit rate last activated on ASC0 for use with the Multiplex driver.

9.25 AT^SNFA Set or query microphone attenuation

Test command AT^SNFA=?	Response **^SNFA:** (list of supported <**atten**>s) Parameter See read command
Read command AT^SNFA?	Response TA returns the current attenuation value on the microphone path for the current audio device (selected with AT^SNFS, see section 9.32). **^SNFA: <atten> OK** <**atten**> Integer type value. Range: 0 – 65535. Multiplication factor for input samples. Parameter <atten> is identical with <inCalibrate> of AT^SNFI. Formula used to calculate microphone attenuation (negative gain): Gain in dB = 20 * log(<**atten**>/32768) 0 = Microphone is muted. 32767 = No attenuation on the microphone path. Values greater than 32767 are not used.
Write command AT^SNFA= <atten>	TA controls the large-scale attenuation on the microphone path for the current audio device (selected with AT^SNFS, see 9.32) with the following restrictions: • It is not allowed for audio device 1. • As long as the microphone is muted, the write command is temporarily disabled. • Setting of value 0 is not allowed (use AT^SNFM=0 for this; see section 9.29). • For values greater than 32767, 32767 will be used. Response **OK** If error is related to ME functionality **+CME ERROR: <err>** Parameter See read command
Reference	Note • The command is provided for compatibility with M20 and is a subset to AT^SNFI (see Chapter 9.28) The parameter <**inCalibrate**> of AT+SNFI is identical with <**atten**> of AT^SNFA. • To make the changes persistent use AT^SNFW (see Chapter 9.34). To restore factory defaults use AT^SNFD (see Chapter 9.27). • The write command works only in audio modes 2 to 6. • Command does not require a PIN.
Examples	^SYSSTART at^snfa=? ^SNFA: (0-65535) OK at^snfa? ^SNFA: 32767

```
OK
at^snfs=4
OK
at^snfa=1
OK
at^snfa?
^SNFA: 1
OK
at^snfi?
^SNFI: 5,1
OK
at^snfi=5,45
OK
at^snfa?
^SNFA: 45
OK
```

9.26 Audio programming model

The following figure illustrates how the signal path can be adjusted with the AT command parameters described in the Chapters 9.25 to 9.34.

The programming model is the same for all three interfaces, except for the parameters <outBbcGain> and <inBbcGain> which cannot be modified if the digital audio interface is being used, since in this case the DAC is switched off.

The parameters inBbcGain and inCalibrate can be set with AT^SNFI. All the other parameters are adjusted with AT^SNFO.

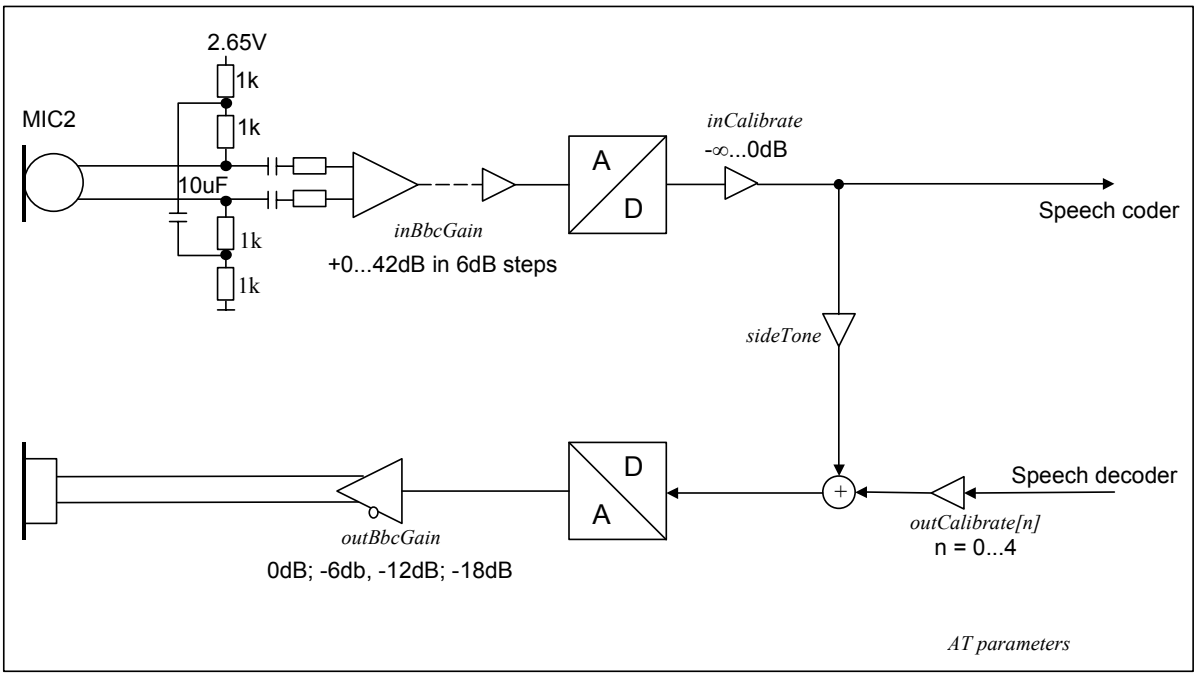

Figure 2: AT audio programming model

9.27 AT^SNFD Set audio parameters to manufacturer default values

Execute command AT^SNFD	TA resets the parameters currently selected in audio modes 2 – 6 to their factory values. The restored values are: AT^SNFI: **<inBbcGain>, <inCalibrate>** (or the equivalent AT^SNFA parameters) AT^SNFO: **<outBbcGain>, <outCalibrate[0]> ... <outCalibrate[4]>, <side Tone>** AT^SAIC: **<io>,<mic>,<ep>** AT^SNFS: **<audMode>** Response **OK**
Reference Siemens	Note Remember that the factory set audio mode 1 is fixed to <outstep>=4. Consequently, AT^SNFD restores <audMode>=1 together with <outstep>=4, but does not affect the values of <outstep> currently selected in audio modes 2 – 6. This means, if <audMode>=1 the read commands AT^SNFO?, AT^SNFV? and AT+CLVL? will always return <outstep>=4. In all other audio modes the <outstep> value is retained until explicitly changed.

9.28 AT^SNFI Set microphone path parameters

Test command AT^SNFI=?	Response **^SNFI:** (list of supported **<inBbcGain>**s), (list of supported **<inCalibrate>**s) **OK** Parameters See write command
Read command AT^SNFI?	Response **^SNFI: < inBbcGain >, <inCalibrate> OK** Parameters See write command
Write command AT^SNFI=<inBbcGain>, <inCalibrate>	Response TA sets microphone path amplifying. **OK**
	Parameters **<inBbcGain>** ADC gain adjustable in eight 6 dB steps from 0 dB to 42 dB: 0 - 7 (where 0 = 0 dB and 7 = 42 dB) **<inCalibrate>** Multiplication factor for input samples: 0 – 32767 Formula to calculate the negative gain (attenuation) of the input signal: Gain in dB = 20 * log (inCalibrate / 32768)
Reference Siemens	Note • The read and write commands refer to the active audio mode. • The write command works only in audio modes 2 to 6. • The range of **<inCalibrate>** is up to 65535 but will be suppressed to 32767. Values above **<inCalibrate>** = 65535 will cause a failure. • Changed values need to be stored with AT^SNFW for use after re-start. To restore factory defaults use AT^SNFD. • Caution: When you adjust the audio parameters avoid exceeding the maximum allowed level. Bear in mind that exposure to excessive levels of noise can cause physical damage to users.

9.29 AT^SNFM Mute microphone

Test command AT^SNFM=?	Response **^SNFM:** (list of supported **<mute>**s) **OK** Parameter See write command
Read command AT^SNFM?	The read command returns whether the microphone is on or off. It can be used no matter whether or not a voice call is in progress. Response **^SNFM: <mute> OK** Parameter See write command
Write command AT^SNFM=<mute>	The write command serves to switch on or off the microphone input. The command can be used in all audio modes (1 to 6), but is allowed only during a voice call. Response **OK** Parameter **<mute>** 0 Mute microphone 1 Microphone on
Reference Siemens	Note During a voice call, users should be aware that when they switch back and forth between different audio modes (for example handsfree on/off) the value of **<mute>** does not change. This means that the status of mute operaton remains in effect until explicitly changed. As an alternative, you can use the AT+CMUT command described in Chapter 4.27.

9.30 AT^SNFO Set audio output (= loudspeaker path) parameter

Test command AT^SNFO=?	Response **^SNFO:** (list of supported <**outBbcGain**>s) (list of supported <**outCalibrate**>s) (list of supported <**outStep**>s) (list of supported <**sideTone**>s) **OK** Parameter See write command
Read command AT^SNFO?	Response **^SNFO: <outBbcGain>, <outCalibrate[0]>,...<outCalibrate[4]>, <outStep>, <sideTone>** **OK** Parameter See write command
Write command AT^SNFO= <outBbcGain>, <outCalibrate[0]>, ...<outCalibrate[4]>, <outStep>,<sideTone>	Set TA's loudspeaker path parameters. Response **OK** Parameters **<outBbcGain>** Negative DAC gain (attenuation) adjustable in four 6 dB steps from 0 dB to -18 dB: 0 – 3 (where 0 = 0 dB and 3 = -18 dB) **<outCalibrate[0]> ... <outCalibrate[4]>** Multiplication factor for output samples: 0 - 32767 Formula to calculate the value of the 5 volume steps selectable with parameter <**outstep**>: Gain in dB = 20 * log (2 * outCalibrate[n] / 32768). **<outStep>** Volume steps 0 – 4, each defined with **<outCalibrate[n]>** **<sideTone>** Multiplication factor for the sidetone gain: 0 to 32767 Formula to calculate how much of the original microphone signal is added to the earpiece signal: Sidetone gain in dB = 20 * log (sideTone / 32768).
Reference Siemens	Note • The read and write commands refer to the active audio mode. • The write command works only in audio modes 2 to 6. • <**outCalibrate**> specifies the amount of volume of each <**outStep**>. The range of <**outCalibrate**> is up to 65535, but will be suppressed to 32767. A value above <**outCalibrate**> = 65535 will cause an error. • The range of <**sideTone**> is up to 65535, but will be suppressed to 32767. A value above <**sideTone**> = 65535 will cause an error. • Any change to <**outStep**> takes effect in audio modes 2 to 6. That is, when you change <**outStep**> and then select another mode with

	AT^SNFS, the same step will be applied. Nevertheless, the sound quality and the amount of volume are not necessarily the same, since all remaining audio parameters can use different values in either mode. Audio mode 1 is fixed to **<outStep>=4**. • The value of **<outStep>** is stored non-volatile when the ME is powered down with AT^SMSO or reset with AT+CFUN=n,1. Any other parameters changed with AT^SNFO need to be saved with AT^SNFW for use after restart. See also AT^SNFD for details on restoring factory defaults. • Caution: When you adjust audio parameters avoid exceeding the maximum allowed level. Bear in mind that exposure to excessive levels of noise can cause physical damage to users! • **<outStep>** can also be selected with AT^SNFV (see Chapter 9.33) and AT+CLVL (see Chapter 4.24).

9.31 AT^SNFPT Call progress tones

Test command AT^SNFPT =?	Response **^SNFPT:** (list of supported **<pt>**s) Parameter See write command
Read command AT^SNFPT?	Response **^SNFPT: <pt> OK** Parameter See write command
Write command AT^SNFPT= <pt>	The write command controls the Call Progress Tones generated at the beginning of a mobile originated call setup. Response **OK** Parameter **<pt>:** 0 Call Progress Tones off 1 Call Progress Tones on (audible tones shortly heard on the phone when ME starts to set up a call). Please note that the setting is stored volatile, i.e. after restart or reset, the default value 1 will be restored. Also, there is no way to store AT^SNFPT to the user defined profile.
Reference Siemens	Note

9.32 AT^SNFS Select audio hardware set

Test command AT^SNFS=?	Response ^SNFS: (list of supported <audMode>s) OK Parameter See write command
Read command AT^SNFS?	Response ^SNFS: <audMode> OK Parameter See write command
Write command AT^SNFS= <audMode>	The write command serves to set the audio mode required for the connected equipment. For use after restart of AC45, you are advised to store the selected mode to the audio profile set with AT^SNFW. Otherwise, audio mode 1 will be active each time AC45 is powered up. AT^SNFS can also be used in conjunction with AT^SAIC. This is useful, for example, if both interfaces are operated alternatively to benefit from different devices. Each audio mode can be assigned a specific interface. To do so, first select the audio mode with AT^SNFS, then activate the audio interface with AT^SAIC and finally enter AT^SNFW to store the settings to your audio profile. To switch back and forth it is sufficient to use AT^SNFS. See Chapters 9.6 for AT^SAIC and 9.34 for AT^SNFW. Response OK If error is related to ME functionality: + CME ERROR: <error> Parameters <audMode> 1 Audio mode 1: Standard mode optimized for the reference handset, that can be connected to the analog interface 1 (see your "Hardware Interface Description" for information on this handset.) To adjust the volume use the knob of the reference handset. In audio mode 4, this handset can be used with user defined parameters. Note: The default parameters are determined for type approval and are not adjustable with AT commands. AT^SNFD restores <audMode>1. 2 Audio mode 2: Customer specific mode for a basic handsfree device (Siemens Car Kit Portable). Analog interface 2 is assumed as default. 3 Audio mode 3: Customer specific mode for a mono-headset. Analog interface 2 is assumed as default. 4 Audio mode 4: Customer specific mode for a user handset. Analog interface 1 is assumed as default. 5 Audio mode 5: Customer specific mode. Analog interface 1 is assumed as default. 6 Audio mode 6: Customer specific mode. Analog interface 2 is assumed as default. In modes 2 – 6, audio parameters can be adjusted with AT commands.

Reference	Note
Siemens	• The write command can be used during a voice call to switch back and forth between different modes. This allows the user, for example, to switch handsfree operation on and off. • Users should be aware that **<outStep>** is a global setting, i.e. when selecting another audio mode the value of **<outStep>** does not change. This is also true for mute operation which can be set with AT^SNFM or AT+CMUT: If the microphone is muted and the user changes to another audio mode then the microphone remains muted until explicitly changed. Exception: In audio mode 1 **<outStep>=4** is fix.

Example 1	Suppose a user wishes to use alternatively a handsfree device and a handset. The handset can be connected to the first analog interface and adjusted to audio mode 4. The handsfree device can be attached to the second analog interface and adjusted to audio mode 2.
	
	Settings for the handset:
	`at^snfs=4`
	`ok`
	`at^saic?` Factory default of AT^SAIC assigned to audio mode 4.
	`^SAIC: 2,1,1`
	
	Settings for the handsfree device:
	`at^snfs=2`
	`ok`
	`at^saic?`
	`^SAIC: 2,2,2` Factory default of AT^SAIC assigned to audio mode 2.
	
	To store the configuration to the user defined audio profile:
	`at^snfw` Stores the audio mode and the interface.
	`ok`
	
	To switch back and forth:
	`at^snfs=4` Switches to the handset connected to analog interface 1.
	`ok`
	`at^snfs=2` Switches to the handsfree device at analog interface 2.

Example 2	The following example illustrates a combination of a handset and a handsfree device connected to other interfaces than those assumed as factory default.
	Settings for a handset connected to the second analog interface and adjusted to audio mode 4:
	`at^snfs=4`
	`ok`
	`at^saic=2,2,2`
	
	Settings for a handsfree device connected to the first analog interface and adjusted to audio mode 2:
	`at^snfs=2`
	`ok`
	`at^saic=2,1,1`
	`ok`
	
	To store the configuration to the user defined audio profile:
	`at^snfw` Stores the audio mode and the interface.
	`ok`

	To switch back and forth: `at^snfs=4` Switches to the handset at analog interface 2. `ok` `at^snfs=2` Switches to the handsfree device at analog interface 1.

9.33 AT^SNFV Set loudspeaker volume

Test command AT^SNFV=?	Response The test command returns the supported value of the parameter **<outStep>**. **^SNFV**: (list of supported **<outStep>**s) **OK** Parameter See write command
Read command AT^SNFV?	Response The read command returns the current value of the parameter **<outStep>.** **^SNFV: <outStep>** **OK** Parameter See write command
Write command AT^SNFV=<outStep>	Response TA sets the volume of the loudspeaker to the value **<outCalibrate>** addressed by **<outStep>**. **OK** Parameter **<outStep>** Volume steps 0 to 4. In each audio mode, factory default is 4. The actual volume of each step is defined by the parameter **<outCalibrate[n]>** which can be set with AT^SNFO.
Reference Siemens	Note • The read and write commands refer to the active audio mode. • The write command works only in audio modes 2 to 6. • Any change to **<outStep>** takes effect in audio modes 2 to 6. That is, when you change **<outStep>** and then select another mode with **AT^SNFS**, the same step will be applied. Nevertheless, the actual volume can be quite different, depending on the values of **<outCalibrate[n]>** set in each mode. The only exception is audio mode 1 which is fixed to **<outStep>=4.** • **<outStep>** is stored non-volatile when the ME is powered down with **AT^SMSO** or reset with **AT+CFUN=1,1**. It is not stored with AT^SNFW. • **<outStep>** can also be changed with **AT^SNFO** (Chapter 9.30) and **AT+CLVL** (Chapter 4.24).

9.34 AT^SNFW Write audio setting in non-volatile store

Test command AT^SNFW=?	Response **OK**
Execute command AT^SNFW	TA writes the parameters currently selected in audio modes 2 – 6 to the non-volatile store. Response **OK** If error is related to ME functionality: + **CME ERROR: <error>** **<error>** memory failure Flash write error
Reference Siemens	Note • Execute command works only in audio mode 2 to 6. • The audio profile saved with AT^SNFW includes the following parameters: AT^SNFI: **<inBbcGain>, <inCalibrate>** (or the equivalent AT^SNFA parameters) AT^SNFO: **<outBbcGain>, <outCalibrate[0]> ... <outCalibrate[4]>, <side Tone>** AT^SAIC: **<io>,<mic>,<ep>** AT^SNFS: **<audMode>**

9.35 AT^SPBC Search the first entry in the sorted telephonebook

This command searches the active phonebook for the index of the first entry that matches the character specified with <schar>. The sort order follows the algorithm described in Chapter 10.6.

CAUTION: Please note that the sorted entries are assigned an index of their own which is not identical with the location numbers used in the various phonebooks. Therefore, the index retrieved with the ATˆSPBC command can be used only as an index for AT^SPBG. Do not use the listed index numbers to dial out or modify entries.

Test command AT^SPBC=?	The test command returns a list of phonebooks that can be searched through with AT^SPBC. Response **^SPBC:** (list of supported **<storage>**s) **^SPBC:** ”FD”,”SM”,”ME” **OK** **ERROR / +CME ERROR**
Write command AT^SPBC= <schar>	Parameter **<schar>** First character of the entry to be searched. Character coding and formatting according to the settings made with AT+CSCS. **<index>** In the active phonebook, the first (lowest) index of an entry beginning with **<schar>** within its parameter **<text>**. If no matching entry has been found <index>=0 will be returned. Response **^SPBC: <index>** **OK/ERROR/+CME ERROR**
Reference Siemens	Note • There is no difference between small and capital letters. • The index numbers are identical with those displayed by AT^SPBG and are intended for reading only (see further explanations in Chapter 9.37). • The minimum valid phonebook index for AT^SPBG is 1. • This command can be used only after the phonebook data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use any of the phonebook commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.

9.36 AT^SPBD Purge phonebook memory storage

This command is used to purge the selected phonebook <storage>, i.e. all entries previously stored in the selected phonebook storage will be deleted.

CAUTION! The operation cannot be stopped nor reversed!

An automatic purge of the phonebooks is performed when the SIM card is removed and replaced with a dfferent SIM card. This affects the ME based part of the ”LD” storage, and storages ”MC” and ”RC”. Storage ”ME” is not affected.

In order to delete all entries stored in ”FD” phonebook, PIN2 authentication must be performed first.

For unsuccessful automatic call attempts, a ”blacklist” functionality according to GSM 02.07, Annex A is implemented. Since the module cannot determine whether user interaction is taking place, the blacklist must be deleted by the application, when applicable. This can be done using command AT^SPBD with parameter ”BL”. The ”blacklist” phonebook is not otherwise accessible by phonebook commands.

Test command AT^SPBD=?	Response ^SPBD: (list of supported **<str>**s) **OK**
Write command AT^SPBD=<str>	The write command deletes all numbers stored in the <str> phonebook. Response **OK / ERROR / +CME ERROR** Parameter **<str>** Phonebook to be deleted "SM" SIM phonebook “FD” SIM fixed-dialing-phonebook "LD" Last dialed numbers list “MC” ME missed (unanswered received) calls “RC” ME received calls list "ON" Own numbers (MSISDN) phonebook "ME" ME Phonebook (250 entries) “BL” ME Blacklist (GSM02.07 Annex A)
Reference Siemens	Note • See Chapter 4.33 for further information on the “SM”, “FD”, “LD”, “MC”, “RC”, “ON”, “ME” phonebooks. Details on the Blacklist can be found in Chapter 2.5. • This command can be used only after the phonebook data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use any of the phonebook commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.

9.37 AT^SPBG Read entry from active telephonebook via sorted index

This command sorts the active phonebook records by name, in alphabetical order. There are two ways to use the AT^SPBG command:

- Optional parameter <RealLocReq> is omitted:
  In this case, the sorted list is assigned an index of its own which is not identical with location numbers used in the various phonebooks. For example, it helps you find entries starting with matching characters. However, do not use the listed index numbers to dial out with ATD> or to modify entries with AT+CPBW.
- Optional parameter <RealLocReq> is included:
  To access an entry found with AT^SPBG for writing or dialing, enter AT^SPBG with the parameter <RealLocReq>=1. Then extract the "real" location number of the entry from the response parameter <location> and use this "real" location number with ATD>, AT+CPBR or AT+CPBW.

Test command AT^SPBG=?	The test command returns the index range supported by the current storage, the maximum length of <number> field, and the maximum length of <text> field. Note: The length may not be available while SIM storage is selected. If storage does not offer format information, the format list should be empty parenthesises. Response **^SPBG: (1-<maxindex), <nlength>, <tlength>** **OK / ERROR / +CME ERROR**
Write command AT^SPBG=<index1>[,<index2>][,<RealLocReq>]	The write command selects the index of the phonebook entry, that is to be displayed in the sorted list of entries, or the range of indices to be displayed. If no <index2> is given, only the entry at <index1> will be displayed. The sorted index always starts with 1, referring to the entry whose <text> is first in the sorted list. Consequentially, the highest index corresponds to the number of currently used entries in the selected phonebook. If parameter <ReaLocReq>=1, the actual location of the entry displayed will be indicated in parameter <location>. If <RealLocReq> is omitted or <RealLocReq>=0, parameter <location> will not be displayed. The indices displayed in the first parameter of the write command response are indices in the sorted list of entries, and not related to the entries' location in the phonebook. They may not be used for dialing from phonebook with "ATD>". Instead, parameter <location> must be used for these purposes. Response **^SPBG: <index1>, <number>, <type>, <text>[,<location>]** **^SPBG: <index2>, <number>, <type>, <text>[,<location>]** **OK / ERROR / +CME ERROR** Parameter **<index1>** (numeric) The first (lowest) index number within phonebook memory for which the corresponding entry is to be displayed. The supported range is given in the test command response. If <index 1> exceeds the upper bound <maxindex> (as indicated by the test command), the AT command will return a CME ERROR 21.

<index2>	(numeric) The last (highest) index number within phonebook memory for which the corresponding entry is to be displayed. The supported range is given in the test command response. If both <index1> and <index 2> are used the following behaviour applies: If both <index1> and <index 2> are in the range indicated by the test command in parameter <maxindex>, the list of entries will be output and terminated with OK. If <index 2> exceeds the range indicated by the test command in parameter <maxindex>, the list of entries will be output but terminated with a +CME error 21 ”invalid index”.
<RealLocReq>	(numeric) Is a display of the "real" location number of the entry required? 0: Do not display an entry's "real" location number. Parameter <**location**> will not be displayed. 1 Display the "real" location number as parameter <**location**> at the end of the entry.
<number>	(string) String type phone number in format specified by <type>. The number parameter may be an empty string.
<type>	(numeric) Type of address octet 145 Dialing string <number> includes international access code character ’+’ 209 Dialing string <number> contains printable non-alphabetic non-digit characters saved with the number string. For further detail, check the parameter descriptions for AT command AT+CPBW . 129 Otherwise
<text>	(string) Text assigned to the phone number. The maximum length of this parameter is given in test command response <tlength>. The text string is returned in the character set and format as specified with AT+CSCS.
<location>	(numeric) The location within phonebook memory at which the corresponding entry is located. This location may be used to locate the entry with the read command AT+CPBR , to modify the entry using the write command AT+CPBW , or for direct dialing from phonebook with ATD> .
<maxindex>	(numeric) Max. index for the currently selected storage. Since it indicates the maximum index in a sorted list, <maxindex> will always be equal to the actual number of entries currently used in the phonebook.
<nlength>	(numeric) Max. length of phone number for ”normal” locations. Depending on the storage, a limited number of locations with extended memory is available per phonebook. Please refer to AT command AT+CPBW for detail.
<tlength>	(numeric) Max. length of <text>assigned to the telephone number. The value indicated by the test command is given in octets. If the <text> string is given in GSM characters, each character corresponds to

	one octet. If the <text> string is given in UCS2, the maximum number of characters depends on the coding scheme used for the alpha field of the SIM according to GSM 11.11, Annex B. In the worst case, the number of UCS2 characters is less than half the number of GSM characters. For a detailed description see GSM 11.11, Annex B.
Reference Siemens, Unicode Technical Standard #10, "Unicode Collation Algorithm"	Note • The AT^SPBG feature is able to sort by the first *6 matching characters* only. All the following characters will be ignored. • The write command can be used for the phonebooks "SM", "FD", "ME" (cf. AT+CPBS). • This command can be used only after the phonebook data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use any of the phonebook commands will result in "+CME Error: 14" (SIM busy). We recommend to take advantage of the "^SSIM READY" URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card.

Example 1	Using AT^SPBG without <RealLocReq >
	1. First, run the *test command* to find out the range of phonebook entries stored in the active phonebook:
	`AT^SPBG=?`
	TA returns the number of entries in the format:
	`^SPBG: (1-33),20,17` where 33 is the total number of entries.
	2. Now, run the *write command* to display the phonebook entries by alphabetical order. It is recommended to enter the full range to obtain best results.
	`AT^SPBG=1,33`
	TA returns phonebook entries by alphabetical order:
	`^SPBG: 1,"01799999999",129,"Charly"`
	`^SPBG: 2,"+49175555555",145,"Dave"`
	`^SPBG: 3,"+49177222222",145,"Esther"`
	The numbers at the beginning of each line are not the memory locations in the phonebook, but only serial numbers assigned to the alphabetical list.

Example 2	Using AT^SPBG with <RealLocReq >
	1. First, run the *Test command* to find out the range of phonebook entries stored in the active phonebook:
	`AT^SPBG=?`
	TA returns the number of entries in the format:
	`^SPBG: (1-33),20,17` where 33 is the total number of entries.
	2. Now, run the *Write command* to display the phonebook entries by alphabetical order. It is recommended to enter the full range to obtain best results.
	`AT^SPBG=1,33,1`
	TA returns phonebook entries by alphabetical order:
	`^SPBG: 1,"01799999999",129,"Charly",17`
	`^SPBG: 2,"+49175555555",145,"Dave",24`
	`^SPBG: 3,"+49177222222",145,"Esther",5`

	The numbers at the end of each line are the memory locations in the phonebook and can be used for dialing or editing phonebook entries: `AT+CPBR=17` Read out phonebook location 17. `+CPBR:17,"01799999999",129,"Charly"` This location can be edited with AT+CPBW

9.38 AT^SPBS Step through the selected phonebook alphabetically

This command can be used to flick through the active phonebook records in sorted order by name. Three entries will be displayed at a time.

There are two ways to use the AT^SPBS command:

- Optional parameter <RealLocReq> is omitted:
  In this case, the sorted list is assigned an index of its own which is not identical with location numbers used in the various phonebooks. For example, it helps you find entries starting with matching characters. However, do not use the listed index numbers to dial out with ATD> or to modify entries with AT+CPBW.
- Optional parameter <RealLocReq> is included:
  To access an entry found with AT^SPBS for writing or dialing, enter AT^SPBS with the parameter <RealLocReq>=1. Then extract the "real" location number of the entry from the response parameter <location> and use this "real" location number with ATD>, AT+CPBR or AT+CPBW.

Test command AT^SPBS=?	Response **^SPBS:** (list of supported **<value>**s) **OK** Parameter See write command
Write command AT^SPBS=<value>[,<RealLocReq>]	Every time the write command is executed, 3 rows of phonebook records are returned. Each triplet overlaps with the next one, i.e. the last two records of the preceding triplet will be presented on top of the next one. The parameter <value> determines whether the index increases or decreases. After the last record of the phonebook (<maxindex> of the AT^SPBG command) has been reached, the internal counter switches over to the first. See examples below. The command allows the user to scroll sequentially through the phonebook. To quickly reset the internal counter it is recommended to use the commands ATZ or AT&F. If you do so, take into account that other settings will be reset, too. See Chapters 2.32 and 2.35 for details on AT&F and ATZ. Response **^SPBS: <index a>,<number>,<type>,<text>[,<location>]** **^SPBS: <index b>,<number>,<type>,<text>[,<location>]** **^SPBS: <index c>,<number>,<type>,<text>[,<location>]** **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<value>** (numeric) 1 To make a step forward in the alphabetically sorted phonebook <index a> = (internal counter) + 1 2 To make a step backward in the alphabetically sorted phonebook <index a>= (internal counter) – 1 **<RealLocReq>** Is a display of the "real" location number of the entry required? 0 Do not display an entry's "real" location number. Parameter **<location>** will not be displayed 1 Display the "real" location number as parameter **<location>** at the end of the entry

	<location>	(numeric) The "real" location number of the entry returned in the response. The number can be used to locate the entry with the read command AT+CPBR or to modify the entry using the write command AT+CPBW.
	<index a>	(numeric) 1… maxindex Index in the sorted list of phonebook records that identifies the first entry displayed. The value of <index a> is determined by the value of the internal counter and by parameter <value>. After a write command has terminated successfully with ”OK”, the value from parameter <index a> is saved and retained as the new internal counter value. Mind after the last record of phonebook, the first entry follows.
	<index b>	(numeric) 1… maxindex Index in the sorted list of phonebook records that identifies the second entry displayed. <index b>=(<index a>+1) Mind after the last record of phonebook, the first entry follows.
	<index c>	(numeric) 1… maxindex Index in the sorted list of phonebook records that identifies the third entry displayed. <index c>=(<index b>+1) Mind after the last record of phonebook, the first entry follows.
	<number>	(string) String type phone number in format specified by <type>. The number parameter may be an empty string.
	<type>	(numeric) Type of address octet 145 Dialing string <number> includes international access code character ’+’ 209 Dialing string <number> contains printable non-alphabetic non-digit characters saved with the number string. For phonebook entries with this <type>, dialing from phone book with ATD> is not possible. For further detail, check the parameter descriptions for at command AT+CPBW. 129 Otherwise
	<text>	(string) Text assigned to the phone number.
Reference Siemens, Unicode Technical Standard #10, “Unicode Collation Algorithm”	Note • The complete list of sorted entries can be retrieved using AT command AT^SPBG . • This command can be used only after the phonebook data from the SIM card have been read successfully for the first time. Reading starts after successful SIM PIN authentication has been performed, and may take up to 30 seconds depending on the SIM card used. While the read process is in progress, an attempt to use any of the phonebook commands will result in “+CME Error: 14” (SIM busy). We recommend to take advantage of the “^SSIM READY” URC. If enabled with AT^SSET=1 (see Chapter 9.47), this URC acknowledges to the user that SIM data is accessible after SIM PIN authentication. It will be delivered once the ME has completed reading data from the SIM card. • This command can be used for the ME, SM and FD phonebook.	

Example 1	Using AT^SPBS without <RealLocReq> parameter or with <RealLocReq>=0: First, AT&F is issued to make sure that AT^SPBS=1 starts from the first character in alphabetical order. The example illustrates how to search down and up again. at&f Reset internal counter to 0. OK at^spbs=1 ^SPBS: 1,"01799999999",129,"Charly" ^SPBS: 2,"+49175555555",145,"Dave" ^SPBS: 3,"+49177222222",145,"Esther" OK at^spbs=1 ^SPBS: 2,"+49175555555",145,"Dave" ^SPBS: 3,"+49177222222",145,"Esther" ^SPBS: 4,"0304444444",129,"Gilbert" OK at^spbs=1 ^SPBS: 3,"+49177222222",145,"Esther" ^SPBS: 4,"0304444444",129,"Gilbert" ^SPBS: 5,"03033333333",129,"Harry" OK at^spbs=2 ^SPBS: 2,"+49175555555",145,"Dave" ^SPBS: 3,"+49177222222",145,"Esther" ^SPBS: 4,"0304444444",129,"Gilbert" OK
Example 2	If the last index in the phonebook has been reached, then the internal counter overflows to the first index: at^spbs=1 ^SPBS: 100,"+49301234567",145,"Tom Tailor" ^SPBS: 1,"01799999999",129,"Charly" ^SPBS: 2,"+49175555555",145,"Dave" OK
Example 3	Using AT^SPBS with <RealLocReq>=1 in order to obtain the entries' location numbers. at^spbs=1,1 ^SPBS: 1,"01799999999",129,"Charly",17 ^SPBS: 2,"+49175555555",145,"Dave",24 ^SPBS: 3,"+49177222222",145,"Esther",5 OK The numbers at the end of each line are the memory locations in the phonebook and can be used for dialing or editing phonebook entries: This entry can now be read with AT+CPBR or edited with AT+CPBW. AT+CPBR=17 Read out phonebook location 17: +CPBR:17,"01799999999",129,"Charly"

9.39 AT^SPIC Display PIN counter

The AT^SPIC command can be used to find out whether the ME is waiting for a password and, if so, how many attempts are left to enter the password.
To check whether or not you need to enter a password use the AT+CPIN? command.

Test command AT^SPIC=?	Response **OK**
Read command AT^SPIC?	The read command returns an identification of the currently required password. The parameter <counter> returned by the execute or write command refers to this password. Response **^SPIC: <code>** **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<code>** Identification of the currently required password (text): SIM PIN — ME is waiting for SIM PIN1. SIM PUK — ME is waiting for SIM PUK1 if PIN1 was disabled after three failed attempts to enter PIN1. SIM PIN2 — ME is waiting for PIN2, when the attempt to access PIN2 requiring features was acknowledged with +CME ERROR:17 (e.g. if client attempts to edit the FD phonebook). SIM PUK2 — ME is waiting for PUK2 to unblock a disabled PIN2. Necessary if preceding command was acknowledged with error +CME ERROR:18. PH-SIM PIN — ME is waiting for phone-to-SIM card password if "PS" lock is active and user inserts other SIM card than the one used for the lock. ("PS" lock is also referred to as phone or anti-theft lock). PH-SIM PUK — ME is waiting for Master Phone Code, if the above "PS" lock password was incorrectly entered three times. PH-NET PIN — ME is waiting for network personalisation password PH-NET PUK — ME is waiting for network personalisation unblocking password
Execute command AT^SPIC	The Execute command returns the number of attempts still available for entering a required password, e.g. the PIN, SIM PUK, PH-SIM PUK etc. Response **^SPIC: <counter>** **OK** If error is related to ME functionality: **+CME ERROR: <err>**

	Parameter **<counter>** Number of attempts for the currently required password. The number will counted down after each failure.
Write command AT^SPIC=<facility>	The write command returns the number of attempts still available for entering a required password identified by <facility>, e.g. the PIN, PIN2, PH-SIM PIN etc. Parameter **<facility>** Password for which the corresponding PIN counter is to be displayed (string): ”SC” SIM PIN or SIM PUK. If the SIM PIN has been deactivated after three failed attempts, the counter for SIM PUK will be returned instead. ”PS” ”phone code” or ”device code” (cf. AT+CLCK and AT+CPWD). If incorrectly entered three times, the Master Phone Code is required to lift the lock and the number of remaining attempts for the master phonecode will be returned. ”P2” SIM PIN 2 or SIM PUK 2. If the SIM PIN 2 has been deactivated after three failed attempts, the counter for SIM PUK 2 will be returned instead. ”PN” Network Personalisation Response **^SPIC: <counter>** **OK** See execute command for parameter **<counter>**.
Reference Siemens	Note • Whenever the required password changes, <counter> changes to reflect that change. • Use the read commands AT+CPIN?, AT+CPIN2? and AT^SPIC? to check which password is currently required. • For passwords associated to the phone lock ("PS" lock) or factory set locks, such as "PF", "PN", "PU", "PP", "PC" the number of attempts is subject to a timing algorithm explained in Chapter 4.35.1. If these passwords are incorrectly entered the counter first returns 3, 2 and 1 remaining attempt(s), but then gives the total number of attempts which amounts to 63 (see example below). • See also Chapters 4.21, 4.35, 4.36, 4.38, 9.16 for further information on locks and passwords.

Example 1	The client fails to provide a correct SIM PIN three times. The counter decreases each time. After the 3rd wrong attempt, the ME requests the SIM PUK, and <counter> now refers to the SIM PUK. Starting from 10, the counter decrements each time the client fails to enter the correct SIM PUK. at+cpin? +CPIN: SIM PIN OK — Currently required password is PIN1. at^spic ^SPIC: 3 OK — 3 attempts left. at+cpin=”9999” +CME ERROR: incorrect password at^spic ^SPIC: 2 — (2 attempts left.) OK at+cpin=”9999” +CME ERROR: incorrect password OK at^spic ^SPIC: 1 OK at+cpin=”9999” +CME ERROR: incorrect password at+cpin? +CPIN: SIM PUK OK — (Now required password is PUK 1.) at^spic ^SPIC: 10 OK — (10 attempts left for PUK 1.) at+cpin=”01234567”,”1234” +CME ERROR: incorrect password at^spic ^SPIC: 9 OK — (9 attempts left for PUK 1.)
Example 2	Though a mobile is locked to a specific SIM card (phone lock), the client attempts to operate it with another SIM card. The client correctly enters the SIM PIN of the SIM card currently inserted, but then fails to give the "PS" lock password (PH-SIM PUK): at+cpin=9999 OK at+cpin? +CPIN: PH-SIM PIN — ME is waiting for phone lock password. OK at^spic ^SPIC: 3 OK at+cpin=”4711” +CME ERROR: PH-SIM PIN required

```
at+cpin=”4712”
+CME ERROR: incorrect password

at^spic
^SPIC: 1                        1 attempt left.
OK

at^spic?
^SPIC: PH-SIM PIN               The counter displayed refers
                                to the phone lock password.

at+cpin=”4713”
+CME ERROR: incorrect password
at^spic
^SPIC: 63
OK

at^spic?
^SPIC: PH-SIM PUK               The counter displayed refers
                                to the Master Phone Code.


at+cpin=”4714”
+CME ERROR: incorrect password
at^spic
^SPIC: 63
```

9.40 AT^SPLM Read the PLMN list

Test command	Response
AT^SPLM=?	**OK** If error is related to ME functionality: **ERROR / +CME ERROR: <err>**
Execute command	**Response**
AT^SPLM	TA returns the list of operator names from the ME. Each operator code **<numericn>** that has an alphanumeric equivalent **<alphan>** in the ME memory is returned. **^SPLM:** numeric **<numeric1>**,long alphanumeric **<alpha1><CR><LF>** **^SPLM:.....OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<numericn>** string type; operator in numeric form; GSM location area identification number **<alphan>** string type; operator in long alphanumeric format; can contain up to 16 characters
Reference	Note
Siemens	See also GSM 07.07: +COPN, +COPS

9.41 AT^SPLR Read entry from the preferred operators list

Test command AT^SPLR=?	Response TA returns the whole index range supported by the SIM. **^SPLR:** (list of supported **<index>s**) **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT^SPLR= <index1>[, <index2>]	Response TA returns used entries from the SIM list of preferred operators with **<index>** between **<index1>** and **<index2>**. If **<index2>** is not given, only entry with **<index1>** is returned. **^SPLR: <index1>, <oper>** **^SPLR: .....** **^SPLR: <index2>, <oper> OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<index1>** location number to read from **<index2>** location number to read to **<oper>** string type; operator in numeric form; GSM location area identification number
Reference Siemens	Note GSM 07.07: AT+CPOL

9.42 AT^SPLW Write an entry to the preferred operators list

Test command AT^SPLW=?	Response TA returns the whole index range supported by the SIM. **^SPLW**: (list of supported **<index>s**) **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter See write command
Write command AT^SPLW=<index>[,<oper>]	Parameter TA writes an entry to the SIM list of preferred operators at location number **<index>**. If **<index>** is given but **<oper>** is left out, the entry is deleted. **<index>** location number **<oper>** string type; operator in numeric form (= GSM location area identification number) Consists of a three digit country code followed by a two or three digit network code (see GSM 04.08 section 10.5.1.3). Response **OK** If error is related to ME functionality: **+CME ERROR: <err>**
Reference Siemens	Note See also GSM 07.07: AT+CPOL

9.43 AT^SPWD Change password for a lock

Test command	Response
AT^SPWD=?	TA returns a list of pairs which represent the available facilities and the maximum length of the associated password. **^SPWD:** (list of supported **(<facility>, <password length>)** **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<facility>** See write command **<password length>** Integer max. length of password
Write command	Response
AT^SPWD = <facility>, [<old password>], <new password>	TA sets a new password for the facility lock function. **OK** If error is related to ME functionality: **+CME ERROR: <err>** Parameter **<facility>** Phone security locks: Primarily intended for the client to take safety precautions, the passwords ”SC” (SIM PIN) and ”P2” (SIM PIN2) are usually predefined, but can be configured individually. The password for lock facility ”PS” can be factory set or user defined. "SC" SIM (lock SIM card). SIM requests SIM PIN1 when ME is switched on and when this lock command is issued. <password length>: 4 to 8 digits. If the password is incorrectly entered three times, the SIM PUK1 is required to perform authentication. Input of the SIM PUK1 is possible only with AT+CPIN or ATD. "P2" SIM PIN2. Required to access the functions listed in Chapter 4.36 (AT+CPIN2). A typical example is the facility lock “FD” configured with AT+CLCK. <password length>: 4 to 8 digits. If the password is incorrectly entered three times, the SIM PUK2 is required to perform authentication. Input of the SIM PUK2 is possible only with AT+CPIN2 or ATD. "PS" Phone locked to SIM (device code). ME requests password when other than current SIM card is inserted. "PS" lock is frequently referred to as "phone lock", or "device lock". Accordingly, the password may be called "phone code" or "device code". The "PS" password is not associated with the PUK of the SIM card. Password: Usually, user defined. It must be set before the “PS” lock can be activated with AT+CLCK or AT^SLCK. If set by factory (e.g. for a prepaid mobile), the password is supplied by the operator or provider. <password length>: 4 digits.

If the password is incorrectly entered three times, the Master Phone Code is required to lift the lock. This is an 8-digit device code associated to the IMEI number of the mobile which can only by obtained from the manufacturer of the AC45 module.
The unblocking procedure can be done as follows: You can use AT^SPWD=”PS”, Master Phone Code or, when setting a new “PS” lock at the same time, AT^SPWD=”PS”, Master Phone Code, new password. Mind that successful PIN authentication is a prerequisite for using AT^SPWD. If PIN authentication has not been completed, input of the Master Phone Code is possible only with AT+CPIN and ATD. See Chapter 4.35.1 for further details.
Once the Master Phone Code has been acctepted, the mobile is operational, and the "PS" lock is no longer active.

Factory set SIM locks:
Typical examples of factory set locks are prepaid phones or network locks used to restric the operation of a mobile to a specific provider or operator. The client should be aware that each of these lock types can only be unlocked if the associated password is available. For example, a mobile can be locked to accept only SIM cards from the respective provider, or even one single SIM card.
Once a different SIM card is inserted the ME will prompt the client to enter a specific code. This is not the PUK of the SIM card, but usually an 8-digit code which needs to be requested from the provider.
The locks can only be set by the manufacturer of the AC45 modules and need to be agreed upon between the parties concerned, e.g. provider, operator, distributor etc. on the one side and the manufacturer on the other side. For details contact your local dealer or Siemens AG.

"PF" Lock Phone to the very first SIM card
"PN" Network Personalisation
"PU" Network-subset Personalisation
"PP" Service-Provider Personalisation
"PC" Corporate Personalisation

Supplementary Service: Call barring
The Supplementary Service ”Call Barring” serves to specify conditions under which calls will be disallowed by the network.
The availability of the Supplementary Services varies with the network. To benefit from call barring services the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package.
Password: The Network Password needs to be supplied from the network provider or network operators.
<password length>: Usually there is one 4-digit password which applies to all call barring options. For details contact your provider.

"AO" BAOC (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
"AG" All outGoing barring services
"AC" All inComing barring services

	<old password> Password specified for the facility. Can be ignored if no old password was allocated to the facility. Take into account that a password may have already been set by factory, or that the service is subject to a password issued by the provider. See notes above or contact provider. **<new password>** New password. To delete a password use the following syntax: **AT^SPWD=<facility>,<old password>**
Reference Siemens	Note See also specification of AT+ CPWD in GSM 07.07 and further details in Chapter 4.38. AT^SPWD and AT+CPWD are using the same parameters.

9.44 AT^SRTC Select, query, test ring tone parameters

Test command AT^SRTC=?	Response ^**SRTC**: (list of supported <**type**>s), (list of supported <**vol**>s), (list of supported <**event**>s) **OK**
Read command AT^SRTC?	Response **^SRTC: <type>** of **event=0, <vol>** of **event=0, <type>** of **event=1, <vol>** of **event=1,<stat>OK** Parameters **<type>** 0 – 7. Type of sound. You have a choice of 7 different ringing tones and melodies. All will be played from the audio output selected with AT^SAIC and AT^SNFS. Factory setting is <type>=3. <type>=0 is only intended for muting. See Write command for details. **<vol>** Volume of ringing tone. Varies from low to high. 0 Mute (factory setting) 1 Very low (initial setting after firmware update) 2 Identical with 1 3 Low 4 Identical with 3 5 Middle 6 Identical with 5 7 High **<stat>** Status of test ringing. Indicates whether or not a melody is currently being played back for testing. 0 Playback is off. 1 Playback is on. **<event>** Event to be indicated. All settings of <type> and <vol> apply to the selected event only. [0] All MTCs (voice, data etc.) 1 Incoming short message. The ring tone or melody will only be played if the URC for incoming SMS is activated with AT+CNMI as described in Chapter 5.10. The Read command can be used while test playback is off or on. In the latter case, see Execute command for details.
Write command AT^SRTC=[<type>][,<vol>][,<event>]	Response **^SRTC: <type>, <vol>,<event> OK** Parameters See Read command The Write command chooses the type and volume of ringing tones for the selected event. It can be used while test playback is off or on. In the latter case, see Execute command for details. The selected type and volume apply to all audio modes. They are saved in the non-volatile Flash memory. If no optional parameter is entered, the old value will be kept.

	Before first using ringing tones: We have chosen to let you decide your own preferences when you start using ringing tones. Therefore, factory setting is AT^SRTC: 3,0,3,0,0 (ringing tones are muted). To activate ringing tones for the very first time, first enter the Write command and simply change the volume. <type>=0: AT^SRTC=0 can be entered to quickly mute the ringing tone or melody currently played to indicate an <event>. No settings will be changed or saved. <type>=0 immediately stops the audible ringing tone, but does not terminate the URC (for example RING).
Execute Command AT^SRTC	The Execute command is intended for testing. It starts to play a melody from the audio output currently selected with the AT^SNFS command. Response **OK** To stop the test use AT^SRTC again. During test playback, you can enter the Write command to select another melody and adjust the volume. Also, you can enter the Read command to check the type and volume of the current ringing tone, and to view the status of playback (on / off). The test ringing signal cannot be activated when an MTC is ringing (ERROR). If an MTC arrives during test playback, test ringing stops and “normal“ ringing is activated (RING). Selecting <vol>=0 during the test, immediately stops playback. After this, ringing tones will be muted until you change <vol> using the Write command.
Reference SIEMENS	

9.45 AT^SSCONF SMS Configuration

Test command AT^SSCONF=?	Response **^SSCONF:** (list of supported <**ra**>s) Parameter See write command
Read command AT^SSCONF?	Response **^SSCONF: <ra> OK** Parameter See write command
Write command AT^SSCONF= <ra>	The write command serves to control the presentation of the recipient address parameters <ra> and <tora>. Response **OK** Parameter **<ra>: display recipient address** [0] the mobile station shall not display the parameter <ra> and <tora>. 1 the mobile station shall display the parameter <ra> and <tora>. Please note that the setting is stored volatile, i.e. after restart or reset, the default value 0 will be restored. Also, there is no way to store AT^SSCONF to the user defined profile.
Reference Siemens	Note The parameters <ra> and <tora> appear in the result codes of the AT commands AT+CMGL, AT^SMGL, AT+CMGR, AT^SMGR and the unsolicited result code +CDS.

9.46 AT^SSDA Set Display Availability

Use the AT^SSDA command to specify whether your AC45 product is designed to provide a display. If there is one available, AT^SSDA enables or disables the mobile station to present incoming Class 0 short messages directly on the display. The command is not required for other short message Classes.

Test command AT^SSDA=?	Response **^SSDA:** (list of supported <**da**>s) Parameter See write command
Read command AT^ SSDA?	Response **^SSDA: <da> OK** Parameter See write command
Write command AT^SSDA= <da>	Response **OK** Parameter **<da>: display availability** 0 the mobile station is not capable of displaying short messages 1 the mobile station is capable of displaying short messages Please note that the setting is stored volatile, i.e. after restart or reset, the default value 0 will be restored. Also, there is no way to store AT^SSDA to the user defined profile.
Reference Siemens	Note • If a mobile station is able to display short messages, class 0 messages can be displayed immediately. If the mobile station has no display, class 0 messages shall be handled as though there was no message class determined. Refer to GSM 03.38 [14]. • The only effect of AT^SSDA is to influence the behavior of the <mt> parameter specified with AT+CNMI: If <da>=1 and <mt>=1, then Class 0 short messages need to be acknowledged with AT+CNMA. See also Chapters 5.9 for CNMA, 5.10 for AT+CNMI and 5.16 for AT+CSMS. • Multiplex protocol: If one instance is set to <da>=1 and <mt>=1, then all other instances must be configured for <mt>=0. • The indication commands AT+CNMI and AT^SSDA as well as AT+CMER can be only switched on at the same instance.

9.47 AT^SSET Settings for Unsolicited Result Code "SIM READY"

After power on and personalization (PIN entry if required) the ME starts reading data from SIM. With this command it is possible to enable URC "^SSIM READY:" indication on the corresponding serial channel when this process has been completed. Afterwards all commands that depend on SIM data fields can be used, e.g. the SMS and phonebook commands.

Test command AT^SSET =?	Response **^SSET:** (list of supported <**n**>s) **OK** Parameter See write command
Read command AT^SSET?	Response **^SSET: <n> OK** Parameter See write command
Write command AT^SSET= [<n>]	The Write command serves to set the presentation mode of the unsolicited result code. Response **OK** Parameter <**n**> SIM ready presentation mode 0 disable 1 enable Using AT&W, the current settings for AT^SSET can be stored to the user defined profile. It is possible to assign different settings to different multiplexer channels. AT&F restores the factory setting <n>=0.
Reference SIEMENS	Unsolicited result code **^SSIM READY** The URC acknowledges to the user that SIM data is accessible. Before that, any attempt to access one of the phonebooks, view SMS or access SIM data will result in "+CME ERROR: 14" (SIM busy).

9.48 AT^SSMSS Set Short Message Storage Sequence

Test command AT^SSMSS=?	Response **^SSMSS:** (list of supported <**seq**>s) Parameter See write command
Read command AT^SSMSS?	Response **^SSMSS: <seq>** **OK** Parameter See write command
Write command AT^SSMSS= <seq>	The short message storage "MT" is a logical storage. It consists of two physical storages "ME" and "SM". This command allows to select the sequence of addressing this storage. The storage types “MT”, “ME” and “SM” are detailed in Chapter 5.11, AT+CPMS. Response **OK** Parameter **<seq>: MT sequence** [0] MT storage is ME then SM 1 MT storage is SM then ME
Reference Siemens	Note Access to the SIM storage is faster. Because of compatibility reasons to previous software releases, the MT sequence <seq>=0 is the factory default.

9.49 AT^SSYNC Configure SYNC Pin

The ^SSYNC command serves to configure the SYNC pin of the AC45 application interface. Please note that the pin may be assigned different functions, depending on the design of the host application.

For detailed information on the SYNC pin of the AC45 module refer to [1]. Before changing the mode of the SYNC pin, carefully read the technical specifications.

Test command AT^SSYNC=?	Response **^SSYNC:** (list of supported <**mode**>s) **OK** Parameter: See write command
Read command AT^SSYNC?	Response **+SSYNC: <mode> OK** Parameter: See write command
Write command AT^SSYNC= <mode>	Response **OK** Parameter **<mode>** 0 Enables the SYNC pin to indicate growing power consumption during a transmit burst. You can make use of the signal generated by the SYNC pin, if power consumption is your concern. To do so, ensure that your application is capable of processing the signal. Your platform design must be such that the incoming signal causes other components to draw less current. In short, this allows your application to accommodate current drain and thus, supply sufficient current to the GSM engine if required. 1 Enables the SYNC pin to control a status LED installed in your application according to the specifications provided in [1]. The coding of the LED is described in Table 20.
Note	The SYNC pin mode is stored to the non-volatile Flash memory, and thus retained after Power Down.

Table 20: Operating modes of the ME indicated by status LED (if <**mode**> = 1):

LED mode	Function
Off	ME is off or running in SLEEP or Alarm mode.
600 ms On / 600ms Off	No SIM card inserted or no PIN entered, or network search in progress, or ongoing user authentication, or network login in progress.
75 ms On / 3 s Off	Logged to network (monitoring control channels and user interactions). No call in progress.
75 ms on / 75 ms Off / 75 ms On / 3 s Off	One or more GPRS contexts activated.
Flashing	LED is ON when data packets were exchanged in GPRS online mode during the last second.
On	Depending on type of call: *Voice call:* Connected to remote party. *Data call:* Connected to remote party or exchange of parameters while setting up or disconnecting a call.

9.50 AT^STCD Display Total Call Duration

Test command	Response
AT^STCD=?	**OK**
Execute command	**Response**
AT^STCD	TA returns total call duration (accumulated duration of all calls) **^STCD: <time> OK** Parameter **<time>** string type value; format is "hh:mm:ss", where characters indicate hours, minutes, seconds; E.g. 22:10:00 “22:10:00" max value is 9999:59:59
Reference	Note
Siemens	The Total Call Duration will not be reset by power off or other means.

10 APPENDIX

10.1 Summary of ERRORS and Messages

The final result codes **+CME ERROR: <err>** and **+CMS ERROR: <err>** indicate errors related to mobile equipment or network. The effect is similar to an **ERROR** result code.

A final result error code terminates the execution of the command and prevents the execution of all remaining commands that may follow on the same command line. If so, neither **ERROR** nor **OK** result code are returned for these commands. A 30 seconds timeout causes **ERROR** to be returned when the input of a command is not complete.

The format of **<err>** can be either numeric or verbose. This is set with the AT+CMEE command (see Chapter 4.25).

10.1.1 Summary of CME ERRORS related to GSM 07.07

Code of <err>	Meaning
0	phone failure
1	no connection to phone
2	phone-adapter link reserved
3	Operation not allowed
4	Operation not supported
5	PH-SIM PIN required
6	PH-FSIM PIN required
7	PH-FSIM PUK required
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
14	SIM busy
15	SIM wrong
16	Incorrect password
17	SIM PIN2 required
18	SIM PUK2 required
20	Memory full
21	invalid index
22	not found
23	Memory failure
24	text string too long
25	invalid characters in text string
26	dial string too long
27	invalid characters in dial string
30	no network service
31	Network timeout
32	Network not allowed emergency calls only
40	Network personalization PIN required
41	Network personalization PUK required
42	Network subset personalization PIN required

Code of <err>	Meaning
43	Network subset personalization PUK required
44	service provider personalization PIN required
45	service provider personalization PUK required
46	Corporate personalization PIN required
47	Corporate personalization PUK required
48	PH-SIM PUK required (PH-SIM PUK may also be referred to as Master Phone Code. For further details see 4.21, 4.35 and 4.35.1)
100	Unknown
132	service option not supported
133	requested service option not subscribed
134	service option temporarily out of order
256	Operation temporary not allowed
257	call barred
258	phone is busy
259	user abort
260	invalid dial string
261	ss not executed
262	SIM blocked

Note: Values below 256 are reserved.

10.1.2 Summary of GPRS-related CME ERRORS

Code of <err>	Meaning
103	Illegal MS
106	Illegal ME
107	GPRS services not allowed
111	PLMN not allowed
112	Location area not allowed
113	Roaming not allowed in this location area
148	unspecified GPRS error
149	PDP authentication failure
150	invalid mobile class

10.1.3 Summary of CMS ERRORS related to GSM 07.05

Code of <err>	Meaning
1	Unassigned (unallocated) number
8	Operator determined barring
10	Call barred
21	Short message transfer rejected
27	Destination out of service
28	Unidentified subscriber
29	Facility rejected
30	Unknown subscriber
38	Network out of order
41	Temporary failure
42	Congestion
47	Resources unavailable, unspecified
50	Requested facility not subscribed
69	Requested facility not implemented
81	Invalid short message transfer reference value
95	Invalid message, unspecified
96	Invalid mandatory information
97	Message type non-existent or not implemented
98	Message not compatible with short message protocol state
99	Information element non-existent or not implemented
111	Protocol error, unspecified
127	Interworking, unspecified
128	Telematic interworking not supported
129	Short message Type 0 not supported
130	Cannot replace short message
143	Unspecified TP-PID error
144	Data coding scheme (alphabet) not supported
145	Message class not supported
159	Unspecified TP-DCS error
160	Command cannot be actioned
161	Command unsupported
175	Unspecified TP-Command error
176	TPDU not supported
192	SC busy
193	No SC subscription
194	SC system failure
195	Invalid SME address
196	Destination SME barred
197	SM Rejected-Duplicate SM
198	TP-VPF not supported
199	TP-VP not supported
208	D0 SIM SMS storage full
209	No SMS storage capability in SIM
210	Error in MS
211	Memory Capacity Exceeded
212	SIM Application Toolkit Busy
213	SIM data download error

Code of <err>	Meaning
255	Unspecified error cause
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
304	Invalid PDU mode parameter
305	Invalid text mode parameter
310	SIM not inserted
311	SIM PIN required
312	PH-SIM PIN required
313	SIM failure
314	SIM busy
315	SIM wrong
316	SIM PUK required
317	SIM PIN2 required
318	SIM PUK2 required
320	Memory failure
321	Invalid memory index
322	Memory full
330	SMSC address unknown
331	no network service
332	Network timeout
340	NO +CNMA ACK EXPECTED
500	Unknown error
512	User abort
513	unable to store
514	invalid status
515	invalid character in address string
516	invalid length
517	invalid character in pdu
518	invalid parameter
519	invalid length or character
520	invalid character in text
521	timer expired
522	Operation temporary not allowed

Note:
If you attempt to use SMS related AT commands before inserting a SIM card or entering the SIM PIN, the resulting errors will be delivered in the form of CME errors instead of CMS errors.
This is a normal behavior since the GSM 07.05 based CMS errors are mapped to GSM 07.07 based CME errors if SIM PIN authentication has not been done.

Example 1	The application tries to send a short message though the SIM card is not present:
	
	`AT+CMGF=1`
	`OK`
	
	`AT+CMGS=123456`
	`+CME ERROR: 10` // Equivalent to `+CMS ERROR: 310`

Example 2	The application tries to send a short message while the SIM card is present, but PIN authentication has not yet been done.
	`AT+CMGF=1`
	`OK`
	`AT+CMGS=123456`
	`+CME ERROR: 11` // Equivalent to +`CMS ERROR: 311`

10.1.4 Summary of Unsolicited Result Codes (URC)

This chapter provides a summary of Unsolicited Result Codes. For further explanations on URCs please refer to Chapter 1.4.5.

Table 21: Summary of URCs

Message	Meaning	How to activate URC
RING	Incoming calls	Not defined by user
+CCCM: <ccm>	Current call meter value	AT^SACM=1
+CREG: <stat>[,<lac>,<ci>]	Registration to ME network changed	AT+CREG=1 or AT+CREG=2
+CRING: <type>	Indication of an incoming call	AT+CRC=1
+CLIP: <number>,<type>,<CLI validity>	Telephone number of caller	AT+CLIP=1
+CMTI:<mem>,<index>	Indication of a new short message (text and PDU mode)	AT+CNMI=1,1
+CMT:,<length><CR><LF><pdu>	Short message is output directly to the TE (in PDU mode)	Example: AT+CNMI=1,2
+CMT:<oa>,,<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data>	Short message is output directly to the TE (in text mode)	Example: AT+CNMI=1,2
+CBM:<sn>,<mid>,<dcs>,<page>,<pages><CR> <LF><data>	Cell broadcast message is output directly to the TE (in text mode)	Example: AT+CNMI=1,0,2
+CBM: <length><CR><LF><pdu>	Cell broadcast message is output directly to the TE (in PDU mode)	Examples: AT+CNMI=1,0,2
+CDS: <length><CR><LF><pdu> +CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>, <st>	SMS status report routed directly to TE (in PDU mode) SMS status report routed directly to TE (in text mode)	Example: AT+CNMI=1,0,0,1
+CDSI: <mem>,<index>	SMS status report routed ME/TA. Can be queried from the memory with location index number (text and PDU mode)	Example: AT+CNMI=1,0,0,2
+CSSI: <code1> +CSSU: <code2>	Supplementary service intermediate/unsolicited result code	AT+CSSN=1,x AT+CSSN=1,x
^SMGO: <mode>	SMS overflow indicator	AT^SMGO=1
^SCKS: <m>	Indicates whether card has been removed or inserted	AT^SCKS=1
^SCTM_B: <m>	Board is close to or beyond critical temperature limit. If <m>=2 or <m>-2, ME switches off.	AT^SCTM=1

Message	Meaning	How to activate URC
^SBC: Undervoltage	Undervoltage detected. ME will be switched off within a minute.	AT^SBC=1
^SYSSTART	Indicates that ME has successfully been started. Note that this URC will not appear if autobauding is enabled.	Not defined by user
^SYSSTART ALARM MODE or, if individual text available: ^SYSSTART ALARM MODE +CALA: <text>	Indicates that ME has entered Alarm mode. RTC alert set with the AT+CALA command. Executed when ME has been powered down. Causes ME to wake up from Power Down mode. Preventing ME from unintentionally registering to the network, Alarm mode allows limited operation. Limited number of AT commands is accessible. Do not confuse with reminder message. Note that this URC will not appear if autobauding is enabled.	AT+CALA=<time>,0,0,<text> or AT+CALA=<time> Power down ME.
+CALA: <text>	Reminder message set with AT+CALA command. Executed while ME is in normal operation. Do not confuse with Alarm mode.	AT+CALA=<time>,0,0,<text> or AT+CALA=<time> Do not power down ME.
+CIEV: <text>	Reports changes from indicators listed in the AT+CIND command specification. Discard CIEV unsolicited result codes when TA-TE link is reserved (e.g. in on-line data mode); otherwise forward them directly to the TE.	AT+CMER=1,0,0,2
+CIEV: <text>	Reports changes from indicators listed in the AT+CIND command specification. Buffer CIEV unsolicited result codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation. Otherwise forward them directly to the TE.	AT+CMER=2,0,0,2
+CIEV: <text>	Reports changes from indicators listed in the AT+CIND command specification. forward CIEV unsolicited result codes directly to the TE; TA-TE link specific in-band technique used to embed result codes and data when TA is in on-line data mode.	AT+CMER=3,0,0,2

Message	Meaning	How to activate URC
+CCWA: <number>,<type>, <class>,,<CLI validity>	Call waiting indication (for data calls, parameter <class> states the actual bearer service group, with a <class> value between 16 and 128)	AT+CCWA=1,1, <class>
^SCWA:	Indicates that a waiting call has been received while ME was engaged in a CSD call, but that this waiting call was hung up by the other part before ME went back to command mode.	AT+CCWA=1,1, <class>
+CUSD:<m>[,<str>,<dcs> (Unstructured supplementary service data)	USSD response from the network after a mobile originated or network initiated action.	AT+ CUSD=1
^SSIM READY	Reading of SMS and phonebooks from SIM is completed	AT^SSET=1
^SHUTDOWN	Issued after complete execution of AT^SMSO. Indicates that AC45 enters POWER DOWN mode.	Not defined by user

Table 22: Summary of Fax Class 2 URCs defined by EIA PN-2388

Message	Meaning
+FCON	Indicates connection with a fax machine
+FNSF:<param>	Reports non-standard setup frame
+FTSI:"<id>"	Reports the remote ID, transmit station ID
+FCSI:"<id>"	Reports the remote ID, called station ID
+FDCS:<VR>, ,<WD>,<LN>, <DF>,<EC>,<BF>,<ST>	Reports the current session parameter (refer to EIA PN-2388, table 3.10)
+FDIS:<VR>, ,<WD>,<LN>, <DF>,<EC>,<BF>,<ST>	Reports the remote station capabilities (refer to EIA PN-2388, table 3.10)
+FHNG:<stat>	Reports call terminated with status
+FPTS:<stat>	Reports received page status
+FET:<stat>	Reports post page message

10.1.5 Result codes

Indication	Numeric	Meaning
OK	0	Command executed, no errors, Wake up after reset
CONNECT	1	Link established
RING	2	Ring detected
NO CARRIER	3	Link not established or disconnected
ERROR	4	Invalid command or command line too long
NO DIALTONE	6	No dial tone, dialing impossible, wrong mode
BUSY	7	Remote station busy
CONNECT 2400/RLP	47	Link with 2400 bps and Radio Link Protocol
CONNECT 4800/RLP	48	Link with 4800 bps and Radio Link Protocol
CONNECT 9600/RLP	49	Link with 9600 bps and Radio Link Protocol
CONNECT 14400/RLP	50	Link with 14400 bps and Radio Link Protocol
ALERTING		Alerting at called phone
DIALING		Mobile phone is dialing

10.1.6 Cause Location ID for the extended error report (AT+CEER)

ID	Description	Reference (related chapter)
0	No error (default)	
1	SIEMENS L2 cause	(none)
2	GSM cause for L3 Radio Resource Sublayer (GSM 04.08 annex F)	10.1.7
3	SIEMENS cause for L3 Radio Resource Sublayer	10.1.8
4	GSM cause for L3 Mobility Management (GSM 04.08 annex G)	10.1.9
5	SIEMENS cause for L3 Mobility Management	10.1.10
6	GSM cause for L3 Mobility Management via MMR-SAP (GSM 04.08 annex G)	10.1.9
7	SIEMENS cause for L3 Mobility Management via MMR-SAP	10.1.10
8	GSM cause for L3 Call Control (GSM 04.08 10.5.4.11 and annex H)	10.1.11
9	SIEMENS cause for L3 Call Control	10.1.12
11	SIEMENS cause for L3 Advice of Charge Entity	10.1.13
12	GSM cause for L3 SMS CP Entity	
13	SIEMENS cause for L3 SMS CP Entity	
14	GSM cause for L3 SMS RL Entity	
15	SIEMENS cause for L3 SMS RL Entity	
16	GSM cause for L3 SMS TL Entity	
17	SIEMENS cause for L3 SMS TL Entity	
18	SIEMENS cause for DSM Entity	
21	GSM cause for L3 Call-related Supplementary Services	10.1.14
22	SIEMENS cause for L3 Call related Supplementary Services	10.1.15
32	SIEMENS cause for Supplementary Services Entity	10.1.16
33	SIEMENS cause for Supplementary Services Manager	10.1.17
34	Network cause for Supplementary Services (GSM 04.08 10.5.4.11 and annex H)	10.1.14
35	Supplementary Services network error (GSM 04.80 3.6.6)	10.1.14
48	GSM cause for GPRS Mobility Management (GSM 04.08 annex G.6)	
49	SIEMENS cause for GPRS Mobility Management	
50	GSM cause for Session Management (GSM 04.08 annex I)	10.1.18
51	SIEMENS cause for Session Management	10.1.19
127	Siemens cause for protocol module or other local cause	10.1.22
128	Supplementary Services general problem (GSM 04.80 3.6.7)	10.1.14
129	Supplementary Services invoke problem (GSM 04.80 3.6.7)	10.1.14
130	Supplementary Services result problem (GSM 04.80 3.6.7)	10.1.14
131	Supplementary Services error problem (GSM 04.80 3.6.7)	10.1.14
241	SIEMENS cause for GPRS API	10.1.20
242	SIEMENS cause for Link Management	
243	SIEMENS cause for Embedded Netcore (Internet Protocol Stack)	10.1.21

10.1.7 GSM release cause for L3 Radio Resource (RR) (AT+CEER)

Number	Description
0	Normal event
1	Abnormal release, unspecified
2	Abnormal release, channel unacceptable
3	Abnormal release, timer expired
4	Abnormal release, no activity on the radio path
5	Pre-emptive release
8	Handover impossible, timing advance out of range
9	Channel mode unacceptable
10	Frequency not implemented
65	Call already cleared
95	Semantically incorrect message
96	Invalid mandantory information
97	Message type non-existent or not implemented
98	Message type not compatible with protocol state
100	Conditional information element error
101	No cell allocation available
111	Protocol error unspecified

10.1.8 Siemens release cause for L3 Radio Resource (RR) (AT+CEER)

Number	Description
1	Racchs not answered
2	Racchs rejected
3	Access class of the SIM is barred by the network provider
4	SABM failure
5	Radio link counter expiry or PerformAbnormalRelease
6	Confirm ABORT of the MM
7	Respond to DEACT_REQ
8	Loss of coverage
9	Reestablishment not possible

10.1.9 GSM release cause for Mobility Management (MM) (AT+CEER)

Number	Description
Causes related to MS identification	
2	IMSI unknown in HLR
3	Illegal MS
4	IMSI unknown in VLR
5	IMEI not accepted
6	Illegal ME
Cause related to subscription options	
11	PLMN not allowed
12	Location Area not allowed
13	Roaming not allowed in this location area
Causes related to PLMN specific network failures and congestion	
17	Network failure
22	Congestion
Causes related to nature of request	
32	Service option not supported
33	Requested service option not subscribed
34	Service option temporarily out of order
38	Call cannot be identified
Causes related to invalid messages	
95	Semantically incorrect message
96	Invalid mandantory information
97	Message type non-existent or not implemented
98	Message not compatible with protocol state
99	Information element non-existent or not implemented
100	Conditional information element error
101	Messages not compatible with protocol state
111	Protocol error, unspecified
Causes related to GPRS	
7	GPRS services not allowed
8	GPRS services not allowed in combination with non-GPRS services
9	MS identity cannot be identified by the network
10	Implicitly detached
14	GPRS services not allowed in current PLMN
16	MSC temporarily unreachable

10.1.10 Siemens release cause for L3 Mobility Management (MM) (AT+CEER)

Number	Description
1	No SIM available
8	No MM connection
9	Authentification failure
11	MM performs detach
17	The registration failed and will be re-attempted in a short term
18	The CM connection establishment failed
19	The registration failed and will be re-attempt in a long term
20	The RR connection is released
21	The MS tries to register
22	The SPLMN is not available
23	An MTC is in progress
24	A PLMN scan is in progress
25	The MM is detached, the MS is in MS class C GPRS only

10.1.11 GSM release cause for L3 Call Control (CC) (AT+CEER)

Number	Description
0	No error
Normal class	
1	Unassigned (unallocated) number
3	No route to 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
25	Pre-emption
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
Resource unavailable class	
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	Resource unavailable, unspecified
Service or option not available class	

Number	Description
49	Quality of service unavailable
50	Requested facility not subscribed
55	Incoming calls barred within the CUG
57	Bearer capability not authorized
58	Bearer capability presently not available
63	Service or option not available, unspecified
Service or option not implemented	
65	Bearer service not implemented
68	ACM equal 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
Invalid message (e.g. parameter out of range) class	
81	Invalid transaction identifier value
87	User not member of CUG
88	Incompatible destination
91	Invalid transit network selection
95	Semantically incorrect message
Protocol error (e.g. unknown message) class	
96	Invalid mandantory information
97	Message type non-existant or not implemented
98	Message type not comaptible with protocol state
99	Information element non-existent or not implemented
100	Conditional information element error
101	Message not compatible with protocol
102	Recovery on timer expiry
111	Protocol error, unspecified
Interworking class	
127	Interworking, unspecified

10.1.12 Siemens release cause for L3 Call Control (CC) (AT+CEER)

Number	Description
1	Call dropped
2	Service not available
3	Hold procedure not available
4	Temporary no service, previous procedure not yet finished
5	No speech service available
6	Call reestablishment procedure active
7	Mobile received a release (complete) message during a modify procedure (modify reject)
8	Call clearing, because loss of radio connection, if no reestablishment is allowed (call not active)
10	Number not included in FDN list
Notifications	
300	Called party barred incoming call

10.1.13 Siemens release cause for L3 Advice of Charge (AOC) (AT+CEER)

Number	Description
1	SIM data not available
2	SIM does not support AOC
3	SIM data access error
4	ACM limit almost reached ACM range overflow
5	ACM range overflow

10.1.14 GSM release cause for Supplementary Service call (AT+CEER)

Number	Description
0	No error (default)
1	UnknownSubscriber
9	IllegalSubscriber
10	BearerServiceNotProvisioned
11	TeleserviceNotProvisioned
12	IllegalEquipment
13	CallBarred
15	CUGReject
16	IllegalSSOperation
17	SSErrorStatus
18	SSNotAvailable
19	SSSubscriptionViolation
20	SSIncompatibility
21	FacilityNotSupported
27	AbsentSubscriber
29	ShortTermDenial
30	LongTermDenial
34	SystemFailure
35	DataMissing
36	UnexpectedDataValue
37	PWRegistrationFailure
38	NegativePWCheck
43	NumberOfPWAttemptsViolation
71	UnknownAlphabet
72	USSDBusy
126	MaxNumsOfMPTYCallsExceeded
127	ResourcesNotAvailable
General Problem Codes	
300	Unrecognized Component
301	Mistyped Component
302	Badly Structured Component
Invoke Problem Codes	
303	Duplicate Invoke ID
304	Unrecognized Operation
305	Mistyped Parameter
306	Resource Limitation
307	Initiating Release

Number	Description
308	Unrecognized Linked ID
309	Linked Response Unexpected
310	Unexpected Linked Operation
Return Result Problem Codes	
311	Unrecognize Invoke ID
312	Return Result Unexpected
313	Mistyped Parameter
Return Error Problem Codes	
314	Unrecognized Invoke ID
315	Return Error Unexpected
316	Unrecognized Error
317	Unexpected Error
318	Mistyped Parameter

10.1.15 Siemens release cause for Call related Supplementary Services (CRSS) (AT+CEER)

Number	Description
0	ECT procedure failed (timer expired)
1	Call has been cleared without receiving an answer to ECT request
2	Initial conditions not fulfilled (one active, one held call)
3	Received “return error”
4	Call has been cleared without receiving an answer to CCBS request
5	Initial conditions for CCBS not fulfilled (Idle CRSS)

10.1.16 Siemens cause for Supplementary Services Entity

Number	Description
1	No Error
2	MM Error
3	MM Release
4	SIM contact lost or power off
5	Error in ASN.1 Codec
6	Unexpected release
7	Mtc collision
8	Out of memory
9	Erroneous message received
10	Protocol error, unspecified

10.1.17 Siemens cause for Supplementary Services Manager

Number	Description
0	Out of Memory
1	Missing parameter
2	Unexpected parameter
3	Activate not allowed
4	Deactivate not allowed
5	Registrate not allowed
6	Erase not allowed
7	Interrogate not allowed
8	Illegal request
9	Null request
10	SS manager busy
11	Received unexpected facility IE
12	Received ‘Release Complete return error’
13	Received ‘Release Complete return reject’
14	Received ‘Release Complete’ without facility IE
15	Received ‘Release Complete’ with erroneous facility IE
16	Received facility with erroneous facility IE
17	Received ‘Return Result” with unexpected OC
18	Received ‘Return Result” with illegal OC
19	Received ‘Return Result” with unexpected empty result
20	Request Barred
22	Supplementary Service Modified (by SAT, SIM call control or other entity)

10.1.18 GSM release cause for Session Management (SM) (AT+CEER)

Number	Description
Causes related to nature of request	
25	LLC or SNDCP failure
26	Insufficient ressources
27	Unknown or missing access point name
28	Unknown PDP address or PDP type
29	User authentification failed
30	Activation rejected by GGSN
31	Activation rejected, unspecified
32	Service option not supported
33	Requested service option not subscribed
34	Service option temporarily out of order
35	NSAPI already used
36	Regular PDP context deactivation
37	QoS not accepted
38	Network failure
39	Reactivation requested
40	Feature not supported
Causes related to invalid messages	
81	Invalid transaction identifier value
95	Semantically incorrect message
96	Invalid mandantory information
97	Message type non-existant or not implemented
98	Message type not comaptible with protocol state
99	Information element non-existent or not implemented
100	Conditional information element error
101	Message not compatible with protocol
111	Protocol error, unspecified

10.1.19 SIEMENS release cause for Session Management (SM) (AT+CEER)

Number	Description
3	The MS has not got any answer to the ACTIVATE PDP CONTEXT request message sent five times to the network
4	A MT PDP context which is active or in the activation process is deactivated because another MT PDP context with the same TI is requested by the network to be activated
5	A MT PDP context which is active or in the activation process is deactivated because another MT PDP context with the same TI is requested by the network to be activated. The activation request is rejected by the SM sending the cause 'insufficient resources' to the network because the SM was not able to perform the necessary comparisons for a static PDP address collision detection.
6	A MT PDP context which is active or in the activation process is deactivated because another MT PDP context with the same TI is requested by the network to be activated. As a static PDP address collision with an MO activating PDP context has been detected by the SM the SM discards the activation request
7	A MT PDP context request has been indicated but could not be processed in time. The activation request is rejected by the SM sending the cause 'insufficient resources' to the network.

10.1.20 SIEMENS release cause for GPRS API (AT+CEER)

Number	Description
0	Regular deactivation of the call
1	Action temporarily not allowed
2	Wrong connection type
3	Specified data service profile invalid
4	PDP type or address is unknown
255	Undefined

10.1.21 SIEMENS release cause for Embedded Netcore (AT+CEER)

Number	Description
0	Regular call deactivation
1	LCP stopped
255	Undefined

10.1.22 GSM cause for L3 Protocol module or other local cause (AT+CEER)

Number	Description
2	No detailed cause

10.2 Summary of PIN requiring AT Commands

The following table lists all the AT commands that are available after the PIN was entered.

AT command	Required PIN
Standard V25.ter AT commands	
ATA	PIN 1
ATD	PIN 1
ATH	PIN 1
AT+ILRR	PIN 1
AT commands originating from GSM 07.07	
AT+CACM	PIN 1, PIN 2
AT+CAMM	PIN 1, PIN 2
AT+CAOC	PIN 1
AT+CCFC	PIN 1
AT+CCWA	PIN 1
AT+CCUG	PIN1
AT+CEER	PIN 1
AT+CGACT	PIN 1
AT+CGATT	PIN 1
AT+CGDATA	PIN 1
AT+CGDCONT	PIN 1
AT+CGPADDR	PIN 1
AT+CGQMIN	PIN 1
AT+CGQREQ	PIN 1
AT+CGREG	PIN1
AT+CGSMS	PIN1
AT+CHLD	PIN 1
AT+CHUP	PIN 1
AT+CIMI	PIN 1
AT+CLCC	PIN 1
AT+CLCK	PIN 1
AT+CLIP read	PIN 1
AT+CLIR	PIN1
AT+CMER	PIN 1
AT+CMGC	PIN 1
AT+CMGD	PIN 1
AT+CMGL	PIN 1
AT+CMGR	PIN 1
AT+CMGS	PIN 1
AT+CMGW	PIN 1
AT+CMSS	PIN 1
AT+CNMA	PIN 1
AT+CNMI	PIN 1
AT+COPN	PIN 1
AT+CPBR	PIN 1
AT+CPBS	PIN 1
AT+CPBW	PIN 1
AT+CPIN2	PIN 1
AT+CPMS	PIN 1

AT command	Required PIN
AT+CPUC	PIN 1, PIN 2
AT+CPWD	PIN 1, PIN 2
AT+CR	PIN 1
AT+CRSM Depending on parameters <command> and <fileId>	PIN 1
AT+CSCA	PIN 1
AT+CSCB	PIN 1
AT+CSDH	PIN 1
AT+CSMP	PIN 1
AT+CSMS	PIN 1
AT+CUSD	PIN 1
Siemens defined AT commands	
AT^SACM	PIN 1
AT^SCNI	PIN 1
AT^SDLD	PIN 1
AT^SGACT	PIN 1
AT^SIND	PIN1
AT^SLCD	PIN 1
AT^SLCK	PIN 1
AT^SLMS	PIN1
AT^SMGL	PIN 1
AT^SMGO	PIN 1
AT^SMGR	PIN 1
AT^SMONC	PIN 1
AT^SMONG	PIN1
AT^SPBC	PIN 1
AT^SPBD	PIN 1
AT^SPBG	PIN 1
AT^SPBS	PIN 1
AT^SPLM	PIN 1
AT^SPLR	PIN 1
AT^SPLW	PIN 1
AT^SPWD	PIN 1, PIN 2
AT^STCD	PIN 1

10.3 AT commands available before entering the SIM PIN

The following table summarizes the AT commands you can use before the SIM PIN has been entered.

Explanation:
- ● AT command usable without PIN
- --- not usable without PIN
- n.a. AT command not available at all

AT command	Test	Read	Write / Execute	Note
Standard V.25ter AT commands				
AT\Q	n.a.	n.a.	●	
ATD	n.a.	n.a	●	For emergency calls only
ATE	n.a.	n.a	●	
ATI	n.a.	n.a	●	
ATO	n.a.	n.a	●	
ATQ	n.a.	n.a	●	
ATS0	n.a.	●	●	
ATS3	n.a.	●	●	
ATS4	n.a.	●	●	
ATS5	n.a.	●	●	
ATS6	n.a.	●	●	
ATS7	n.a.	●	●	
ATS8	n.a.	●	●	
ATS10	n.a.	●	●	
ATS18	n.a	●	●	
ATV	n.a.	n.a	●	
ATX	n.a.	n.a	●	
ATZ	n.a.	n.a	●	
AT&C	n.a.	n.a	●	
AT&D	n.a.	n.a	●	
AT&F	n.a.	n.a	●	
AT&S	n.a.	n.a	●	
AT&V	n.a.	n.a	●	
AT+IPR	●	●	●	
AT commands originating from GSM 07.07				
AT+CALA	●	●	●	
AT+CBST	●	●	●	
AT+CCLK	●	●	●	
AT+CFUN	●	●	●	
AT+CGMI	●	n.a.	●	
AT+CGMM	●	n.a.	●	
AT+CGMR	●	n.a.	●	
AT+CGSN	●	n.a.	●	
AT+CIND	●	●	●	
AT+CLIP	●	---	●	
AT+CLVL	●	●	●	
AT+CMEE	●	●	●	
AT+CMGF	●	●	●	
AT+CMUT	●	●	●	
AT+CMUX	●	●	●	
AT+COPS	●	●	●	

AT command	Test	Read	Write / Execute	Note
AT+CPAS	●	n.a.	●	
AT+CPIN	●	●	●	
AT+CRC	●	●	●	
AT+CREG	●	●	●	
AT+CRLP	●	●	●	
AT+CRSM	●	●	●	Depending on parameters <command> and <fileId>
AT+CSCS	●	●	●	
AT+CSNS	●	●	●	
AT+CSQ	●	---	●	
AT+CSSN	●	●	●	
AT+GCAP	●	n.a.	●	
AT+GMI	●	n.a.	●	
AT+GMM	●	n.a.	●	
AT+GMR	●	n.a.	●	
AT+GSN	●	n.a.	●	
AT+VTD	●	●	●	
AT+VTS	●	n.a.	●	Usage of Write comd. before PIN1 authentication only for emergency calls.
AT+WS46	●	●	●	12 (GSM digital cellular)
Siemens defined AT commands				
AT^MONP	●	n.a.	●	
AT^MONI	●	n.a.	●	
AT+CXXCID	●	n.a.	●	
AT^SAD	●	●	●	
AT^SAIC	●	●	●	
AT^SBC	●	●	●	
AT^SCID	●	n.a.	●	
AT^SCKS	●	●	●	
AT^SCTM	●	●	●	
AT^SGAUTH	●	●	●	
AT^SHOM	●	n.a.	●	
AT^SM20	●	●	●	
AT^SMSO	●	●	●	
AT^SNFA	●	●	●	
AT^SNFD	●	n.a.	●	
AT^SNFI	●	●	●	
AT^SNFM	●	●	●	
AT^SNFO	●	●	●	
AT^SNFPT	●	●	●	
AT^SNFS	●	●	●	
AT^SNFV	●	●	●	
AT^SNFW	●	n.a.	●	
AT^SPIC	●	n.a.	●	
AT^SRTC	●	●	●	
AT^SRSA	●	●	●	
AT^SRSM	●	●	●	
AT^SSET	●	●	●	

AT command	Test	Read	Write / Execute	Note
AT^SSCONF	●	●	●	
AT^SSDA	●	●	●	
AT^SSMSS	●	●	●	
AT^SSYNC	●	●	●	
Remote-SAT commands				
AT^SSTA	●	●	●	
AT^SSTGI	●	●	●	
AT^SSTR	●	●	●	

10.4 Standard GSM service codes

The following GSM command strings can be sent with the ATD command and must be terminated with semicolon ";". See also ATD in Chapter 2.5. Reference: GSM 2.30.

Table 23: GSM service codes

*# code	Functionality	Possible response(s)
Phone security		
*#06#	Query IMEI	<IMEI> OK
**04*oldPIN*newPIN*newPIN#	Change PIN1	+CME ERROR: <err> / OK See also Chapters 4.21, 4.35, 4.35.1, 4.36.
**042*oldPIN2*newPIN2*newPIN2#	Change PIN2	
**05*unblKey*newPIN*newPIN#	Unlock PIN 1. (Unblock SIM card after 3 failed attempts to enter PIN1)	
**052*unblKey*newPIN*newPIN#	Unlock PIN2 (after 3 failed attempts to enter PIN2)	
*#0003*MasterPhoneCode#	Unlock "PS" lock with Master Phone Code	
[*]03[ZZ]*oldPw*newPw*newPw#	Registration of net password (change call barring password)	
Phone number presentation		
*#30#	Check status of CLIP (Calling Line Identification Presentation)	+CLIP: <n>,<m> OK (Cf. Chapter 4.22)
*#31#	Check status of CLIR (Calling Line Identification Restriction)	+CLIR: <n>,<m> OK (Cf. Chapter 4.23)
*31#<Phonenumber>[;]	Suppress CLIR	(Cf. Chapter 4.23)
#31#<Phonenumber>[;]	Activate CLIR	(Cf. Chapter 4.23)
*#76#	Check status of COLP (Connected Line Identification Presentation)	+COLP: 0,<m> OK (where <m> = active or not active)
*#77#	Check status of COLR (Connected Line Identification Restriction)	+COLR: 0,<m> OK (where <m> = active or not active)
Call forwarding (see also Chapter 10.4.1)		
(choice of *,#,*#,**,##)21*DN*BS#	Act/deact/int/reg/eras CFU	^SCCFC: <reason>, <status>, <class1>[, <number>, <type> [, <time>]] <CR><LF>[^SCCFC: ...]OK Refer to Chapter 4.6 for a description of parameters and Chapter 10.4.1 for differences regarding the responses ^SCCFC and +CCFC.
(choice of *,#,*#,**,##)67*DN*BS#	Act/deact/int/reg/eras CF busy	
(choice of *,#,*#,**,##)61*DN*BS*T#	Act/deact/int/reg/eras CF no reply	
(choice of *,#,*#,**,##)62*DN*BS#	Act/deact/int/reg/eras CF no reach	
(choice of *,#,*#,**,##)002*DN*BS*T#	Act/deact/int/reg/eras CF all	
(choice of *,#,*#,**,##)004*DN*BS*T#	Act/deact/int/reg/eras CF all cond.	
Call waiting (see also Chapter 10.4.1)		
(choice of *,#,*#)43*BS#	Activation/deactivation/int WAIT	+CCWA : <status>, <class><CR><LF> [+CCWA...]OK. See Chapter 4.9.
Call barring (see also Chapter 10.4.1)		
(choice of *,#,*#)33*Pw*BS#	Act/deact/int BAOC	^SCLCK: <facility>, <status>, <class> [, ...] Refer to Chapter 4.21 for a description of parameters and Chapter 10.4.1 for differences regarding the responses ^SCLCK and +CLCK.
(choice of *,#,*#)331*Pw*BS#	Act/deact/int BAOIC	
(choice of *,#,*#)332*Pw*BS#	Act/deact/int BAOIC exc.home	
(choice of *,#,*#)35*Pw*BS#	Act/deact/int. BAIC	
(choice of *,#,*#)351*Pw*BS#	Act/deact/int BAIC roaming	
#330*Pw*BS#	Deact. All Barring Services	
#333*Pw*BS#	Deact. All Outg.Barring Services	
#353*Pw*BS#	Deactivation. All Inc.Barring Services	

*# code	Functionality	Possible response(s)
Call Hold / Multiparty		
C[C] in call	Call hold and multiparty	+CME ERROR: <err> / OK (see Chapter 4.16)
USSD messages		
[C]...[C]# (varies with the serving network)	Send USSD message	+CME ERROR: <err> / OK (see Chapter 4.48)
C[C] (excluded 1[C]) (varies with the serving network)	Send USSD message	+CME ERROR: <err> / OK (see Chapter 4.48)

Abbreviations of codes and responses used in Table 23

Codes / parameters to be sent with ATD		
ZZ = type of supplementary services:	Barring services	330
	All services	Not specified
DN = dialing number:	String of digits 0-9	
BS = basic service equivalent to parameter <class>	Voice	11
	FAX	13
	SMS	16
	SMS +FAX	12
	Voice + FAX	19
	Voice + SMS + FAX	10
	Data circuit asynchron	25
	Data circuit synchron	24
	PAD	27
	Packet	26
	Data circuit asynchron + PAD	21
	Data circuit synchron + packet	22
	Data circuit asynchron + syncron. + PAD	20
	All Services	---
T = time in seconds	In contrast to AT command AT+CCFC, parameter T has no default value. If T is not specified, an operator defined default or the last known value may be used, depending on the network operator.	
PW = Password		
C = character of TE character set (e.g. asterix, hash or digit in case of USSD, or digits in case of held calls or multiparty calls)		
Possible responses		
<m>	Mode: 0 = not active, 1 = active	
<n>	Unsolicited result code: 0 = presentation disabled, 1 = presentation enabled	
<status>	Status: 0 = not active, 1 = active	
<class>	Represents BS = basic service See Chapters 4.6 (AT+CCFC), 4.21 (AT+CLCK) and 10.4.1.	
<facility>	Facility lock. See Chapter 4.21 (AT+CLCK)	
<reason>	Call forwarding reason	

For specifications of the format and parameters for *# strings, please refer to GSM 02.30, Annex C, and GSM 02.04, Table 3.2.

Function of *# codes for Supplementary Services

*# code	Abbreviation used in Chapter 10.4	Function
*	act	Activate (except for CLIR, see list above)
**	reg	Register and activate
*#	int	Check status (interrogate)
#	deact	Deactivate (except for CLIR, see list above)
##	eras	Unregister and deactivate

10.4.1 Additional notes on ^SCCFC, +CCWA, ^SCLCK

The following is a brief summary of differences between the *# codes for Call Forwarding, Call Waiting and Call Barring and their equivalent AT commands:

Differences regarding the syntax:

The number of parameters displayed in the ^SCCFC and ^SCLCK output strings differs from the equivalent +CCFC and +CLCK output strings: In contrast to the +CCFC string, ^SCCFC also includes the <reason>. Likewise, the ^SCLCK string includes additionally <facility>.

Response to atd*#21#; (query status of Call Forwarding Unconditional):
^SCCFC: <reason>, <status>, <class1>[, <number>, <type> [, <time>]]

Response to to at+ccfc=0,2 (query status of Call Forwarding Unconditional):
+CCFC: <status>, <class1>[, <number>, <type> [, <time>]]

Differences regarding default basic services / classes:

In the query mode, if no basic service is given, the *# codes use default <class> 15 (= voice, data, fax, SMS). In contrast to this, the AT commands AT+CCFC, AT+CCWA, AT+CLCK, AT+SCLCK use default <class> 7 (=voice, data, fax).

Selected examples:

Querying the status of Call Forwarding Unconditional	atd*#21#; ^SCCFC: 0,0,1 ^SCCFC: 0,0,8 ^SCCFC: 0,0,4 ^SCCFC: 0,0,2 OK at+ccfc=0,2 +CCFC: 0,1 +CCFC: 0,2 +CCFC: 0,4 OK
Querying the status of Call Waiting.	atd*#43#; +CCWA: 1,1 +CCWA: 0,8 +CCWA: 1,4 +CCWA: 1,2 OK at+ccwa=,2 +CCWA: 1,1 +CCWA: 1,2 +CCWA: 1,4

10.5 GSM alphabet tables and UCS2 character values

This section provides tables for the special GSM 03.38 alphabet supported by the ME (see Chapter 1.5). Below each GSM character you can find the corresponding two byte UCS2 character value.

Main character table of GSM 03.38 alphabet				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	@ 0040	Δ 0394	SP 0020	0 0030	¡ 00A1	P 0050	¿ 00BF	p 0070
0	0	0	1	1	£ 00A3	_ 005F	! 0021	1 0031	A 0041	Q 0051	a 0061	q 0071
0	0	1	0	2	$ 0024	Φ 03A6	" 0022	2 0032	B 0042	R 0052	b 0062	r 0072
0	0	1	1	3	¥ 00A5	Γ 0393	# 0023	3 0033	C 0043	S 0053	c 0063	s 0073
0	1	0	0	4	è 00E8	Λ 039B	¤ 00A4	4 0034	D 0044	T 0054	d 0064	t 0074
0	1	0	1	5	é 00E9	Ω 03A9	% 0025	5 0035	E 0045	U 0055	e 0065	u 0075
0	1	1	0	6	ù 00F9	Π 03A0	& 0026	6 0036	F 0046	V 0056	f 0066	v 0076
0	1	1	1	7	ì 00EC	Ψ 03A8	' 0027	7 0037	G 0047	W 0057	g 0067	w 0077
1	0	0	0	8	ò 00F2	Σ 03A3	(0028	8 0038	H 0048	X 0058	h 0068	x 0078
1	0	0	1	9	ç 00E7	Θ 0398	) 0029	9 0039	I 0049	Y 0059	i 0069	y 0079
1	0	1	0	10 /A	LF [LF][2)]	Ξ 039E	* 002A	: 003A	J 004A	Z 005A	j 006A	z 007A
1	0	1	1	11 /B	Ø 00D8	[1)]	+ 002B	; 003B	K 004B	Ä 00C4	k 006B	ä 00E4
1	1	0	0	12 /C	ø 00F8	Æ 00C6	, 002C	< 003C	L 004C	Ö 00D6	l 006C	ö 00F6
1	1	0	1	13 /D	CR [CR][2)]	æ 00E6	- 002D	= 003D	M 004D	Ñ 00D1	m 006D	ñ 00F1
1	1	1	0	14 /E	Å 00C5	ß 00DF	. 002E	> 003E	N 004E	Ü 00DC	n 006E	ü 00FC
1	1	1	1	15 /F	å 00E5	É 00C9	/ 002F	? 003F	O 004F	§ 00A7	o 006F	à 00E0

1) This code is an escape to the following extension of the 7 bit default alphabet table.
2) This code is not a printable character and therefore not defined for the UCS2 alphabet. It shall be treated as the accompanying control character.

Extension character table of GSM 03.38 alphabet				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0					| 007C			
0	0	0	1	1								
0	0	1	0	2								
0	0	1	1	3								
0	1	0	0	4		^ 005E						
0	1	0	1	5							€ [2] 20AC	
0	1	1	0	6								
0	1	1	1	7								
1	0	0	0	8			{ 007B					
1	0	0	1	9			} 007D					
1	0	1	0	10 /A	[3] [LF]							
1	0	1	1	11 /B		[1]						
1	1	0	0	12 /C				[005B				
1	1	0	1	13 /D				~ 007E				
1	1	1	0	14 /E				] 005D				
1	1	1	1	15 /F			\ 005C					

In the event that an MS receives a code where a symbol is not represented in the above table then the MS shall display the character shown in the main default 7 bit alphabet table.

1) This code value is reserved for the extension to another extension table. On receipt of this code, a receiving entity shall display a space until another extension table is defined.
2) This code represents the EURO currency symbol. The code value is the one used for the character ‘e’. Therefore a receiving entity which is incapable of displaying the EURO currency symbol will display the character ‘e’ instead.
3) This code is defined as a Page Break character and may be used for example in compressed CBS messages. Any mobile which does not understand the 7 bit default alphabet table extension mechanism will treat this character as Line Feed.

10.6 Sort order for phonebooks

Due to the support of UCS 2 for the "text" part of phonebook entries, the sort order for phonebook records follows the algorithm published as Unicode Technical Standard #10, "Unicode Collation Algorithm". A memory-optimized version of the proposed collation tables "[AllKeys]" from Unicode Technical Standard #10 is used in order to determine collation weights for Code points between 0000 and 06FF, and composed keys for Code points from ranges 0700 to 33FF, A000 to D7FF and E000 to FFFD. Code Points not referenced in these tables will be assigned a default collation weight with their unicode value as level 1 weight. Decomposition is not supported.

Phonebook entries whose names contain only characters from the GSM07.07 default alphabet are converted internally into their UCS 2 equivalents in order to achieve consistent sorting results.
For the user, this means that:

- Punctuation marks and other non-alphabetical characters from the common latin-based character sets, and from the standard GSM character set, will be sorted before any alphabetical characters. The order in which these marks appear as compared to other non-alphabetical characters from the same group is determined by their collation weights and does not reflect their code values in the UCS2 or GSM alphabet tables above. Please refer to www.unicode.org for detail.
- Alphabetical characters from the common latin-based character sets, and from the standard GSM character set, will be sorted according to their underlying base characters, plus the collation weights of their accent signs.
- Only collation levels 1 and 2 are regarded, so sorting is not case-sensitive.

Example: the European letters "å" (GSM 0FH), "a" (GSM 61H), "à" (GSM 7FH) and "b" (GSM 62H) will be sorted in order "a", "à", "å", b, although their numerical values in GSM and UCS2 suggest a different ordering.

References: Unicode Technical Standard #10, "Unicode Collation Algorithm"